



Shoalhaven Starches, Bomaderry

Access & Parking Assessment

April 2017

prepared for

Manildra Shoalhaven Starches

prepared by

ARC Traffic + Transport

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Executive Summary

Manildra Shoalhaven Starches (Manildra) operates an Ethanol Plant in Bolong Road, Bomaderry (the SS Site), the current operations of which are based on the Shoalhaven Starches Ethanol Plant (SSEP) Approval granted by the Minister for Planning on the 28th January 2009. As part of the SSEP Approval, conditions required the provision of additional access and parking infrastructure across the broader Starches Sites, which of specific relevance in this assessment include the (former) Dairy Farmers Site (DF Site); Packing Plant Site (PP Site); BOC Site; and Moorehouse Site.

Subsequent Modifications – including recently approved Modifications and Modification proposals currently before the Department of Planning & Environment (DP&E) - have in some instances revised (further to appropriate approvals) those access and parking infrastructure requirements, but a number of conditions (associated with both the SSEP Approval and subsequent Modification approvals) remain unresolved at this time.

Further to the recently submitted Modification 12 (for a Beverage Grade Ethanol Plant, currently before the DP&E) submissions from Shoalhaven City Council (Council) and the Roads & Maritime Service (RMS) identified what they (Council and the RMS) considered to be outstanding and/or incomplete works across the Starches Sites necessary to provide compliance with past approval conditions. Further to an on-site meeting (17th February 2017) attended by Manildra, DP&E and Council representatives, and based on our discussions with Council and the RMS, these issues include: -

- The provision of a compliant number of on-site parking spaces.
- The interaction between car park access points and Bolong Road.
- The design of on-site car parks.
- The design of the Bolong Road & DF Site intersection.
- The operation of the Bolong Road & Ethanol Driveway intersection and internal 'Service Driveway' currently providing sole access to eastern portion of the SS Site (Services Area).
- The location of an electronic gate providing access to the Manildra Environmental Farm of Hanigans Lane.

ARC Traffic + Transport (ARC) has been engaged by Manildra to provide an independent assessment of these issues.

Further to our preliminary assessment (based on the scope of work agreed with DP&E and Council, 17th February 2017) ARC provided a number of recommendations to Manildra to appropriately respond to the Council and RMS issues. Manildra has adopted the recommendations of ARC, and subsequently is in the process of submitting revisions to Modification 12 (Beverage Grade Ethanol Plant) to the DP&E which incorporate these recommendations.

It is also expected that this assessment will be provided to the DP&E as an addendum to Modification 10 (Flour Mill B) also currently before the DP&E, as Manildra proposes an extension of the use of the Temporary Car Park located on the PP Site off Bolong Road for the duration of the Modification 10 (Flour Mill B) construction period.

With specific reference to the issues raised by Council and RMS, the revised Modification 12 (Beverage Grade Ethanol Plant) response (to the Council and RMS issues) is summarised below.

i. Parking Space Requirements

Condition 31 of the SSEP Approval required the provision of some 345 parking spaces across the Starches Sites. This parking total was determined at a time when construction activity at the SS Site was at 'super-peak' levels, and was further conditioned to respond to issues (at that time) in regard to parking along Bolong Road.

Further to parking restrictions being implemented in Bolong Road, and the provision (at that time) of temporary construction staff parking in the south-west portion of the SS Site, parking issues in Bolong Road were essentially eliminated. More importantly in the context of the conditioned parking requirement, the super-peak construction staff numbers at the time of the SSEP Approval are no longer evidenced, with current projects employing up to 50 on-site construction staff compared to the 150 on-site construction staff at the time of the SSEP Approval.

Notwithstanding, there is still a significant parking demand across the Starches Sites to be accommodated, and indeed additional demand has been identified in the short-term (mid-2017 to end 2017) when proposed construction works (further to approvals) associated with Modification 10 (Flour Mill B) and Modification 12 (Beverage Grade Ethanol Plant) would overlap. During this short period, the peak number of on-site staff (across the Starches Sites) at any one time is estimated to comprise: -

- Up to 185 operational and administration staff.
- Up to 30 contract and maintenance staff.
- Up to 100 construction staff, essentially comprising up to 50 construction staff for the Modification 10 (Flour Mill B) construction works and 50 construction staff for the Modification 12 (Beverage Grade Ethanol Plant) construction works.

