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3.2 Summary of Constraints

3.2.1 Physical Features and Constraints

Investigation Area A lies in the northern end of the Majura Valley, immediately south of the Federal Highway, and to either side of the north south alignment of the existing Majura Road. It lies on the edge of the foot slopes of the Mount Majura ridge, at a height in excess of 720 m, falling away quite steeply to a height of approximately 650 m closer to the valley floor. The Investigation Area is characterised by a generally rural land use pattern, with scattered trees, and some vineyard and pine plantation activity towards the south of the Investigation Area. The Mount Majura Nature Reserve lies to the southwest of the Investigation Area. Investigation Area A is well connected to existing transport infrastructure, owing to the close proximity to the Majura Road and Federal Highway interchange, which offers grade separated traffic movements in all directions. Previous investigations have identified that Basalt rock outcrop in the north of the Investigation Area, has a sulphur content, which if not managed carefully can result in adverse impacts to the soil and water chemistry. It is expected that this feature would need to be carefully considered during any detailed design or if construction or earthworks were ever to take place, to ensure that appropriate soil and water management protocols were developed and effectively implemented. In addition the Majura Park Gun Club, although located outside of the Investigation Area, could potentially influence future land use activities within the locality, on account of the acoustical characteristics of its ongoing operation.

3.2.2 Ecological Features and Constraints

The assessment of ecological opportunities and constraints prepared by David Hogg Pty Ltd identified extensive areas of the endangered ecological community, yellow box – red gum grassy woodland (box gum woodland) in the north of the Majura Valley, however the majority of these patches of woodland fall outside of the area identified as Investigation Area A. There are however some patches identified within the Investigation Area (see Figure 1) which, although having lost most of their canopy tree species, retain a predominantly native understorey and as such are classified as secondary native grassland which forms part of this woodland community listed under both ACT and Commonwealth legislation. Approximately 700 ha of box gum woodland occurs in the nearby Mount Majura and Mount Ainslie Nature Reserve and as such this community is considered to be well represented in conservation reserves within a local context. Pending more detailed assessment of the condition and extent of the box gum woodland in the Investigation Area, it could be reasonably expected that impacts on, or even the removal of these patches, would be unlikely to significantly impact upon this ecological community such that its long-term survival in the locality is compromised.

The northernmost portion of Investigation Area A, immediately south of the Federal Highway lies within an important wildlife movement corridor, which as far as possible should be considered and retained within development planning going forward. Part of this corridor is already mapped as box gum woodland, and accordingly, retention in the landscape will not only conserve the listed endangered ecological community but likely also contribute to a localised continuous movement corridor available to local fauna.

In general the remainder of the Investigation Area does not contain any substantial ecological constraints that would impede future development options. The remainder of notable ecological features are restricted to individual trees or clumps of tress, which may be valuable as animal habitat, providing nesting hollows, as well as food resources for some species. These features are unlikely to provide a major constraint on development, however they may influence block layout or indeed utilisation of land within affected blocks.

3.2.3 Heritage Features and Constraints

Within Investigation Area A there is one identified heritage feature, a RAAF Memorial Grove, which although not listed on any known heritage registers, likely retains a moderate to high significance and should be retained *in situ*. The site is part of the Canberra-Sydney Memorial Grove system to members of the Australian Armed Forces killed on active service. This section of the system has the RAAF Memorial in it. The plot includes plantings, notably large old growth *Pinus radiata* and native species and is located in close proximity to the southbound exit from the Federal Highway onto Majura Road. Should any direct impacts be proposed on this site, then it is likely that a statement of heritage impact would need to be prepared, which would include relevant mitigation measure for the site.

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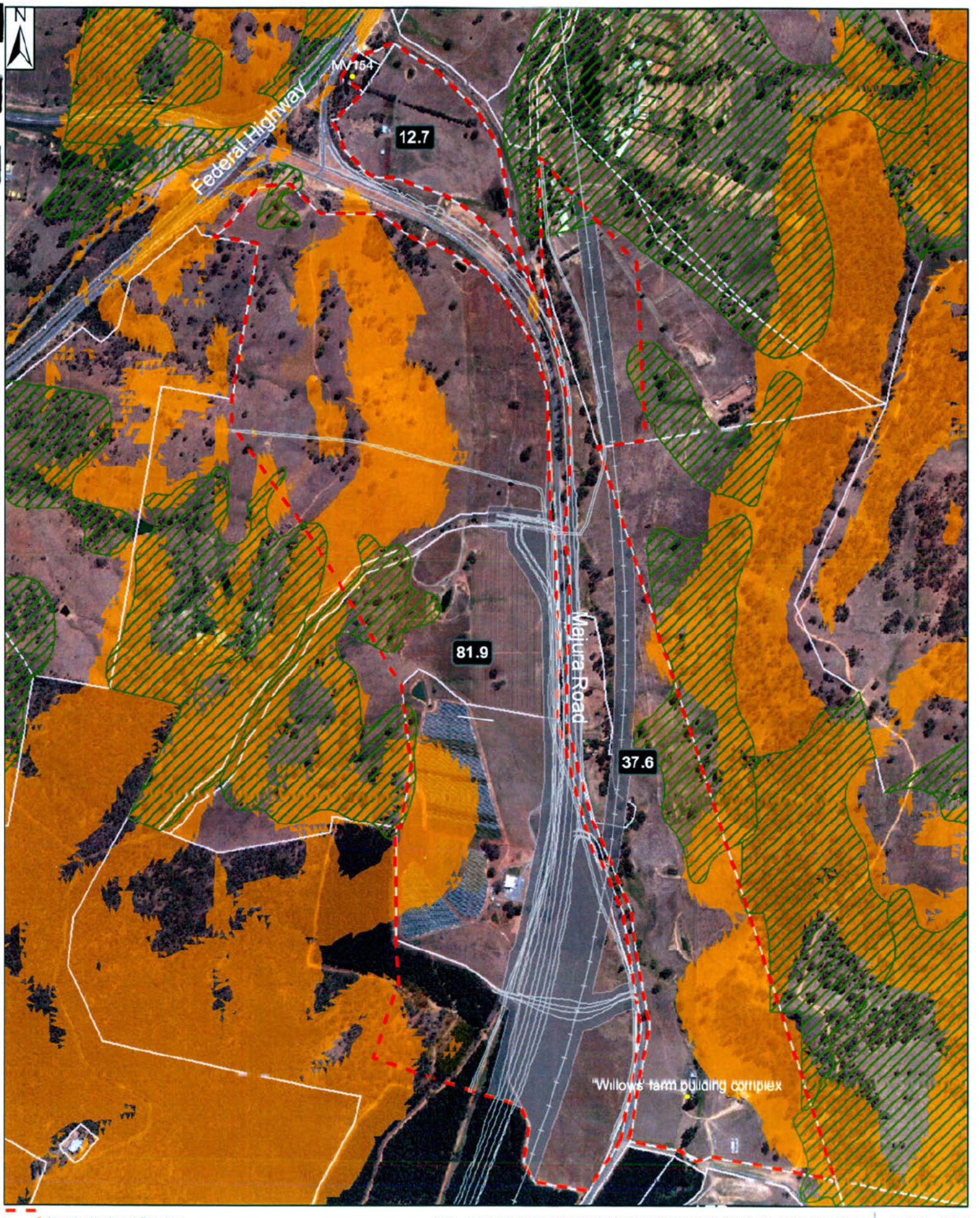

Investigation Area A Boundary

Box Gum Woodland EEC

Physical and Servicing Constraint

Heritage Items

Slope > 15%

14.8 Area (Ha)

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY

INVESTIGATION AREA A - CONSTRAINTS

Source: ActewAGL (2009), ACTPLA (2009), Telstra (2009), SMEC (2009)

0 125 250 500

Meters

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3.3 Net Developable Area

There are physical and servicing constraints within Investigation Area A, as discussed in Sections 3.2.1 to 3.2.3. However, ACTPLA's potential development scenarios (refer to Table 1) call for at most 20 ha of land to be developed. It is anticipated that the nominated 20 ha will be situated to avoid the physical and environmental constraints located within the investigation area. The potential development scenarios A and B are graphically illustrated below in Figure 2

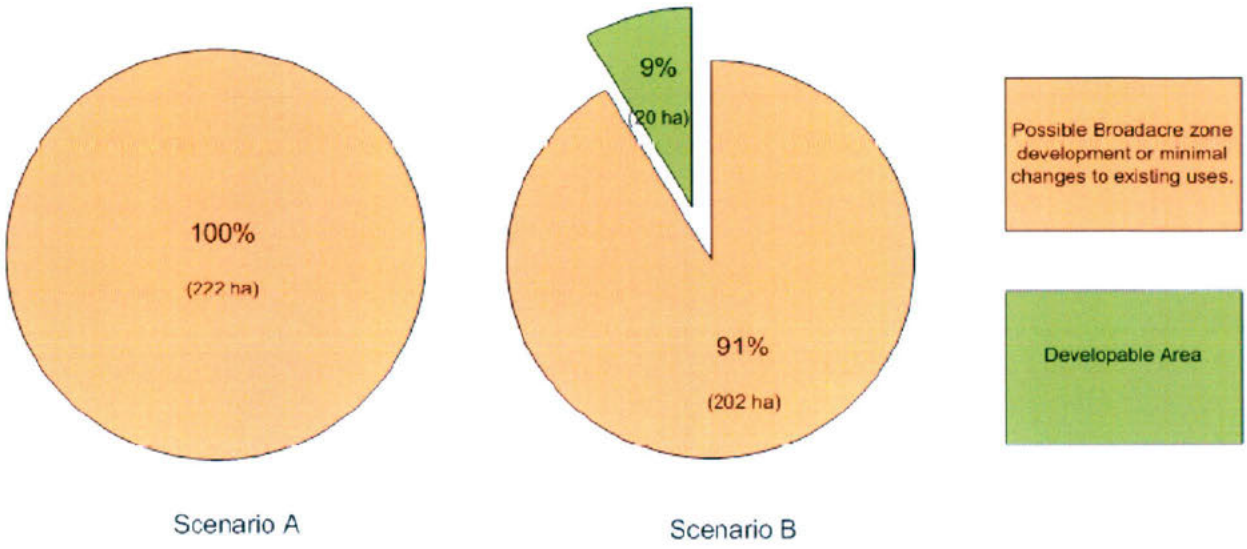

Figure 2 Potential development scenarios A and B

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4.0 Servicing Strategy

Sections 4.1 through 4.5 provide servicing strategy details for Investigation Area A. Refer to Section 7.0 in the body of the main report for an overview of the strategy for servicing all Investigation Areas.

