

Civil Report

Cardno

Haul Road Development Application – Civil Report

St Marys Development Site – Central
Precinct

89914020



Prepared for
Lend Lease Communities

18 June 2014



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Executive Summary

The Central Precinct will ultimately require approximately two million cubic metres of fill to be imported, placed and compacted in order to meet flood risk management requirements.

In order to mitigate the potential noise and traffic impacts on local residents during the fill importation activities, a haul road is proposed to join Links Road, Dunheved to the eastern boundary of the Central Precinct.

The haul road will be located across two Local Government Areas, Blacktown City Council and Penrith City Council.

The haul road alignment is consistent with approved road corridors under the *St Marys Central Precinct Precinct Plan*, JBA, May 2009 and Development Application Reference numbers DA07/0494 and DA-07-1029 for Penrith City Council and Blacktown City Council respectively.

This report has been prepared in support of a Development Application for the haul road and addresses the following:

- Stormwater management
- Flooding
- Road design.

The construction and operation of the haul road is considered to have minimal impact on receiving waters and downstream ecosystems.

The fill activity associated with the construction of the haul road is demonstrated to have no significant impact on the existing flood characteristics of South Creek.

The haul road will be operated as a private road. The vertical and horizontal geometries of the haul road have been developed in consultation with Lend Lease Engineering who will be the Principal Contractor operating the haul road.

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1 Introduction

1.1 Project Background

Cardno has been engaged by Lend Lease Communities to provide Civil Engineering services to support the development of the St Marys Central Precinct.

The Central Precinct is located within the Penrith City Council (Council) Local Government Area (LGA) and covers an approximate area of 135 hectares. The Central Precinct is located within the former ADI Site, St Marys and is bound by regional park to the north and west, South Creek to the east and existing urban development to the south. A site locality plan is included in **Figure 1-1**.

Figure 1-1 Central Precinct – Site Locality Plan



Source: Central Precinct St Marys Precinct Plan and Development Control Plan, JBA, May 2009

Under existing conditions, the Central Precinct is subject to inundation from rising water levels in South Creek during local and regional rainfall events. To provide finished floor levels within the Central Precinct above the 1% Annual Exceedance Probability (AEP) flood, approximately two million cubic metres of fill needs to be imported, placed and compacted.

Vehicular access to the Central Precinct is currently afforded via a private road network that:

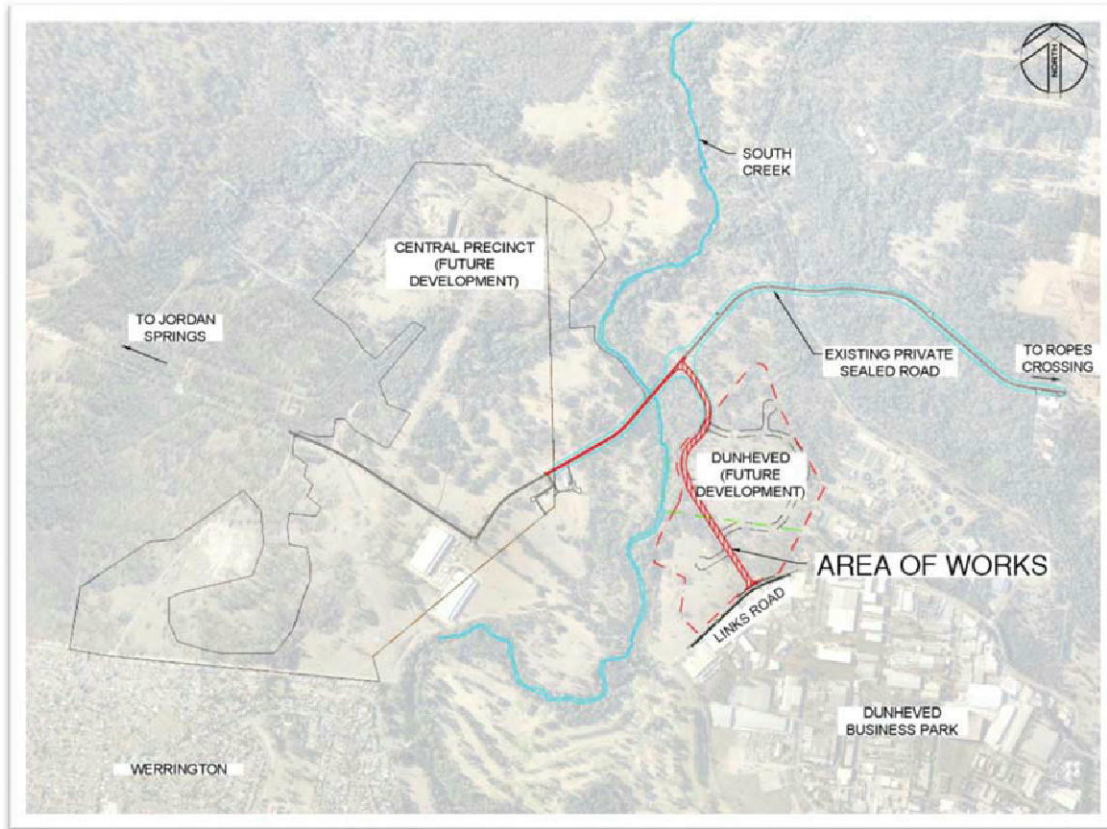
- Traverses the regional park between eastern boundary of the Central Precinct and Ropes Crossing Boulevard, Ropes Crossing
- Traverses the regional park between the western boundary of the Central Precinct and Lakeside Parade, Jordan Springs.