As such, it is estimated that during this short period of dual construction projects up to 315 staff would be on-site at any one time. After this period, i.e. during the ongoing construction of the Modification 10 (Flour Mill B) works alone (continuing to mid-2018) it is estimated that up to 265 staff would be on-site at any one time, while longer term – when there is no construction project underway – it is estimated that up to 215 staff would be on-site at any one time.

While there is evidence that suggests that total on-site staff parking demand (spaces) is lower than total on-site staff numbers, revised Modification 12 (Beverage Grade Ethanol Plant) nonetheless provides for a minimum of 380 parking spaces to be provided across the Starches Sites during the short-term dual project construction period (mid-2017 to end 2017), which not only exceeds the peak demand estimate during this period, but appropriately responds to the location (of the two proposed construction projects) such that capacity is provided in proximity to each of these (construction) locations.

At the end of the Modification 10 (Flour Mill B) construction in mid-2018, the Temporary Car Park would be closed, with 280 parking spaces retained across the Starches Sites, again in excess of the peak parking demand during a single construction project period, and significantly in excess of the peak parking demand during a period where there was no construction occurring.

ii. Car Park Locations & Operations

Revised Modification 12 (Beverage Grade Ethanol Plant) provides the following car parking areas: -

Western Car Parks (52 spaces)

While parking immediately adjacent to the administration building will remain unchanged, minor revisions are proposed to the car park at the rear of the administration buildings to ensure aisle widths and parking space dimensions are provided in accordance with Australian Standard 2890.1: Parking Facilities – Off Street Car Parking (AS 2890.1) while retaining access to the Bomaderry Country Store.

Moorehouse Site Car Park (110 spaces)

Minor revisions to the Moorehouse Car Park are proposed to ensure aisle widths and parking space dimensions are provided in accordance with AS 2890.1 while providing for future Modification proposals (currently being prepared by Manildra).

Dairy Farmers Car Park (60 spaces)

Revised Modification 12 (Beverage Grade Ethanol Plant) provides for the 'reinstatement' of (what has previously been referred to as) the Dairy Farmers Car Park (DF Car Park), generally as per the existing Modification 3 (DF Car Park) Approval, though with a minor change in siting to provide for the infrastructure proposed under Modification 12 (Beverage Grade Ethanol Plant). As per the Modification 3 (DF Car Park) Approval, this car park will be accessed exclusively via the DF Site intersection to Bolong Road.

BOC Car Park (58 spaces)

Revisions to the BOC Car Park as submitted in the original Modification 12 (Beverage Grade Ethanol Plant) are proposed to ensure aisle widths and parking space dimensions are provided in accordance with AS 2890.1, while also retaining access to the on-site fire pump buildings.

As importantly, ARC has determined that the intensified use of the (currently underutilised) BOC Car Park would potentially impact the adjacent intersection of Bolong Road & Ethanol Driveway.

These potential impacts relate not only to the pre-existing issue of U-turns at the intersection (as previously identified by ARC) but also to the relatively short distance between the BOC Site Driveway and Ethanol Driveway; vehicles merging across the Bolong Road eastbound through lane to the right turn lane to Ethanol Driveway (as observed) in this short distance in our opinion poses a potential safety concern.

As such, and as previously suggested by Council as a *low cost and viable* option, revised Modification 12 (Beverage Grade Ethanol Plant) provides for the extension of the existing Bolong Road median and barrier fence across Ethanol Driveway, i.e. the removal of the right turn Bolong Road to Ethanol Driveway. As a result, trucks travelling to Ethanol Driveway (exclusively from/to the west) and vehicles departing the BOC Car Park would proceed east to the custom designed turn facility at the DF Site, and then return to enter Ethanol Driveway via a left turn, or continue west in Bolong Road. These movements would be essentially identical to movements at the adjacent Glutton Driveway, for which the DF Site turn facility was specifically designed.

Temporary Car Park (100 spaces)

Manildra proposes the continued use of the Temporary Car Park to provide for construction staff for the Modification 10 (Flour Mill B) construction works, which (further to approval) would commence immediately following the completion of the Modification 7 (Starch Dryer 5) Approval construction works (mid-2017). The continued use of the Temporary Car Park provides both additional short-term capacity and parking in close proximity to the proposed Modification 10 (Flour Mill B) construction site, and would continue to operate in an essentially identical manner to that provided for by the Modification 6 (Moorehouse Demolition) and Modification 7 (Starch Dryer 5) Approvals.