The terminology of 'developer' is used to reference the entity which will ultimately be responsible for constructing the potential developments described in this report. The 'developer' may be a private or government entity.

4.1 Water

Ground elevations in Investigation Area A will entail the construction of a new Majura (TWL 720) high zone reservoir to provide service to elevations between 650 m and 690 m. Water will be pumped from the Upper Hackett reservoir to the new Majura reservoir. The Upper Hackett reservoir will cater for the remainder of Investigation Area A. It is probable that the 20 ha potential development will be located below 650 m, therefore the new Majura reservoir may not be required for Investigation Area A. However, it is illustrated in Figure 3 for completeness.

The construction of the new Majura reservoir will entail the removal of trees and vegetation. However, it is anticipated that the existing access tracks located with Investigation Area may be utilized for access to the reservoir. The environmental impact of constructing the reservoir and trunk mains is discussed in Section 6.3 in the body of the main report.

4.2 Sewer

The trunk sewer located within Investigation Area C could be extended through Investigation Area B and into Investigation Area A to provide service to the potential 20 ha development. This option is illustrated in Figure 4. The developer will be responsible for the trunk sewer main extension.

4.3 Gas

Existing and proposed gas infrastructure located within and adjacent to Investigation Area A is illustrated in Figure 5.

An easement would need to be located above the 250 mm diameter high pressure steel gas main. Additional liaison with Jemena is required, as future planning progresses into the design phase, before an easement width can be determined. A width of 5 m has been assumed for the purpose of this study.

Gas main infrastructure from the proposed gas-off take station to the Investigation Area boundary will be the responsibility of the developer. A gas main can be extended through Investigation Area B and into Investigation Area A if the off-take station is located within Investigation Area B, adjacent to the AFP site.

If the off-take station is located to the east of Investigation Area C, then a gas main will need to be laid from the off-take station though Investigation Area B, and into Investigation Area C. The construction cost for this work (into Investigation Area C and through Investigation Area B) is included as part of Investigation Areas B and C costs.

4.4 Electricity

The existing cables (refer to Figure 6) may remain as overhead, and a 10 m easement maintained. A more desirable option is to relocate them underground within in a future road reserve.

Electricity service to Investigation Area A could be provided by new 11 kV underground feeders from the Eastlake Zone Substation. ActewAGL will be responsible for the cost of extending the feeders to Investigation Area A. The developer will be responsible for the construction of a new distribution substation(s) within the Investigation Area. The number and type of distribution substations cannot be determined until the potential developments progress into a more detailed design phase, therefore they are not included in the services costing.

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4.5 Telecommunications

Existing and proposed telecommunications infrastructure located within and adjacent to Investigation Area A is illustrated in Figure 6.

Telstra

An easement (of yet undetermined width) will be required above the Sydney-Melbourne-Gundaroo low/ high integrity data cable. The remaining Telstra infrastructure located within the Investigation Area may be relocated to shared trenches within future road reserves.

Telstra has advised that they should be able to provide service to Investigation Area A, however they cannot comment upon infrastructure capacity or costing until the potential development progresses into a more detailed design phase. It is anticipated that spare Telstra conduits will be installed within the future Majura Parkway road reserve, which may facilitate future servicing of Investigation Area A.

TransACT

TransACT infrastructure can be extended from Campbell (through Investigation Areas B and C) to provide service to Investigation Area A. The developer's contribution for this service will be a percentage of TransACT's costs. TransACT will first need to prepare a business case to look at the viability of servicing the development and the estimated cost to the developer.

ICON

ICON and Intact are government owned carriers which only supply services to ACT and Commonwealth facilities, including schools. The potential development is a tourist/ resort facility, therefore no new ICON services are planned.

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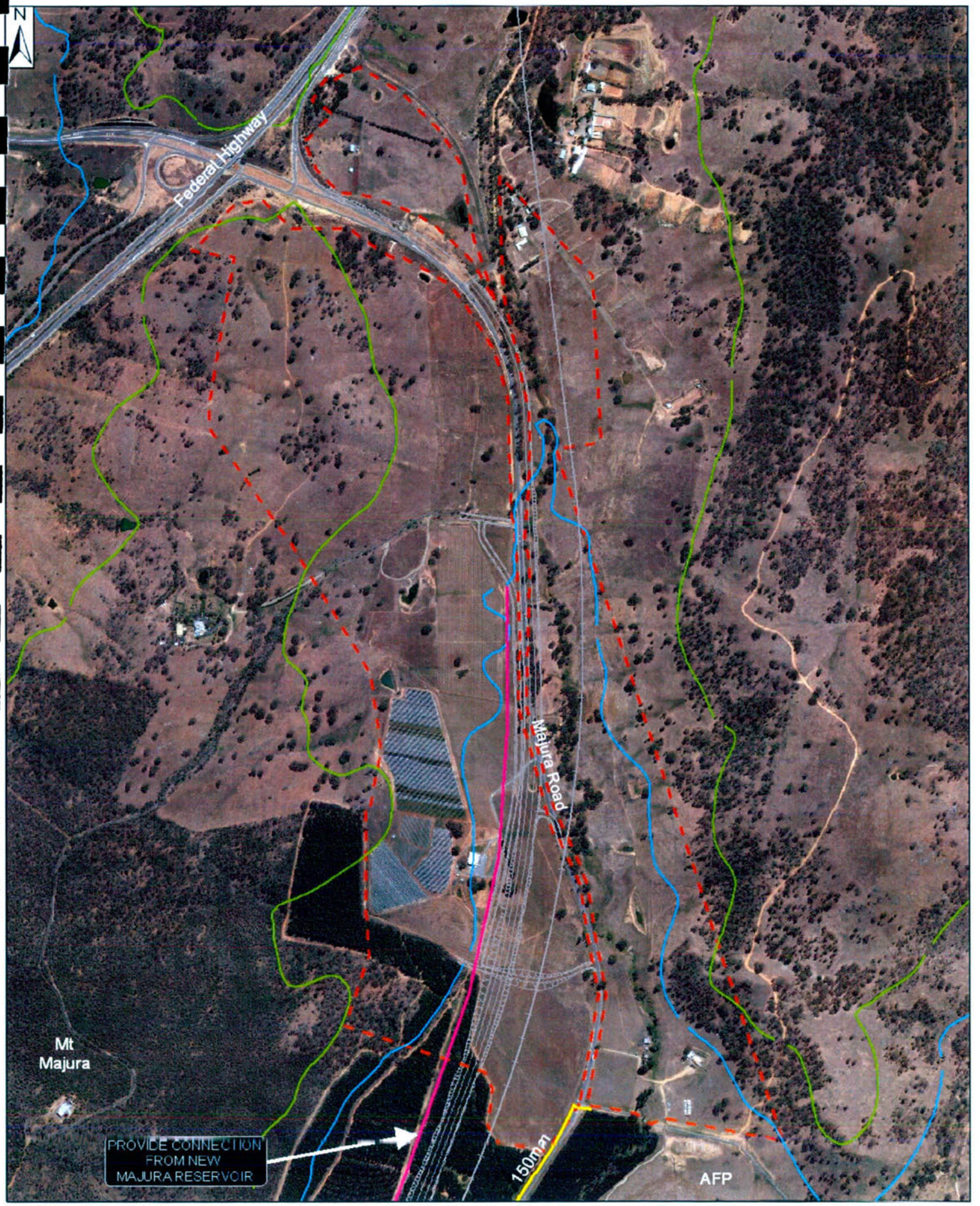

Proposed Water Main
Existing Water Service (150mm)
RL 650m contour - Supply from Upper Hackett Reservoir
RL 690m contour - Upper Limit of High Zone - Supply from new Majura Reservoir
Investigation Area Boundary
Proposed Majura Parkway & VHST Route

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY
INVESTIGATION AREA A - WATER SERVICES

Source: ActewAGL (2009), ACTPLA (2009), SMEC (2009)

0 125 250 500 m

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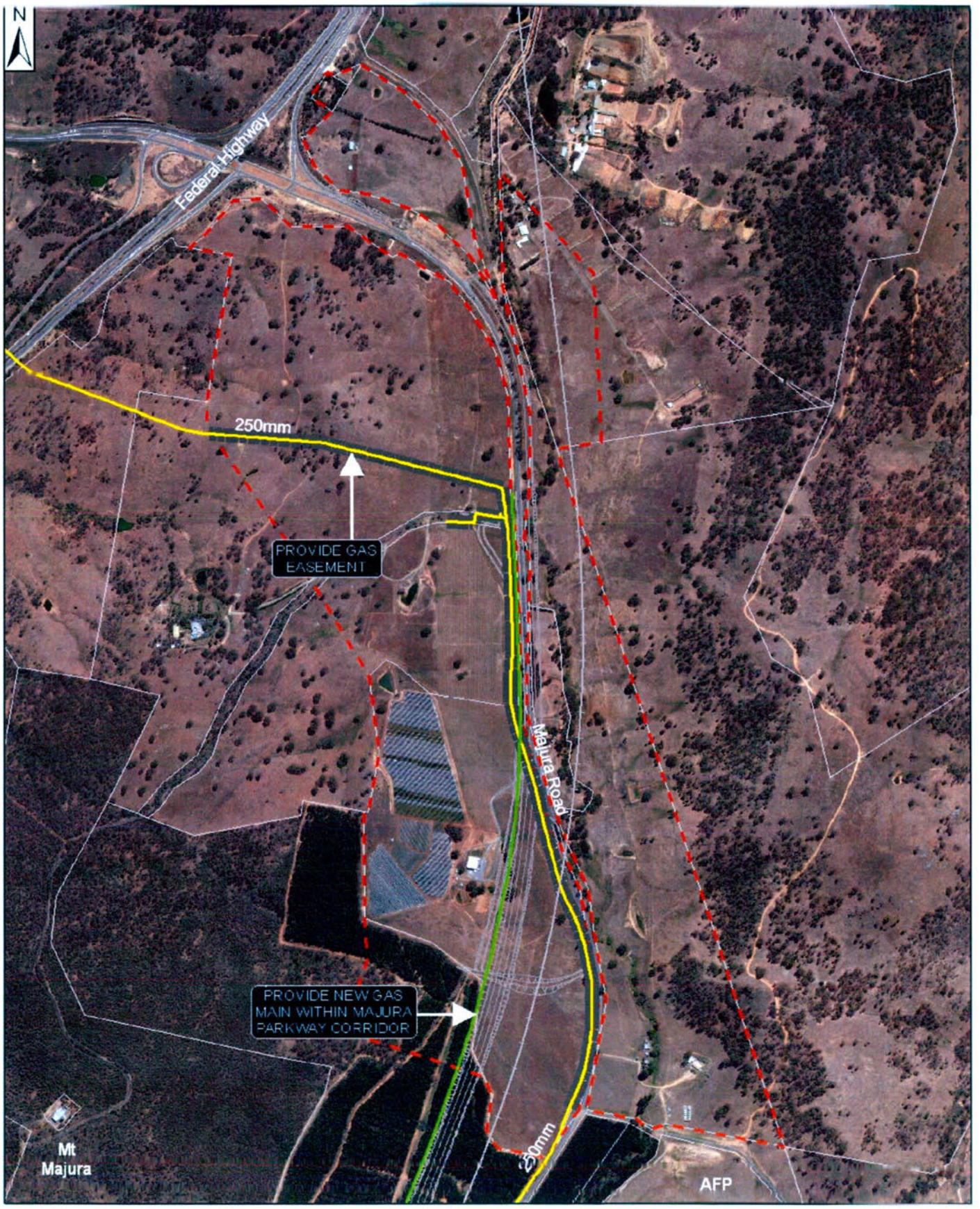