In order to facilitate the delivery of the required fill volume and to mitigate the potential impacts on residents at Ropes Crossing and Jordan Springs it is proposed to construct a haul road linking the Central Precinct to the existing public road network within the Dunheved Industrial Estate.

The proposed haul road would connect to the existing road network at Links Road, traverse the Dunheved Precinct and then join the existing private road that currently joins the Central Precinct to Ropes Crossing Boulevard. The proposed haul road route is shown in **Figure 1-1**.

The proposed haul road route starts and ceases within the Penrith City Council LGA. However, it does traverse a small portion of the Blacktown City Council LGA.

Figure 1-2 Proposed Haul Road Route



Source: Central Precinct St Marys Site Haul Road Development Application Drawing Set, Cardno, June 2014

1.2 Purpose of this Report

This report has been prepared in support of a Development Application that will be submitted to Penrith and Blacktown Councils and addresses the following:

- Existing site conditions
- Stormwater drainage
- Flooding
- Route selection
- Haul road civil design principles.

2 Existing Site Conditions

2.1 Site Location

The St Marys site covers an area of approximate 1,545 hectares and stretches approximately 7 kilometres from the east to the west and approximately 2 kilometres from the north to the south. The St Marys site is bound by Palmyra Avenue and Ninth Avenue to the north, Forrester Road and Palmyra Avenue to the east, the Dunheved Industrial Area, Dunheved Golf Club, Cambridge Gardens, Werrington Gardens and Werrington County residential estates to the south.

The Central Precinct development site is situated within the St Marys site and sits wholly within the Penrith City Council LGA. The Central Precinct covers an area of approximately 135 hectares and is bound by a regional park to the north and west, South Creek to the east and Werrington County to the south and The Northern Road to the west.

The haul road route covers an approximate distance of 2 kilometres and will connect Links Road to the eastern boundary of the Central Precinct. The haul road can be considered in two discrete components, viz:

1. Road 001 – a newly constructed sealed road that will traverse the Dunheved Precinct and connect Links Road to an existing sealed private road that connects the Central Precinct to Ropes Crossing Boulevard
2. Road 002 – an upgraded segment of the existing private road that currently connects the Central Precinct to Ropes Crossing Boulevard.

The haul road will start and finish within the Penrith City Council LGA. However, for a portion of its length, the haul road will traverse the Blacktown City Council LGA.

The haul road route is shown in **Figure 1-2**.

2.2 Site Topography

The existing topography of the haul road route is noticeably flat. Existing Reduced Levels (RLs) along the haul road route range from 18 mAHD to 21 mAHD.

The haul road route is located in close proximity to the eastern bank of South Creek. A catchment of approximately 5.5 hectares currently drains from the east of the haul road alignment towards South Creek.

2.3 Existing Assets and Structures

The haul road route is largely cleared of vegetation and is unburdened by existing assets and structures.