Upon completion of the Modification 10 (Flour Mill B) construction works, the Temporary Car Park would be closed.

Car Park Traffic Operations

Further to the above, ARC has examined the operation of the local road network further to the revised Modification 12 (Beverage Grade Ethanol Plant) car park access provisions, and specifically further to the redistribution of trips to the DF Car Park and BOC Car Park; and further to the proposed access revisions at Bolong Road & Ethanol Driveway.

ARC has determined that the redistribution of vehicle trips (which essentially remain within the trip generation parameters established in the SSEP Approval) can be appropriately accommodated by the local road network, and specifically at the key intersection of Bolong Road & DF Site.

Car Park Pedestrian Access

Additional pedestrian infrastructure will be provided to appropriately link the DF Car Park and BOC Car Park to existing pedestrian paths and Bolong Road pedestrian refuge crossings.

iii. Internal Car Park Design

Council has raised the issue of sealing the car parks to a higher standard than currently provided across the existing and proposed DF Site and BOC Site car parks per revised Modification 12 (Beverage Grade Ethanol Plant). It is our opinion that the use of a road base surface is appropriate for these car parks, based on the following: -

- These car parks are used exclusively by staff in light vehicles.
- During periods where this is no construction work, a significant number of parking spaces would be unused.

- There is no evidence that the use of a road base surface within the existing Moorehouse Car Park or BOC Car Park has any impact on the local road network, while any internal damage to the car parks (were it to occur) would be the responsibility of Manildra.

Notwithstanding, the Temporary Car Park is not provided with a formal sealed/concrete driveway from Bolong Road, and is generally in poor condition with the potential to transfer gravel onto the Bolong Road carriageway. As such, ARC recommends the provision of a formal sealed/concrete driveway at the Temporary Car Park for a distance of not less than 12m from Bolong Road, as provided at the Moorehouse Site and BOC Site driveways.

- The potential exists for future Modifications to require the relocation of (existing and proposed) parking areas; as such, the provision of a significantly costlier higher standard surface (that may then require removal) is not financially viable.
- The existing/proposed road base surface is in our opinion superior to the surface materials used at a number of Council's own public car parks; it is in our opinion incongruous that Manildra be required to provide a higher standard surface than required by Council for their own public car parks.

Further to the above, it is the recommendation of ARC that all parking spaces (across the Starches Sites, and including the Temporary Car Park) be appropriately delineated so as to prescribe parking spaces which comply with AS 2890.1 dimension requirements (minimum 5.5m by 2.4m for User Class 1 – employees). In this regard, and dependent on the surface material available in different car parks, ARC recommends the use of either line marking or plastic disc markers.

iv. Intersection Bolong Road & Dairy Farmers Site

Further to the Modification 3 (DF Car Park) Approval, Manildra submitted (to Council) plans for the upgrade of the intersection of Bolong Road & Dairy Farmers Site, which were subsequently approved for construction. These approved plans include the left turn auxiliary lane, Bolong Road to DF Site, which – further to the reinstatement of the DF Car Park as described above – is again 'warranted'.

It is acknowledged by Manildra that the subsequent upgrade of the intersection has not been in strict accordance with those approved plans; Manildra has therefore committed to remediation works to provide full compliance with those plans *to the satisfaction of Council*.

v. Ethanol Driveway Operations

As detailed above, the revised Modification 12 (Beverage Grade Ethanol Plant) will provide for the extension of the Bolong Road median and barrier fence across the Ethanol Driveway; this will eliminate U-turn movements at the intersection of Bolong Road & Ethanol Driveway. In addition, the provision of a new access driveway between the DF Site and the Services Area on the eastern portion of the SS Site, which will accommodate the DF Car Park and Modification 12 (Beverage Grade Ethanol Plant) infrastructure, will allow for the closure of the existing Service Driveway to all but emergency vehicles.

As with the DF Car Park itself, this access driveway would again be generally provided in accordance with the existing Modification 3 (DF Car Park) Approval.

vi. Environmental Farm Electric Gate

The electric gate providing access to the Environmental Farm off Hanigans Lane was relocated to a distance of approximately 45m from Hanigans Lane in mid-2016. As previously determined by ARC, this ensures that there is adequate queuing distance so that a truck accessing the Environmental Farm does not impede traffic movements in Hanigans Lane.