Existing Gas Main (250mm)
Proposed Gas Pipeline
Investigation Area Boundary
Proposed Majura Parkway & VHST Route

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY
INVESTIGATION AREA A - GAS SERVICES
Source: SMEC (2009), Jemena (2009), ACTPLA (2009)

0 125 250 500 m

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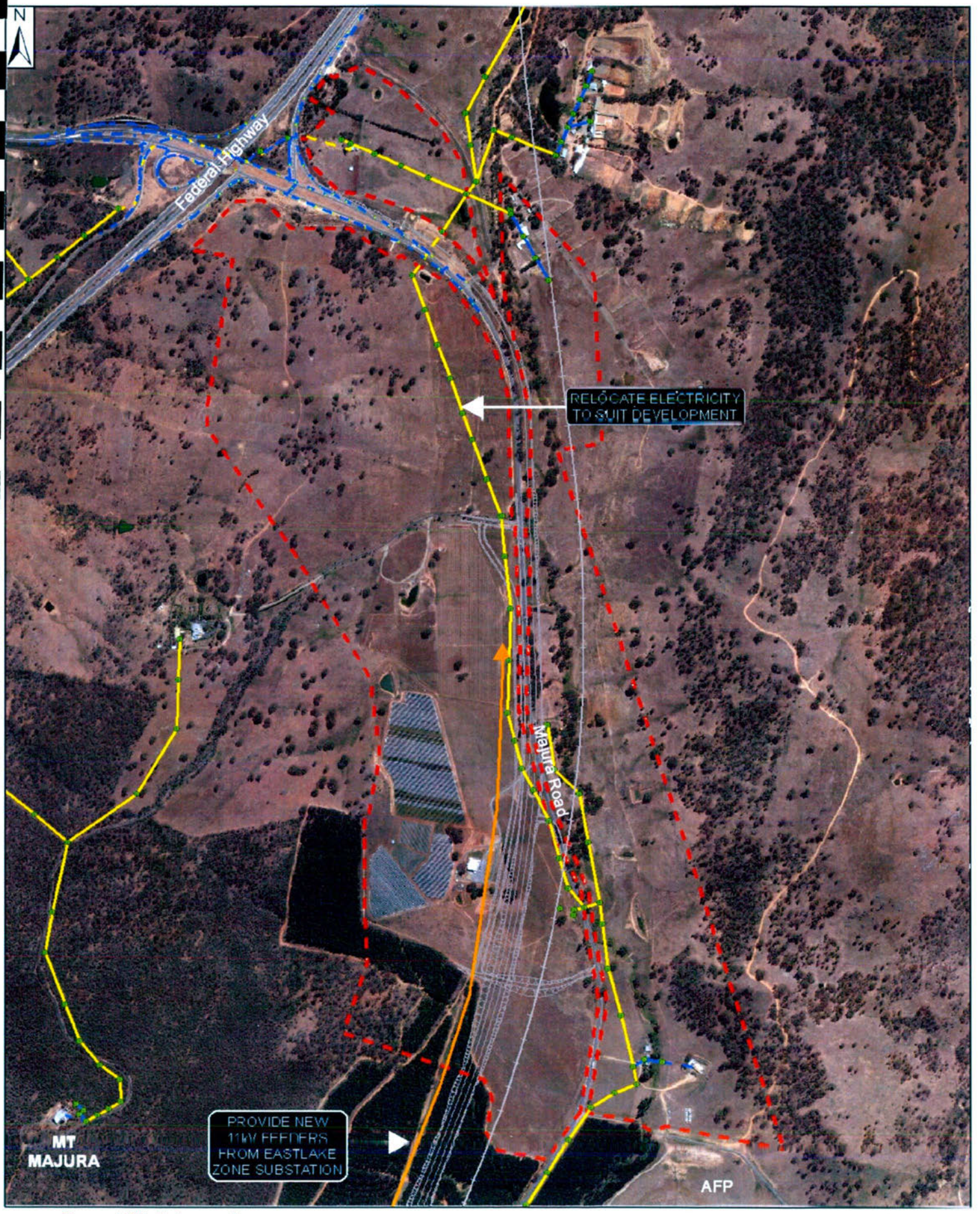

Proposed 11Kv Underground
Existing Electricity 11kV Overhead
Existing Electricity 11kV Underground
Existing Electricity LV Overhead
Existing Electricity LV Underground
Powerpoles
Investigation Area A Boundary
Proposed Majura Parkway & VHST Route

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY
INVESTIGATION AREA A - ELECTRICITY SERVICES

Source: ActewAGL (2009), ACTPLA (2009), SMEC (2009)

0 125 250 500 m

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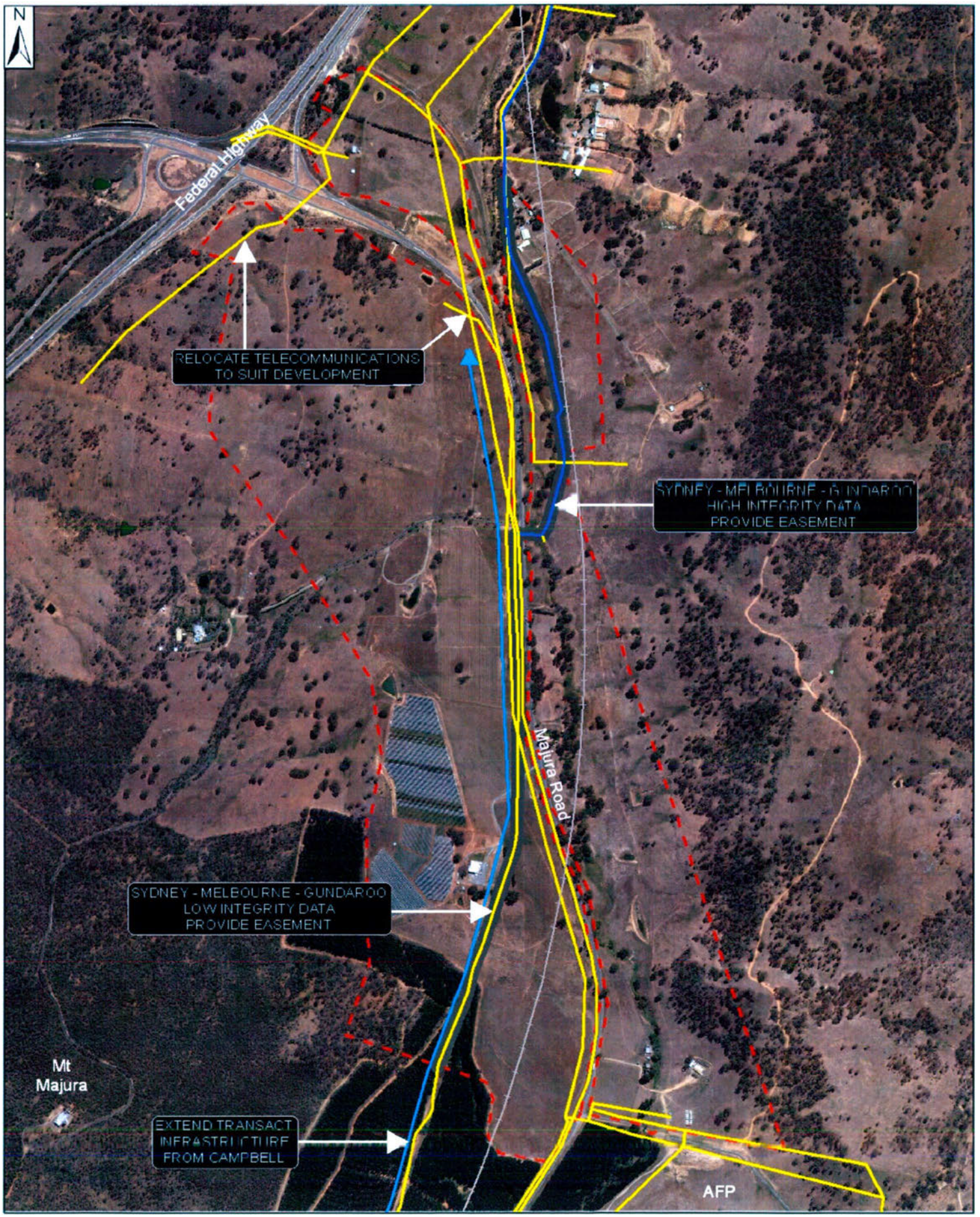

Proposed TransACT
Existing Optical Fibre
Existing Telstra
Investigation Area Boundary
Proposed Majura Parkway & VHST Route

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY

INVESTIGATION AREA A - TELECOMMUNICATIONS SERVICES

Source: Telstra (2009), TransACT (2009), Optus (2009), Diverse (2009), ACTPLA (2009), SMEC (2009)

0 125 250 500 m

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5.0 Water Sensitive Urban Design Strategy

Development of Investigation Area A considered two scenarios.

- Scenario 1 involved no change in the existing rural land use
- Scenario 2 included developments of 20 hectares of the site. The scenario 2 development was considered likely by 2021 with no change occurring for the duration of the study timeframe through to 2041.

MUSIC modelling was undertaken to size treatment elements for best practice water quality load reduction objectives (80/45/45) for rainfall runoff discharged from the site. Maximum treated yields represent the treated component of water through the system with overflows resultant from either peak storm events or sustained rainfall bypassing the treatment elements. The proportion of treated flows required to further boost performance in accordance with the regional targets was quantified. ACTPLA development targets will be exceeded in all instances. Table 2summarises the key findings. Scenario 1 was not modelled as no land change is proposed from the pre-development scenario.