The haul road route crosses South Creek. An existing bridge crosses South Creek and has been deemed suitable for accommodating construction traffic. It is likely that despite the width of the bridge being approximately 8 metres that the bridge will operate as a single lane bridge to meet Lend Lease Engineering's construction safety practices.

3 Stormwater Management

3.1 Stormwater Drainage

Drainage associated with the haul road has been considered in two contexts:

1. Drainage of the haul road pavement
2. Drainage of catchments located on the high side of the haul road road reserve.

The drainage strategies adopted are nominated under the relevant sub-headings below.

3.1.1 Drainage of Haul Road

The road reserve for the haul road has been designed such that there is two-way cross fall away from the road centreline. Drainage swales have been included along both road verges and have the following typical features:

- Trapezoidal cross section with a base width of 1.0 metre, batter slopes at 1(V):3(H)
- Maximum depth of 1.0 metres
- Minimum longitudinal grade of 0.5%
- Grass lined.

Sag points along the channel are located above drainage infrastructure installed to convey water from the upstream side of the haul road to the low side (*refer Section 3.1.2*). At these sags, a surface inlet pit will be constructed to capture runoff from the haul road and to discharge it towards South Creek via a proposed pipe network.

3.1.2 Drainage of Upstream Catchments

The haul road route will result in a raised road carriageway that will result in an area of approximately 8.8 hectares being unable to discharge via sheet flow towards South Creek.

To maintain a drainage connection between this catchment and South Creek, 5 pipe crossings will be constructed under the haul road. The pipe crossings are located at existing low points along the eastern edge of the haul road batter.

The pipe crossings have the following typical features:

- Precast concrete headwalls and aprons at the inlet and outlet
- 450 mm diameter RCP
- Minimum longitudinal grade of 0.5%
- Level spreaders at the outlet to mitigate the potential for scour.

These crossings have been located so as to mimic existing surface flow patterns as far as is practicable.

3.2 Stormwater Quantity

The construction of the haul road will result in a minor increase in impervious area within the South Creek catchment.

A qualitative assessment has been undertaken and it is considered that the minor increase in impervious area would be unlikely to have a quantifiable impact on the existing flow characteristics within South Creek.

As such, no stormwater detention or retention structures have been included in the design of the haul road.

3.3 Stormwater Quality

3.3.1 Construction Phase

The construction of the haul road will require approximately 3 hectares of existing surface to be stripped and reshaped. A series of measures have been included to minimise the impact on receiving watercourses and downstream environments. Measures included have been developed in accordance with *Managing Urban Stormwater: Stormwater Soils and Construction. Volume 1*, Landcom, 2004 and include the following:

- Minimising the extent and timeframes that surfaces are disturbed
- Managing stockpile areas
- Protecting downstream watercourses through the installation of sediment fences
- Providing stabilised site access and egress points
- Including hay bale check dams in existing water courses
- Providing pit inlet protection measures.

The maintenance and operation of the construction phase stormwater quality management assets and structures will be the responsibility of the Principal Contractor. A potential arrangement of sediment and erosion control measures is included on sheets 1301-1310 of the *Central Precinct St Marys Site Haul Road*, Cardno, May 2014 drawing set.

3.3.2 Operation Phase

Throughout the operation phase of the haul road, stormwater runoff will be directed to open channels on either side of the carriageway. There is the potential for sediment to enter the drainage channels and migrate to downstream receiving waters. To reduce the likelihood of the downstream migration of pollutants, it is proposed to provide pit inlet protection in the form of a geotextile.

Additionally, at the confluence of the haul road and the Central Precinct boundary, a cattle grid will be included to reduce the potential for material to be transported off-site via truck tyres.

4 Flooding

4.1 Background

The haul road route runs in close proximity to and crosses South Creek. South Creek is a tributary of the Hawkesbury-Nepean River system and is subject to inundation from local and regional storm events.

Throughout the development of the St Marys Site, SKM has provided Lend Lease with advice on the hydraulic capacity of South Creek and the flood extents for various design storms.

If existing surface levels were to be maintained along the haul road route, the haul road would be inundated by rising waters in South Creek associated with significant local and regional storm events.

Peak water surface levels have been taken from the most recent round of flood modelling undertaken by SKM and presented to Penrith City Council. Approximate flood levels for various design storm events are summarised in **Table 4-1**.