Further to the conclusions outlined above, and noting that the majority of the broader ARC recommendations have already been incorporated into the revised Modification 12 (Beverage Grade Ethanol Plant), ARC provides the following recommended actions further to an approval of revised Modification 12 (Beverage Grade Ethanol Plant) and Modification 10 (Flour Mill B): -

- That Manildra prepare appropriately detailed plans of all new or revised car parks to show compliance with AS 2890.1 in regard to aisle widths, parking space dimensions and general design requirements.
- That Manildra provide a formal sealed/concrete driveway at the Temporary Car Park for a distance of not less than 12m from Bolong Road as provided at the Moorehouse Driveway and BOC Driveway.
- That Manildra immediately prioritise the construction of the internal access driveway between the DF Site and the Services Area, providing for the DF Car Park and Modification 12 (Beverage Grade Ethanol Plant) infrastructure so as to allow for the closure of the Service Driveway to all but emergency vehicles.
- That Manildra consults with Council and the RMS in regard to an appropriate design and schedule for the extension of the Bolong Road median and barrier fence across Ethanol Driveway.

Based on our detailed assessment of the outstanding issues relating to the Starches Sites – and further to the implementation of the recommendations detailed above - it is the opinion of ARC that revised Modification 12 (Beverage Grade Ethanol Plant) and Modification 10 (Flour Mill B) are supportable in regard to access, traffic and parking considerations. Moreover, it is our opinion that the implementation of the suite of ARC recommendations appropriately responds to the issues raised by Council and the RMS.

1 Introduction

Manildra Shoalhaven Starches (Manildra) operates an Ethanol Plant in Bolong Road, Bomaderry, the current operations of which are based on the Shoalhaven Starches Ethanol Plant (SSEP) Approval granted by the Minister for Planning on the 28th January 2009. This approval also encapsulated previous approvals into one overall approval, noting that the SSEP is a 'transitional Part 3A Project' for the purposes of Schedule 6A of the Environmental Planning & Assessment Act.

The SSEP provides for an increase in ethanol production at the Shoalhaven Starches Site (SS Site) in a staged manner from 126 million litres per year to 300 million litres per year. To accomplish the increase in ethanol production, the SSEP required a series of plant upgrades and increases in throughput of raw materials, principally flour and grain. Many of these upgrades have been completed, but since 2009 a number of additional Modifications to the SSEP Approval have also been submitted (and approved), noting that at this time (April 2017) a number of Modifications (including Modification 10 relating to Flour Mill B, Modification 11 relating to the DDG Dryers, and Modification 12 relating to a Beverage Grade Ethanol Plant) remain before the Department of Planning & Environment (DP&E) for assessment.

The SSEP Approval conditioned an increase in parking spaces, and more specifically the provision of an additional 60 spaces on the SS Site south of Bolong Road, and a further 30 spaces on the Packing Plant Site (PP Site) north of Bolong Road, to an estimated total (at that time) of some 345 spaces.

Approved Modification 3 (Dairy Farmers Car Park – DF Car Park) provided for the 60 spaces (required south of Bolong Road) to be relocated from the originally proposed location within the SS Site (off the SS Site Western Driveway) to the eastern portion of the SS Site (Services Area) to be accessed via the Dairy Farmers Site (DF Site). However, the recently submitted Modification 12 (Beverage Grade Ethanol Plant) currently before the DP&E proposed the relocation of these spaces from the DF Site to the BOC Site (part of the broader Starches Site) located north of Bolong Road and east of Abernathy's Creek.

In response to the Modification 12 (Beverage Grade Ethanol Plant) application - and moreover as raised through numerous recent Modification applications - the DP&E, Shoalhaven City Council (Council) and the Roads & Maritime Service (RMS) have all noted that the SSEP conditioned additional parking has not to date been provided, a fact acknowledged by Manildra. Council and the RMS have also raised issues with the broader provision of parking across the Starches Sites, the location and capacity of which has fluctuated in recent years further to work associated with approved (and proposed) Modifications.

This is particularly the case at this time, with significant staff parking currently relocated from the existing car park on the former Moorehouse Site (again part of the broader Starches Site) to a Temporary Car Park within the PP Site, as provided for by Modification 6 (Moorehouse Demolition) and Modification 7 (Starch Dryer 5) Approvals.