Table 2 Treatment areas and yields for Investigation Area A/ scenario 2.

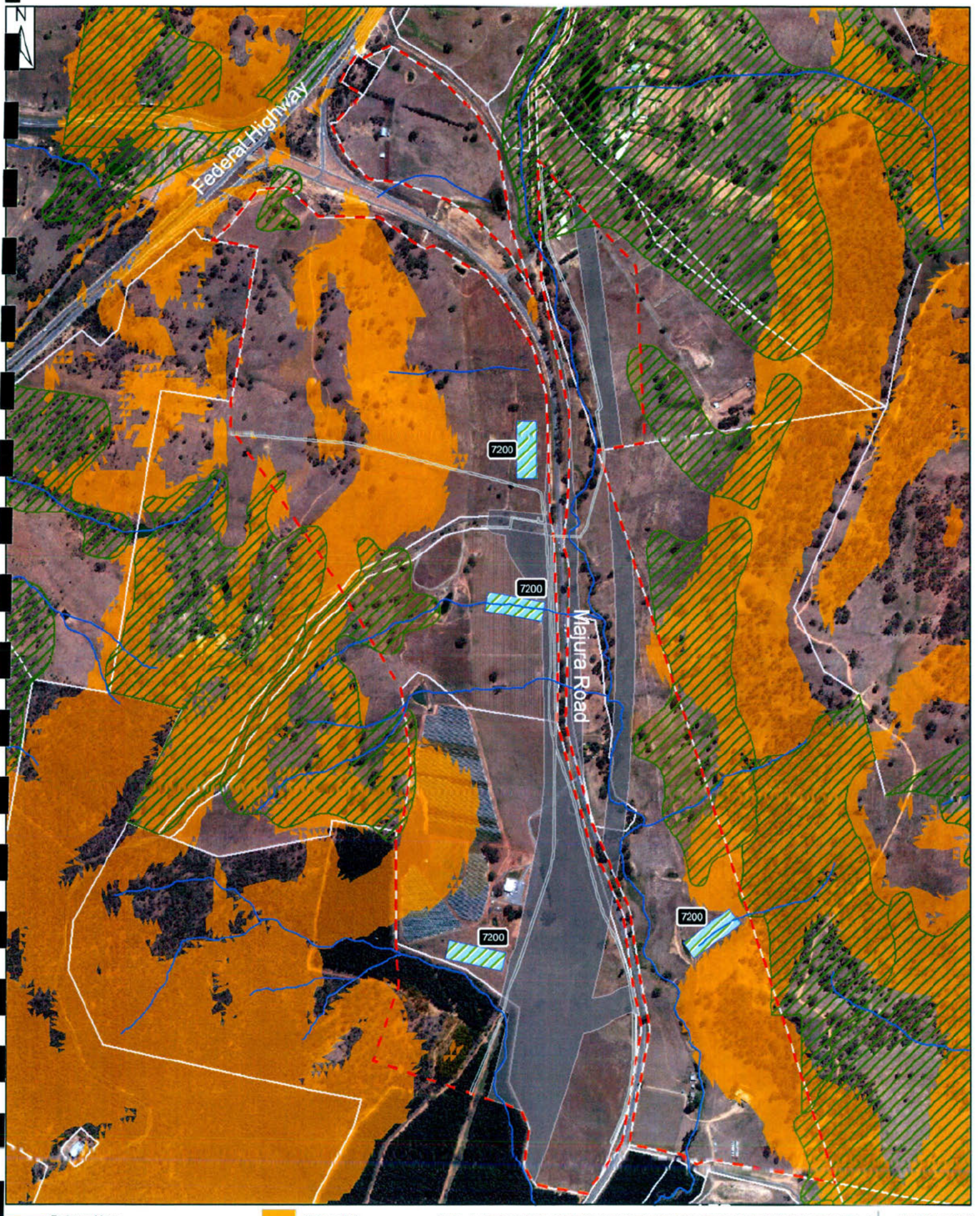
Investigation Area A/ scenario 2			
	2021	**2031**	**2041**
Pre development runoff (ML/yr)	11	11	11
Total developable area (ha)	20	20	20
Development impervious area (ha)	18	18	18
Post development runoff (ML/yr)	106	106	106
Investigation Area wetland area @ 3.5% total impervious (m^2)	6,160	6,160	6,160
Maximum treated yield from wetlands (ML/yr)	45	45	45
Harvested volume to achieve regional targets (ML/yr)	20	20	20
Distributed SZ bio area @ 1% road/hardstand (m^2)	560	560	560
Maximum treated yield from bio (ML/yr)	20	20	20
Maximum yield from roof area (ML/yr)	60	60	60

These results show an order of magnitude increase in runoff from the 20 hectare potential development area following construction. Of the 95ML/yr additional water resultant from development, approximately 47% (45 ML/yr) could be harvested from centralised treatment wetlands sized for best practice. By harvesting directly from roof surfaces (assuming 80 % capture efficiency) and using distributed SZ bioretention systems, up to 84% of the additional runoff could be harvested.

Harvesting 20 ML/yr of the treated stormwater will increase the removal of contaminants in accordance with the Water Sensitive Urban Design General Code regional targets. This harvested volume represents approximately 50% of the outflow from treatment wetlands sized for best practice and all of the flow from bioretention systems sized for best practice. This 20 ML/yr could support approximately 4 ha of open space irrigation (based on 500 mm annual application). Based on the assumed development densities this area exceeds the anticipated area of open space (2 ha). Further demands can be serviced including internal non potable uses (i.e. toilets and/or commercial uses), irrigation of planted zones within constraint areas or reticulated distribution to out of precinct demands/storages.

Based on the treatment provided in the wetland sized at 3.5% of total impervious area and harvest of flows to achieve regional targets the following approximate mean annual pollutant load reduction can be achieved:

- Total Suspended Solids (TSS) 10,591 kg/yr
- Total Phosphorous (TP) 21 kg/yr
- Total Nitrogen (TN) 143 kg/yr



Drainage Lines

Possible Treatment Wetland (See note)

Investigation Area A Boundary

Box Gum Woodland EEC

Physical and Servicing Constraint

Slope > 15%

8500 Area (m2)

NOTE: Possible treatment wetlands based on 20 Ha development. Exact location of possible development unknown.

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY

INVESTIGATION AREA A - INDICATIVE FOOTPRINT AND LOCATION OF WETLANDS

Source: ActewAGL (2009), ACTPLA (2009), Telstra (2009)

0 125 250 500

Meters

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6.0 Cost Estimate and Staging

6.1 Estimated Cost of Construction

6.1.1 Services Infrastructure

The approximate costs for providing water, sewer, electricity, telecommunications, and gas services to Investigation Area A are detailed in Table 3

Table 3 Summary of Investigation Area A cost

Description	Approximate Cost (excluding GST)		Comment
Water Distribution mains from the Upper Hackett and new Majura reservoirs to the Investigation Area boundary	$970,000		Developer responsible for cost of distribution mains. Cost of reservoir, pump station and mains between reservoirs borne by ActewAGL.
Sewer Extension of sewer trunk main from Investigation Area B through Investigation Area A.	$2,630,000		FSTP and MSPS improvements by ActewAGL at ActewAGL's expense.
Electricity 11kV overhead to underground relocation	$950,000		ActewAGL will be responsible for extending 11 kV feeders from Eastlake Zone substation.
Telecommunications Extend TransACT infrastructure from Investigation Area B through Investigation Area A.	$200,000		Approximate cost. Final cost to developer will be a percentage of TransACT's costs and will be determinate by TransACT at a later date.
Gas	Option 1 $320,000	Option 2 $320,000	Option 1: Off-take station located within Investigation Area B. Option 2: Off-take station located within Investigation Area C.
Subtotal:	$5,070,000	$5,070,000	
40% Contingency:	$2,028,000	$2,028,000	
Investigation Area A Total:	$7,098,000	$7,098,000	

6.1.2 Water Sensitive Urban Design Strategy

Costs incurred for the construction of Investigation Area wide treatment systems will vary significantly depending on the ultimate design of the overall development and final treatment strategy adopted. Stormwater treatment measures most appropriate for the respective Investigation Areas will need to be formulated in conjunction with development layout and configuration as part of Investigation Area-based water management plans. Detailed costing of these measures can then be undertaken.

Approximate costs for typical systems can be estimated using guidelines provided by Landcom (2009). Total Acquisition Costs and Annual Maintenance Costs have been estimated for bioretention systems and constructed wetlands. A range of costs is given. The range reflects the relatively high start up cost and the increase in cost efficiency associated with the construction of larger systems. Therefore, on an areal basis it is expected that smaller treatment systems designed to treat runoff from individual lots will be more expensive than large Investigation Area-scale treatment systems.

6.1.2.1 Total Acquisition Costs

The estimates of Total Acquisition Costs are as follows:

Bioretention Systems

- If implemented in a distributed way = $1000 per m^2.
- If implemented at the Investigation Area-scale = $300 per m^2.

Constructed Wetlands

For constructed wetland systems sized between 100 m^2 and 1000 m^2, total acquisition costs are estimated to be between $200 to $400 per m^2. Smaller systems cost more on a per m^2 basis due to the high initial start up costs associated with construction.

6.1.2.2 Maintenance Costs

Annualised maintenance costs for these treatment systems have also been calculated. Like construction costs, maintenance also becomes less costly on an area basis for treatment systems that are larger rather than smaller. A range of estimates is provided to accommodate this.

Annualised maintenance costs are:

- Bioretention systems = $2 to $4 per m^2
- Constructed wetland systems = $3 to $5 per m^2

Maintenance costs will typically include general maintenance of public areas, litter control, weed control (especially during establishment phase) and inspection (with occasional repairs) of hydraulic structures (pipes/pits/weirs etc).

6.2 Staging

ACTPLA's program of potential developments indicates that Investigation Area A will be developed after Investigation Areas B and C. Sewer, gas, electricity and telecommunications have dependencies of on infrastructure being extended through Areas B, C, and D. However, Investigation Area A is not dependent upon the potential developments being constructed within those areas as long as long as service corridors are allowed for. Table 4 summarises staging dependencies for Investigation Area A. Overall staging is discussed in more detail in Section 9.0 in the body of the main report.

Table 4 Investigation Area A Staging

Service	Staging Comments	Investigation Area Dependencies
Water	Majura reservoir and distribution mains from Majura and Upper Hackett must be constructed prior to development.	None
Sewer	Extend trunk sewer from Investigation Area C through Investigation Area B, and into A.	Trunk sewer in Investigation Areas B and C.
Gas	Gas main from new off-take station to Investigation Area boundary.	Dependent on location of off-take station. Gas infrastructure may be required through Investigation Areas B and C or only B.
Electricity	11 kV feeders from new Eastlake Zone Substation and construction of distribution substation.	11 kV feeders likely extended through Investigation Areas D, C, B and then into A.
Telecommunications	TransACT infrastructure extended from Campbell.	Infrastructure to be extended through Investigation Areas B and C, then into A.