Table 4-1 Approximate Flood Levels Along Haul Road Route

Annual Exceedance Probability	Approximate Peak Water Surface Level (mAHD)	
	Local Tailwater Level	Regional Tailwater Level
5%	19.8	19.4
1%	19.8	20.0
Probable Maximum Flood	22.4	26.7

4.2 Proposed Filling of Haul Road Route

In order to mitigate the impact of inundation on the operation and maintenance of the haul road, it is proposed to raise the haul road route to a level that exceeds that 5% AEP peak water surface profile for the regional tailwater level.

Thus, the minimum elevation along the haul road is RL 19.4 mAHD.

4.3 Flood Impact Assessment

The construction of the haul road will require approximately 20,000 cubic metres of fill to be imported, placed and compacted along the haul road alignment. The haul road alignment is known to be located within the existing flood extents of South Creek for local and regional storm events.

The proposed fill levels along the haul road alignment are located beneath the finished road and lot levels nominated within the Dunheved Precinct Industrial Land Development Development Application and Construction Certificate documentation¹.

As such, flood impacts associated with the construction of the haul road have not been assessed as part of this Development Application. Given the proposed levels along the haul road route are below the previously approved Dunheved Precinct fill platform, the effect of the haul road on flooding has been considered as acceptable.

¹ Reference numbers DA07/0494 and DA-07-1029 for Penrith City Council and Blacktown City Council respectively.

5 Haul Road Design

5.1 Route Selection

The haul road joins Link Road, Dunheved to the Central Precinct via two road corridors identified as Road 001 and Road 002.

Road 001 runs north-south along a corridor that joins Link Road, Dunheved to Road 002. The corridor is consistent with the road reserves approved under the Dunheved Precinct Industrial Land Development Application and Construction Certificate documentation², and the *St Marys Central Precinct Precinct Plan*, JBA, May 2009.

Road 002 runs east-west along a corridor that joins Road 001 to the eastern boundary of the Central Precinct. The corridor is consistent with the road reserves approved under the *St Marys Central Precinct Precinct Plan*, JBA, May 2009.

The haul road route is illustrated in **Figure 1-2**.

5.2 Horizontal Geometry

The haul road will be constructed and operated as a private road. As such, the road cross sections have been prepared in consultation with Lend Lease who will be the Principal Contractor and be responsible for the construction and operation of the haul road.

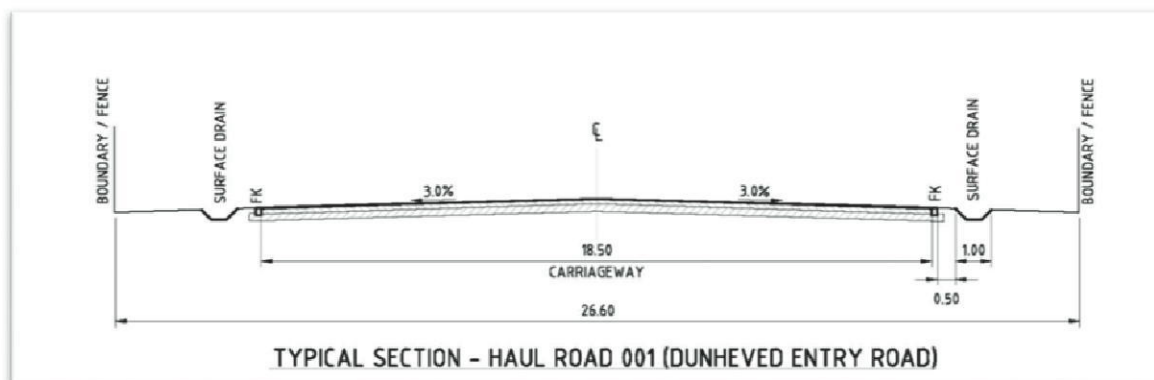
The horizontal geometry of the haul road can be considered in three distinct areas, viz:

1. Road 001
2. Road 002
3. The bridge crossing South Creek.

Typical road cross sections for Road 001 and Road 002 are shown in Figure 5-1 and Figure 5-2 respectively.