In addition, Council and the RMS have raised issues with other infrastructure works across the Starches Sites, including: -

- The interaction between car park access points and Bolong Road.
- The design of on-site car parks.
- The design of the Bolong Road & DF Site intersection.
- The operation of the Bolong Road & Ethanol Driveway intersection and internal 'Service Driveway' linking Ethanol Driveway with the Services Area.
- The location of an electronic gate providing access to the Manildra Environmental Farm of Hanigans Lane.

Acknowledging that at this time the capacity, demand, access to and design of car parking across the Starches Sites is ill-defined, and that a number of design and operational issues remain contested, Manildra has engaged ARC Traffic + Transport (ARC) to undertake a detailed assessment of the outstanding issues as summarised above. The scope of this assessment is primarily based on our discussions with, and review of correspondence from, the DP&E, Council and the RMS in regard to the recent Modification 12 (Beverage Grade Ethanol Plant) application, but also incorporates issues raised and actionable items determined in our meeting with representatives of the DP&E, Council and Manildra on 17th February 2017.

In preparing this assessment, ARC has referenced numerous reports (prepared by ARC) in regard to the SSEP Approval and subsequent Modifications, including: -

- [Shoalhaven Starches Ethanol Upgrade & Packaging Plant TIA 2008 \(SSEP TIA\)](#)
- [Shoalhaven Starches Staff Car Park Proposal TIA 2012 \(Mod 3 TIA\)](#)
- [Shoalhaven Starches Access Review 2014 \(Access Review\)](#)
- [Dairy Farmers Site Reuse Proposal TIA 2014 \(Dairy Reuse TIA\)](#)
- [Shoalhaven Starches, Bomaderry Proposed Demolition Works TIA October 2015 \(MOD 6 TIA\)](#)
- [Shoalhaven Starches, Bomaderry Proposed Starch Dryer No. 5 Relocation TIA October 2015 \(MOD 7 TIA\)](#)
- [Shoalhaven Starches, Bomaderry Flour Mill Modification TIA September 2015 \(MOD 8 TIA\)](#)
- [Shoalhaven Starches, Bomaderry Proposed Packing Plant Modification TIA December 2015 \(MOD 9 TIA\)](#)
- [Shoalhaven Starches, Bomaderry Proposed Flour Mill B Modification TIA October 2016 \(MOD 10 TIA\)](#)
- [Shoalhaven Starches, Bomaderry DDG Modification TIA April 2016 \(MOD 11 TIA\)](#)
- [Shoalhaven Starches Packing Plant Construction Traffic Management Plan May 2016 \(PP CTMP\)](#)
- [Shoalhaven Starches, Bomaderry Environmental Farm Traffic Assessment August 2016 \(Farm TA\)](#)
- [Shoalhaven Starches, Bomaderry MP 06 0028 Modification Proposal TIA November 2016 \(MOD 12 TIA\)](#)

ARC has also referenced key standards and guidelines, including: -

- [AustRoads Guide to Road Design Part 4A Unsignalised and Signalised Intersections \(GRD4A\)](#)
- [Australian Standard 2890.1: Parking Facilities – Off Street Car Parking \(AS 2890.1\)](#)
- [Council's Development Control Plan 2014 \(DCP 2014\)](#)

From the outset, ARC would acknowledge the assistance of the DP&E, Council and RMS officers through the preparation of this assessment, particularly in regard to the scope of work provided herein, and in regard to the identification of key outstanding and local issues.