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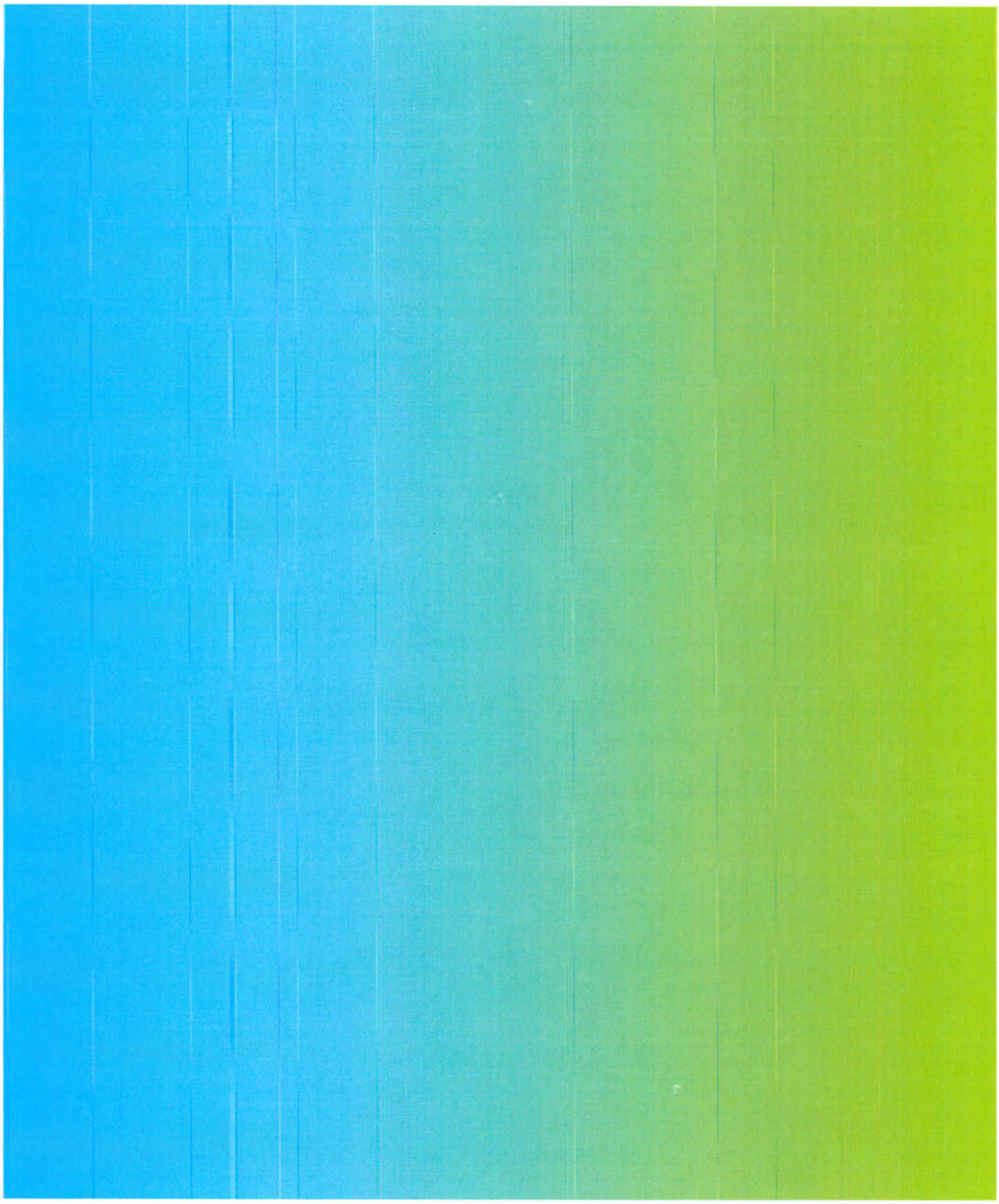
Appendix B
Investigation Area B



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1.0 Zoning and Permissibility

Investigation Area B comprises part Territory Land and part Designated Area under the NCP. As in Investigation Area A, the far western portion of the Investigation Area is a Designated Area, subject to the provisions of the NCP. This portion of the Investigation Area is known as 'The Inner Hills' forming part of the 'Hills, Ridges and Buffer Spaces' under the NCP. In relation to the Territory Land, major utility installations are assessable under the merit assessment track, as above. Therefore, the provisions outlined in Appendix A in relation to Investigation Area A are also applicable to Investigation Area B.

In addition, a small area of land is identified as an Area of Plantation Forest (P4) within Investigation Area B. Site specific controls are provided in the Code with respect to the P4 – Plantation Forestry Investigation Area. The intent of the P4 Investigation Area is:

> *To make provision for plantation forestry in association with compatible uses.*

The land within the P4 Investigation Area permits consistent land uses as NUZ1. However, under the Non-Urban Zones Development Code, additional criteria is applied to development within the P4 Investigation Area, including:

- Agriculture is limited to livestock grazing excluding horse agistment where appropriate.
- For tourist facilities, buildings are low rise with emphasis on integration of the development into the landscape and compatibility with related environmentally sensitive areas. Buildings comprise lodge style and self-contained cabins.

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2.0 Overview of Existing Services

Sections 2.1 through 2.5 provide a description of existing services infrastructure located within Investigation Area B. An overview of existing services located within and adjacent to all Investigation Areas is located within Section 3.0 in the body of the main report.

2.1 Water

Existing and proposed water infrastructure located within and adjacent to Investigation Area B is illustrated in Figure 3.

A 225 mm diameter water main extends across Investigation Area B from the Upper Hackett reservoir to the reserve of Majura Road. It then proceeds north along the road reserve, reducing to a 150 mm diameter main. It ultimately provides water to the AFP site located to the east of Investigation Area B. There are domestic water services located off of the 225 mm diameter main which may provide service to existing lessees located within the Investigation Area. However, information supplied by ActewAGL does not extend beyond the billings meters, which are located approximately 15 m from the main.

2.2 Sewer

Existing and proposed sewer infrastructure located within and adjacent to Investigation Area B is illustrated in Figure 4.

There is no ActewAGL sewer infrastructure located within Investigation Area B. Existing lessees may use septic systems.

A 65 mm diameter sewer rising main (owned by Defence) is located within the adjacent road reserve of Majura Road. It connects the Defence property (to the east of Investigation Area A) to the gravity main located to the northeast of the airport.

AFP (east of Investigation Area B) has an on-site sewer treatment plant, and does not connect into the ActewAGL system.

2.3 Gas

Existing and proposed gas infrastructure located within and adjacent to Investigation Area B is illustrated in Figure 5.

A 250 mm diameter high pressure steel gas primary main is located adjacent to the road reserve of Majura Road.

2.4 Electricity

Infrastructure is located throughout the Investigation Area in the form of high (11 kV) and low voltage overhead cables. Existing and proposed electricity infrastructure located within and adjacent to Investigation Area B is illustrated in Figure 6.

2.5 Telecommunications

Existing and proposed telecommunications infrastructure located within and adjacent to Investigation Area B is illustrated in Figure 7.

Neither TransACT nor ICON infrastructure is located within Investigation Area B. Telstra infrastructure is located within the Investigation Area, primarily running in a north-south direction. The Sydney-Melbourne-Gundaroo low integrity data is also located within the Investigation Area.

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3.0 Planning Constraints and Opportunities

3.1 ACTPLA Potential Development Scenarios

Proposed development scenarios and permissibility for Investigation Area B are summarised in Table 1 below.

Table 1 Investigation Area B – Development Scenarios

Investigation area / development scenario	Existing uses	Permissible land uses
Likely Scenario Majority of area	Rural and recreational uses (e.g.: Girl Guides camp)	Land subject to the Territory Plan permits: transport depot, store (storage), defence installation. Land subject to the NUZ1 Broadacre Zone under the Territory Plan, permits: agriculture, caravan park/camping ground, farm tourism, outdoor recreation facility, tourist facility.
Designated Area (National Capital Plan)	Rural lease	Land subject to the Designated Area – Inner Hills under the National Capital Plan permits the following relevant land uses: agriculture, general farming, landscape buffer. Likely continuation of rural uses.
	Majura Pines Recreation Area	Majura Pines forest area unlikely to be developed

The above development scenarios identify the likely continuation of rural uses in Investigation Area B. Other relevant permissible land uses identified include:

- Transport depot – *means the use of land for the parking or storage of motor vehicles used in connection with a commercial or industrial transport undertaking.*
- Store – *means the use of land for the storage, whether permanent or temporary, of goods (not including motor vehicles or obsolete machinery) within or upon which no trade (whether retail or wholesale) or industry is carried on.*
- Defence installation – *means the use of land operated by the Department of Defence or the armed forces of Australia and includes Department of Defence offices, offices associated with national security and defence communications facilities, but does not include facilities associated with military aviation.*

In the Inner Hills Designated Area under the NCP, agriculture, general farming and landscape buffer are permitted land uses.

A Draft Variation to the Territory Plan will be required to change the land use zoning for commercial/ employment areas.

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3.2 Summary of Constraints

Figure 1 illustrates the physical, ecological and heritage constraints to potential develop within Investigation Area B.

3.2.1 Physical Features and Constraints

The western margin of Investigation Area B sits on the edge of Mount Majura at an elevation of approximately 680 m at its highest, and then sloping quite steeply in parts to the east and the generally flat valley floor arriving at an elevation of about 620m adjacent to the Majura Road, and Woolshed Creek, which divide Investigation Area B in a generally north south direction. The western edge of Investigation Area B adjoins the Mount Majura Nature Reserve where there is a clear boundary between the woodland of the reserve, and areas generally cleared for agricultural land use. In the north of the Investigation Area, there is a pine plantation, and some higher quality remnant vegetation adjacent to the road reserve associated with Majura Road. In addition the Majura Park Gun Club, although located outside of the Investigation Area, could potentially influence future land use activities within the locality, on account of the acoustical characteristics of its ongoing operation.

Slope

As described in Section 6.3 of the main report, land with a slope greater than 15% can be difficult to develop, particularly for employment uses. Therefore, all areas with a slope of greater than 15% are shaded in Figure 1 as a constraint.