The existing bridge crossing South Creek is approximately 8 metres wide. Given the nature of the existing barriers, the bridge width is too narrow to operate safely as a two-lane multi direction bridge under Lend Lease's construction standards. As such, temporary measures will be incorporated onto the existing bridge deck to meet current safety standards and to restrict traffic to a single lane. Trucks heading east over the bridge will be required to give way to trucks heading west.

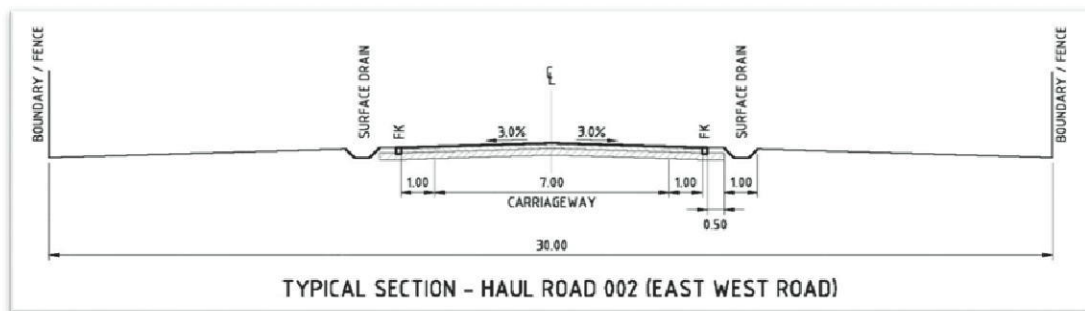
Figure 5-1 Road 001 Typical Cross Section



Source: Central Precinct St Marys Site Haul Road Development Application Drawing Set, Cardno, June 2014

² Reference numbers DA07/0494 and DA-07-1029 for Penrith City Council and Blacktown City Council respectively.

Figure 5-2 Road 002 Typical Cross Section



Source: Central Precinct St Marys Site Haul Road Development Application Drawing Set, Cardno, June 2014

5.3 Vertical Geometry

The vertical alignment of the haul road takes into consideration the regional flood levels within South Creek. South Creek flood levels have been taken from the latest round of flood modelling work completed by SKM and presented to Penrith City Council in October 2013.

The minimum level of the haul road is RL 19.4 mAHD which is consistent with the 5% AEP regional flood level. This level was selected to provide relief from nuisance flooding in more frequent storm events and to reduce the likelihood of maintenance being required after storm events.

The haul road adopts a maximum longitudinal grade of 1%. The longitudinal grade has been incorporated into the design to assist in draining the road pavement.

5.4 Pavement Design

A preliminary pavement design has been undertaken for the haul road. The preliminary pavement design is based on anticipated existing ground conditions and the bearing capacity of fill material imported to the site.

In preparing the preliminary pavement design, the following assumptions have been made:

- The haul road will be temporary only and operate as a private road
- Truck and dog (19 metres) adopted as the design vehicle
- 400 truck movements in the design lane per day.

The preliminary pavement design is defined by the following layer characteristics:

- Sub-grade Assumed CBR of 4%
- Sub-base 450 mm DGS40
- Base Course 250 mm DGB20
- Wearing Course 30 mm AC10

The pavement design will require additional investigations during the detailed design phase to confirm the aforementioned assumptions and to validate, or refine, the preliminary pavement design.

6 Conclusion

Concept design documentation for the haul road has been prepared by Cardno in consultation with Lend Lease and is documented within the *Central Precinct St Marys Site Haul Road Development Application Drawing Set, Cardno, June 2014*.

As an outcome of the concept design process, the following can be concluded:

- The haul road will join Links Road, Dunheved to the Central Precinct via approved road corridors
- The haul road cross section has been developed in consultation with Lend Lease who will be the Principal Contractor and will be responsible for constructing and operating the haul road
- The construction and operation of the haul road is unlikely to have an adverse impact on downstream receiving waters and ecosystems
- Catchments upstream of the haul road have been identified and appropriately sized drainage conduits have been included to convey water from the upstream side of the haul road to the downstream
- The haul road has been designed above the estimated 5% AEP regional peak water surface level associated with South Creek
- The construction and operation of the haul road is unlikely to have an adverse impact on South Creek's existing flood behaviour.