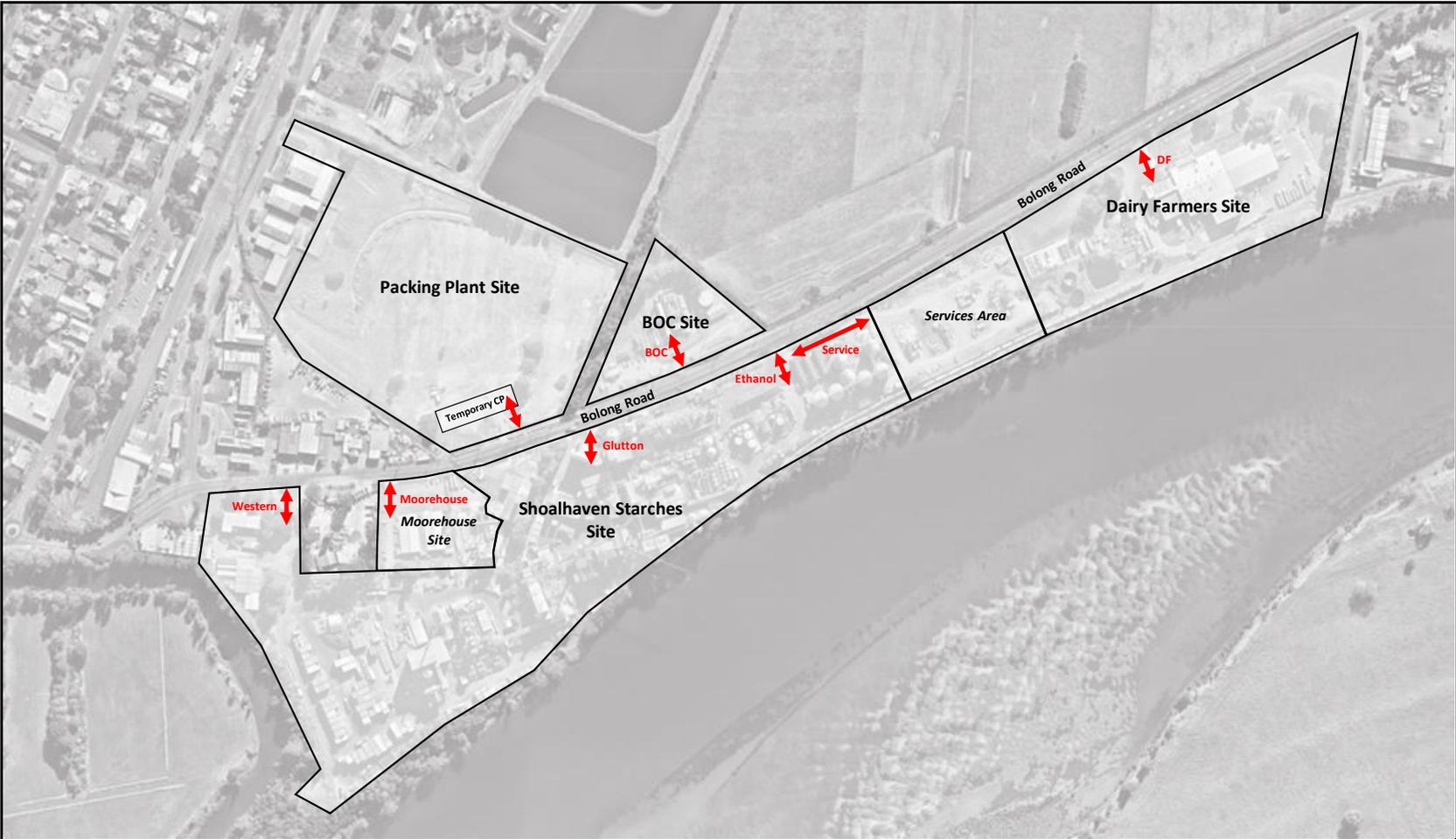
1 Existing Starches Operations

1.1 Shoalhaven Starches Sites

Shoalhaven Starches operations occupy a number of distinct 'sites' in Bomaderry; while operations are integrated across all sites, they are differentiated in this assessment for ease of reference.

The primary SS Site and immediately adjacent DF Site are located south of Bolong Road. The Moorehouse Site sits within the SS Site east of the railway spur, while the Services Area occupies the eastern portion of the SS Site. The approved PP Site is located on the northern side of Bolong Road opposite the primary SS Site, and currently accommodates a Temporary Car Park per Modification 6 (Moorehouse Demolition) and Modification 7 (Starch Dryer 5) Approvals which is accessed from Bolong Road. The BOC Site is located on the northern side of Bolong Road east of Abernathy's Creek. These sites are shown in their local context in **Figure 1.1**, including existing access driveway locations.

Figure 1.1 Shoalhaven Starches Sites



Source: Nearmap

Further to our discussions with Manildra, and consistent with our past assessments, Manildra acknowledges that there are occasional periods when operation staff numbers during the day (8:00am – 2:00pm) can be marginally higher than these average numbers, particularly when new infrastructure has come on-line and requires additional operational staff for short periods. During these peak periods, up to 185 operational and administration staff can be on-site, and it is noted that the Starches operations during the time of our assessment were generating this peak staff total (again further to recent approved infrastructure upgrades 'coming on line').

Importantly, this peak total (185 operational and administration staff) is entirely consistent with past (peak) staff estimates (as reported in previous Modification assessments prepared by ARC).