Woolshed Creek

Woolshed Creek (refer to Section 4.0 of the main report) is located within Investigation Area B. All land located within Woolshed Creek's 100 year flood line is included as a constraint, i.e. not developable.

Easements

Easements will be required for existing services located within Investigation Area B, as described in Section 4.0. Service authorities were not able to provide required easement sizes, so a width of 5 m has been assumed for Telstra's Sydney-Melbourne-Gundaroo data cable and ActewAGL's 225 mm diameter water main.

Majura Parkway

A corridor has been allowed for the future Majura Parkway and VHST. The corridor extends approximately 25 m to either side of the parkway's anticipated limit of earthworks.

3.2.2 Ecological Features and Constraints

The assessment of ecological opportunities and constraints prepared by David Hogg Pty Ltd identified extensive areas of the endangered ecological community, box gum woodland in the north of the Majura Valley; however these patches of identified woodland generally fall outside of the area identified as Investigation Area B. The Ecological Assessment prepared for the Majura Parkway EIS did identify one patch of box gum woodland that meets the criteria for listing as an endangered ecological community under both ACT and Commonwealth legislation. The majority of Investigation Area B contains extensive patches of substantially and severely modified woodland vegetation, characterised by scattered trees with a predominantly exotic groundcover. This substantially and severely modified woodland does not meet the criteria of the endangered ecological community, however does retain some important ecological habitat features in the form of trees either individually or in clumps. Should areas of this woodland be determined, through more detail on the ground survey work, to contain areas in a more reasonable condition then additional development constraints may arise. However based on the information available it is expected that these areas of woodland currently do not pose a major constraint to the development of this Investigation Area, however may influence specific development options and layouts at a local scale.

As noted in Investigation Area A, approximately 700 ha of box gum woodland occurs in the nearby Mount Majura and Mount Ainslie Nature Reserve, and as such this community is considered to be well represented in

conservation reserves within a local context. Accordingly, potential impacts on this community, within Investigation Area B, would be unlikely to significantly impact upon this ecological community such that its long-term survival in the locality is compromised.

3.2.3 Heritage Features and Constraints

Within Investigation Area B there are a number of identified heritage sites considered to be of moderate to high heritage significance. In addition there are a number of other potential heritage sites, which to date have not been assessed in detail. Figure 1 presents an indication of where these sites exist in Investigation Area B. The assessment completed by Navin Officer in 2007 proposed an indicative assessment for some of these sites, as presented in more detail below:

- Gladefield homestead complex, the former home of the McIntosh family (for 103 years). The site includes existing buildings, plantings, curtilage and potential archaeological deposits. The buildings include two 1860s vertical slab and corrugated iron roof domestic structures with brick chimneys; also early twentieth century weatherboard cottage, and a 1950s home. Assessed as having a high local and potentially high regional significance. Recommendations for the site involve conservation *in situ* within appropriate contextual buffer, the completion of a detailed recording and assessment of the site, and the development of a plan of management designed to conserve the significant elements of the site.
- [redacted].
- MV 181 is a grave of child Margaret Darmody who was born in 1855 at Duntroon. The site is characterised by a brick and stone surrounds inset with white quartz pebbles with small turtle figurine. White painted iron cross with rusted sections. The grave is obviously well tended. The site is assessed as having a high significance.
- Majura House and outbuildings are located just within the southern extent of Investigation Area B, on the western side of Woolshed Creek. The site dates from the 1840s-60s, possibly built by/for Alfred Mayo but also recorded as first occupied by John McIntosh when he was a Duntroon shepherd. On the site, stone and slab walled and corrugated iron roof buildings remain. Large slab structure demolished 1950s, shearing shed dates from between wars. All C19 structures extensively renovated and added to. Location of former structures known including fernery and kitchen block. The site is listed on the Register of the National Trust (ACT), Register of the National Estate, nominated to the interim ACT Heritage Places Register and is considered to be the oldest farm complex in the ACT still in its original use. The management recommendations for the site involve conservation *in situ*, and further investigation of the significant elements and surrounds, it is noted that residential use is compatible with the conservation of heritage values.

Given the desktop nature of the review of heritage constraints conducted to date, a number of potential heritage issues have been identified, which would need to undergo further specific assessment in order to definitively ascertain the influence these sites would have on future development activities. The main consideration in this respect is determining the significance of these heritage sites (currently not listed on any statutory registers), and in doing so understanding the level of development which would be acceptable, and to what degree these sites would practically influence development generally.

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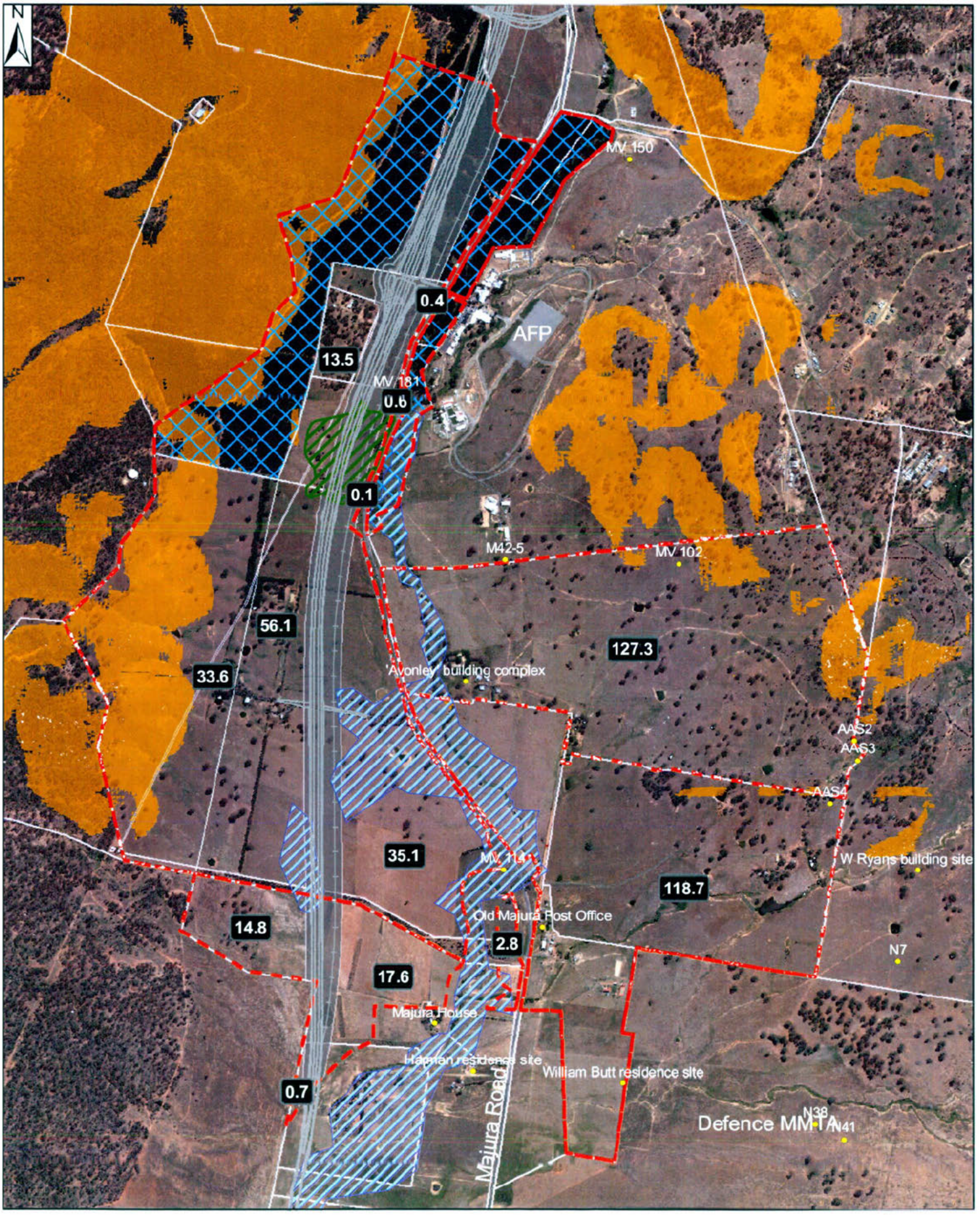

Heritage Items
Investigation Area B Boundary
100yr ARI
Box Gum Woodland EEC
Physical & Servicing Constraint
Majura Pines Rec Area
Slope >15%
14.8 Area (Ha)

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY

INVESTIGATION AREA B - CONSTRAINTS

Source: Telstra (2009), TransACT (2009), Hogg (2009), Navin (2009), ACTPLA (2009), SMEC (2009)

0 0.25 0.5 1
km

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3.3 Net Developable Area

There are physical and servicing constraints within Investigation Area B, as discussed in Section 3.2. It is estimated that of the Investigation Area's 650 ha, 99 ha cannot be developed due to constraints. An additional 163 ha is unlikely to be developed because it is Designated Land. Forty percent of the remaining land (155 ha) is anticipated to be used for roads and open spaces. The remaining area, approximately 233 ha, will be used for actual developments, i.e. building footprints.

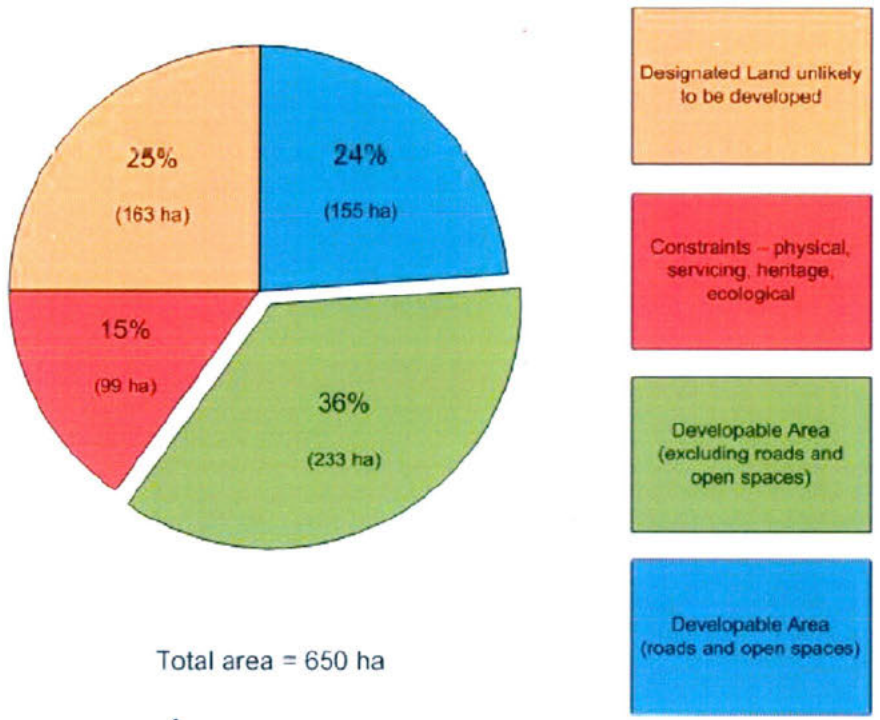

Figure 2 **Potential development scenario**

4.0 Servicing Strategy

Sections 4.1through 4.5 provide servicing strategy details for Investigation Area B. Refer to Section 7.0 in the body of the main report for an overview of the strategy for servicing all Investigation Areas.

The terminology of 'developer' is used to reference the entity which will ultimately be responsible for constructing the potential developments described in this report. The 'developer' may be a private or government entity.

4.1 Water

Ground elevations in Investigation Area B will entail the construction of a new Majura (TWL 720) high zone reservoir to provide service to elevations between 650 m and 690 m. Water will be pumped from the Upper Hackett reservoir to the new Majura reservoir. The Upper Hackett reservoir will cater for the remainder of Investigation Area B. It is probable that potential development will be located below 650 m, therefore the new Majura reservoir may not be required for Investigation Area B. However, it is illustrated in Figure 3 for completeness.

The construction of the new Majura reservoir will entail the removal of approximately 3.5 hectares of trees and vegetation for the reservoir itself and provision of an easement within which the connecting pipeline can be placed underground. At this stage it is expected that this easement would likely have vegetation clearing impacts in the order of 10 m wide for the length of the easement. However, it is anticipated that the existing access tracks located with Investigation Area may be utilized for access to the reservoir. The environmental impact of constructing the reservoir and trunk mains is discussed in Section 6.3.3 in the body of the main report.

4.2 Sewer

The trunk sewer located within Investigation Area C could be extended through into Investigation Area B to provide service to the potential development. This option is illustrated in Figure 4. The developer will be responsible for the trunk sewer main extension.

4.3 Gas

Existing and proposed gas infrastructure located within and adjacent to Investigation Area B is illustrated in Figure 5.

An easement would need to be located above the 250 mm diameter high pressure steel gas main. Additional liaison with Jemena is required, as future planning progresses into the design phase, before an easement width can be determined. A width of 5 m has been assumed for the purpose of this study.

Gas main infrastructure from the proposed gas-off take station to the Investigation Area boundary will be the responsibility of the developer. A gas main can be easily extended through Investigation Area B if the off-take station is located within Investigation Area B, adjacent to the AFP site. Therefore there is no gas costing included in Table 3.

If the off-take station is located to the east of Investigation Area C, then a gas main would need to be laid from the off-take station though to Investigation Area B.

4.4 Electricity

The existing cables (refer to Figure 6) may remain as overhead and a 10 m easement maintained. A more desirable option is to relocate them underground within in a future road reserve. .

Electricity service to Investigation Area B could be provided by new 11 kV underground feeders from the Eastlake Zone Substation. ActewAGL will be responsible for the cost of extending the feeders to Investigation Area B. The developer will be responsible for the construction of a new distribution substation(s) within the Investigation Area. The number and type of distribution substations cannot be determined until the potential developments progress into a more detailed design phase, therefore they are not included in the services costing.

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4.5 Telecommunications

Existing and proposed telecommunications infrastructure located within and adjacent to Investigation Area B is illustrated in Figure 7.

Telstra

An easement (of yet undetermined width) will be required above the Sydney-Melbourne-Gundaroo low integrity data cable. The remaining Telstra infrastructure located within the Investigation Area may be relocated to shared trenches within future road reserves.

Telstra has advised that they should be able to provide service to Investigation Area B, however they cannot comment upon infrastructure capacity or costing until the potential development progresses into a more detailed design phase.

TransACT

TransACT infrastructure can be extended from Campbell (through Investigation Area C) to provide service to Investigation Area B. The developer's contribution for this service will be a percentage of TransACT's costs. TransACT will first need to prepare a business case to look at the viability of servicing the development and the estimated cost to the developer. Investigation Area B is located adjacent to Investigation Area A, therefore the cost of extending infrastructure from Dickson is included in the Investigation Area A estimated construction costs.

ICON

ICON and Intact are government owned carriers which only supply services to ACT and Commonwealth facilities, including schools. ICON infrastructure will not be extended unless the potential development includes government facilities.

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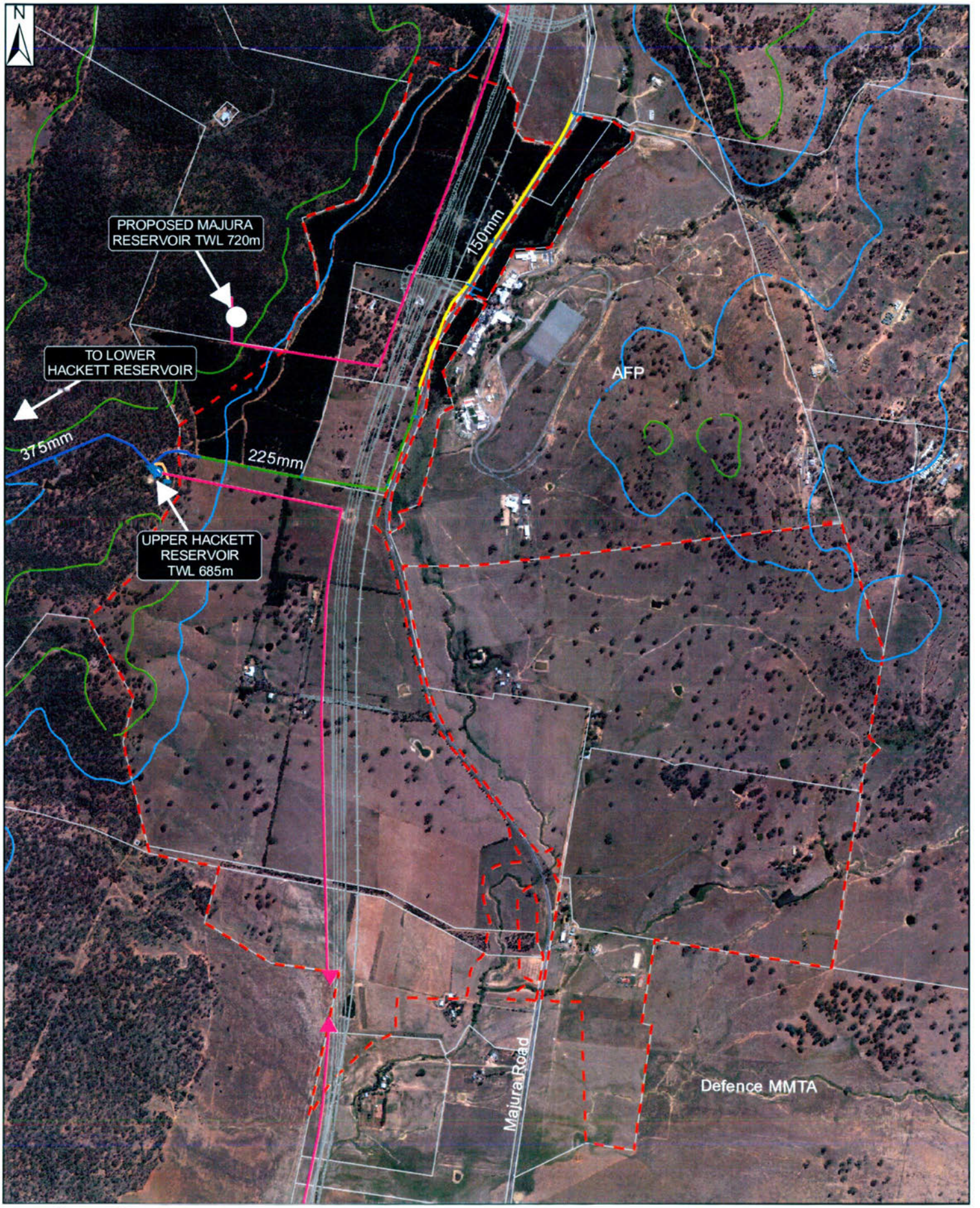

Proposed Water Main
Existing Water Main Reticulation
Existing Water Main Reticulation
Existing Water Main Distribution
Investigation Area Boundary
Proposed Majura Parkway & VHST Route
RL 690m contour - Upper Limit of High Zone Supply from new Majura Reservoir
RL 650m contour - Supply from Upper Hackett Reservoir

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY
INVESTIGATION AREA B - WATER SERVICES

Source: ActewAGL (2009), ACTPLA (2009), SMEC (2009)

0 125 250 500 m

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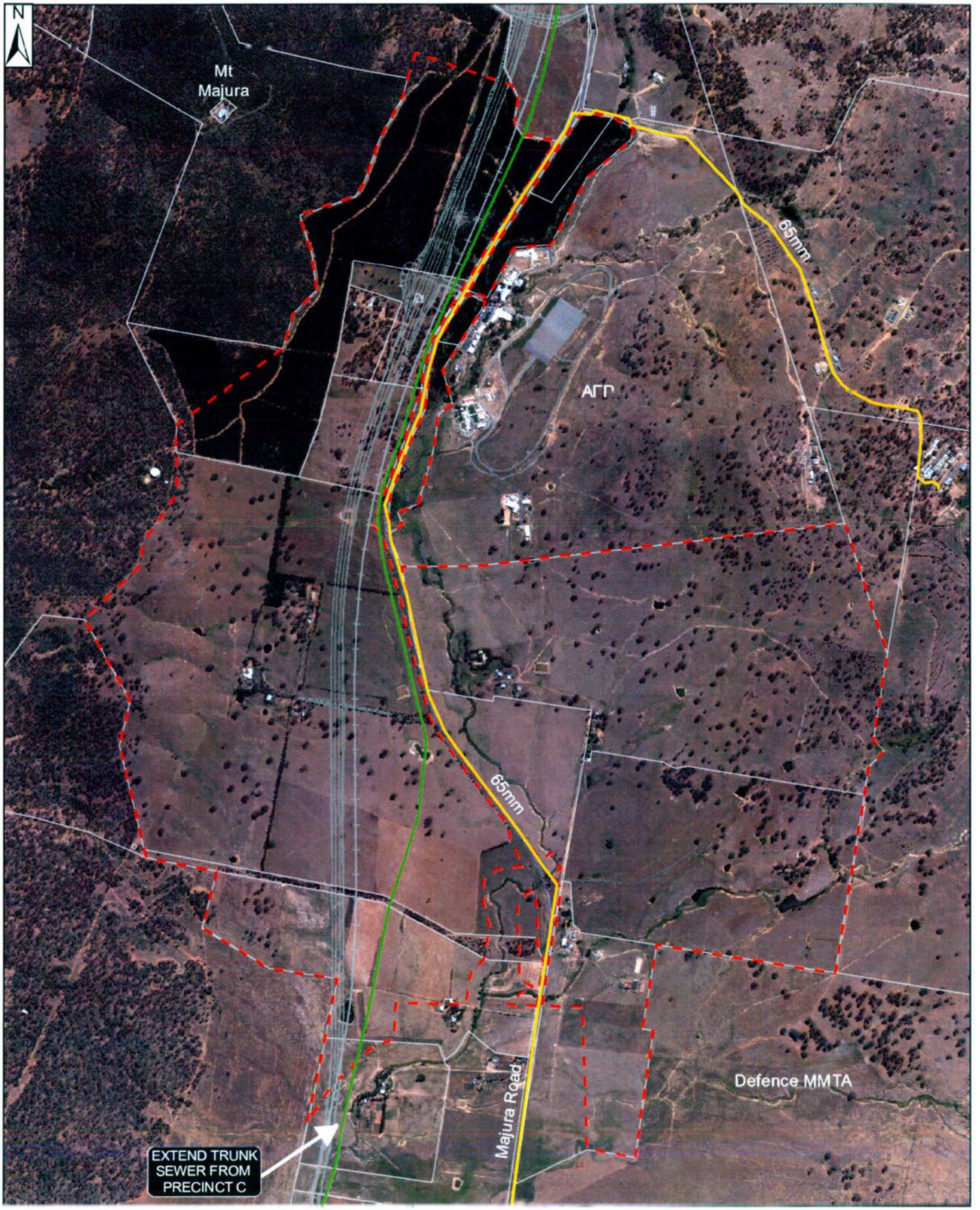

Proposed Sewer Gravity Main

Existing Sewer Rising Main (65mm)

Investigation Area Boundary

Proposed Majura Parkway & VHST Route

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY

INVESTIGATION AREA B - SEWER SERVICES

Source: ActewAGL (2009), ACTPLA (2009), SMEC (2009)

0 125 250 500

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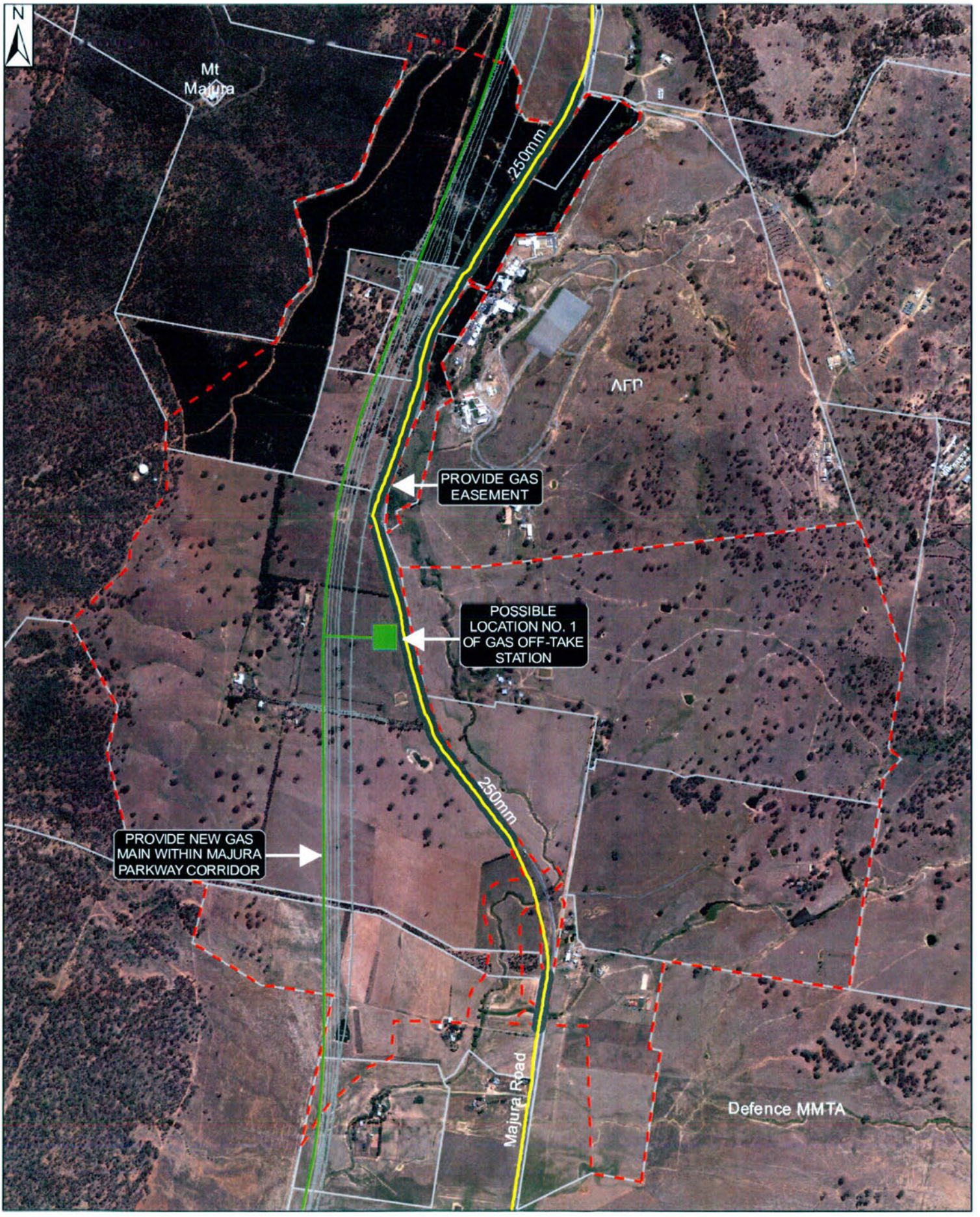

Proposed Gas Pipeline

Existing Gas Main (250mm)

Investigation Area Boundary

Proposed Majura Parkway & VHST Route

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY

INVESTIGATION AREA B - GAS SERVICES

Source: SMEC (2009), Jemena (2009), ACTPLA (2009)

0 125 250 500 m

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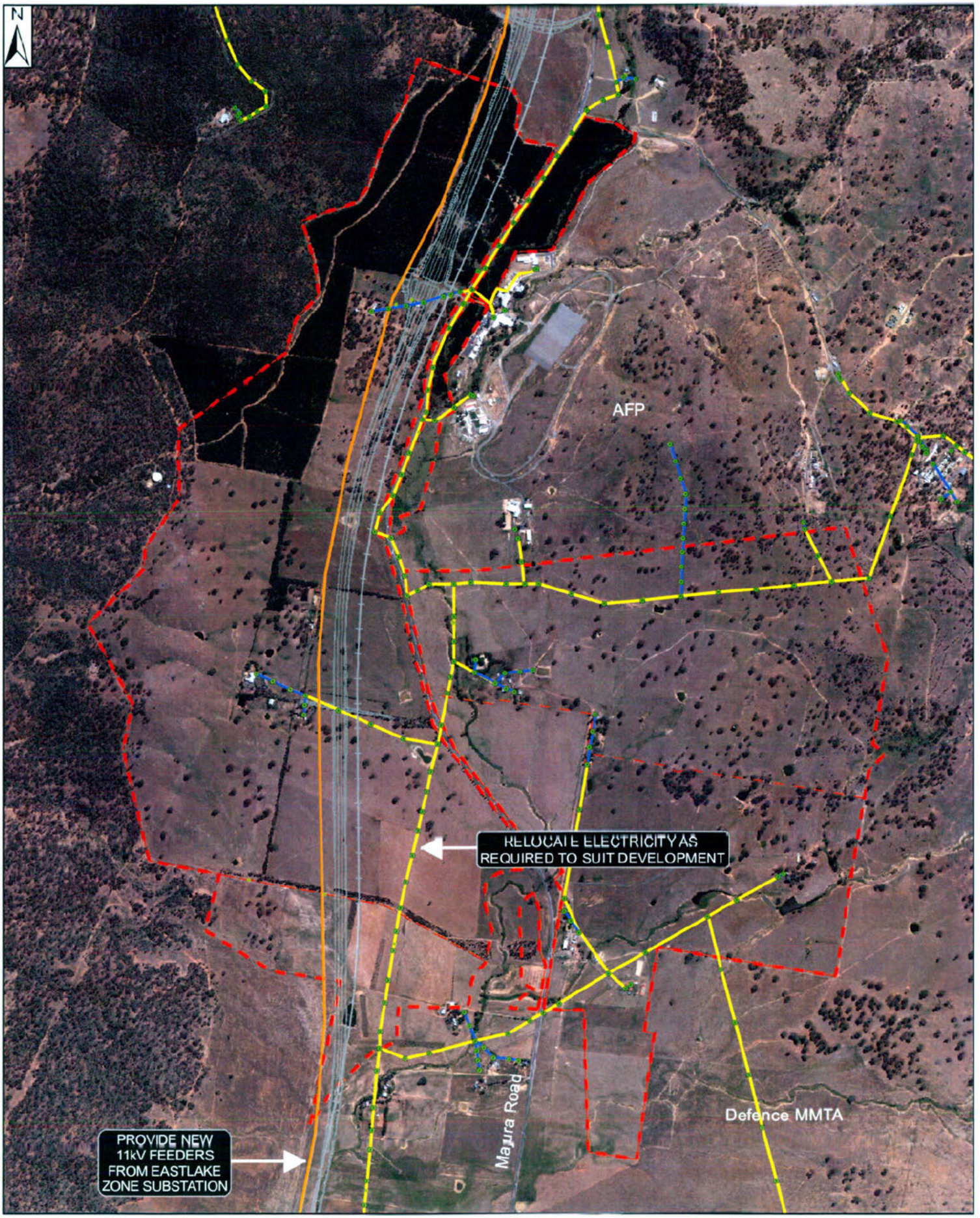

Proposed Electrical 11Kv Underground
Existing Electrical 11Kv Overhead
Existing Electrical 11Kv Underground
Existing Electrical LV Overhead
Existing Electrical LV Underground
Powerpoles
Investigation Area Boundary
Proposed Majura Parkway & VHST Route

MAJURA VALLEY ENGINEERING FEASIBILITY STUDY

INVESTIGATION AREA B - ELECTRICITY SERVICES

Source: ActewAGL (2009), ACTPLA (2009), SMEC (2009)

0 125 250 500 m

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