Appropriately, ARC has adopted this higher occasional operational and administration staff peak for this assessment.

1.2.2 Contract Maintenance & Service Staff

Contract maintenance and service staff are employed on a daily basis across the Starches Sites (though primarily on the SS Site). Information provided by Manildra indicates that on a peak day (generally mid-week, Tuesday to Thursday) up to 30 contract staff can be on-site at any one time.

1.2.3 Construction Staff

The number of construction staff on-site has varied significantly in recent years. During past peak construction periods - and specifically at the time of the SSEP Approval - up to 150 construction staff were employed across the SS Site in addition to operational and contract staff, requiring (at the time) the provision of temporary car parks (located at the time in the south-west portion of the SS Site) to alleviate parking constraints in Bolong Road. It is noted that the SSEP Approval (parking) Condition 31 was based on the total SS Site staff (operational + administration + contractor + construction) demand during this super-peak period, estimated at some 345 staff (and a commensurate 345 parking spaces).

However, construction staff numbers are significantly lower at this time. Information provided by Manildra indicates that up to 50 construction staff, primarily associated at this time with the construction of the approved Modification 7 (Starch Dryer 5) works, are currently on-site at any one-time.

Notwithstanding, and with reference to sections below, Manildra proposes a construction schedule in the short-term (mid 2017 to end 2017) which would (further to approvals) provide for the simultaneous construction of both the Modification 10 (Flour Mill B) and Modification 12 (Beverage Grade Ethanol Plant) infrastructure. During this period, it is estimated that up to 50 construction staff could be employed on each construction project, i.e. up to 100 construction staff could be on-site at any one time.

1.2.4 Total Staff Numbers

Further to sections above, a total of up to 315 staff (operational + administration + contractor + construction) are estimated to be on-site at any one-time during a dual project construction period such as proposed between mid-2017 and the end of 2017 for the Modification 10 (Flour Mill B) and Modification 12 (Beverage Grade Ethanol Plant) construction works.

During periods where there is a single construction period, i.e. the ongoing Modification 10 (Flour Mill B) construction works (estimated to be completed by mid-2018) following the completion of the Modification 12 (Beverage Grade Ethanol Plant) construction works, a total of up to 265 staff (operational + administration + contractor + construction) are estimated to be on-site at any one-time. Finally, during periods where there are no construction projects being undertaken, a total of up to 215 staff (operational + administration + contractor) are estimated to be on-site at any one-time.

1.3 Staff Parking Demand

1.3.1 Operational & Administration Staff

Based on our on-site observations over many years, it is apparent that there is a very low operational and administration staff car occupancy, i.e. almost all operational and administration staff drive their own vehicle. As such, for sensitivity purposes it is estimated that the peak operational and administration staff parking demand could be up to 185 parking spaces.

1.3.2 Contract Staff

In the context of parking demand, it is important to note that many contract staff are 'assigned' to maintenance/service locations around the SS Site, and as such do not park in designated car parks, or more specifically do not need formal parking spaces. In such instances, the tools and equipment required by these contract staff are transported in utilities and (smaller) service vehicles directly to internal work-sites, as shown in the figures below.

Figure 1.3.2.1 Contract Staff at Service/Maintenance Location



Figure 1.3.2.2 Contract Staff at Service/Maintenance Location

With reference to **Section 2** below, ARC conducted surveys across the Starches Sites in February and March 2017. For the February survey day, Manildra was able to conduct a simultaneous survey of contract staff on the SS Site, which has been provided to ARC. This survey reports that on the survey day: -

- 3 contract staff were working at the Southern Mill A (1 company vehicle at service location).
- 4 contract staff were working at Unload (4 contract staff vehicles parked in car parks).
- 4 contract staff were installing pipes and brackets (2 company vehicles at service locations).
- 1 contract plumber was on-site (Freeman Plumbing located opposite the Site in Bolong Road, walk trip).
- **In summary, the 12 contract staff on-site on the survey day generated a demand for only 4 parking spaces.**

With reference to the higher on-site contract staff peak (as opposed to that observed on the survey day) identified in **Section 1.2.2**, it is estimated that the peak 30 contract staff could generate a peak formal parking demand for up to 20 parking spaces.

1.3.3 Construction Staff

As detailed in numerous ARC reports, construction projects often require specialised construction teams, the majority of whom are based in Wollongong or Sydney. These construction teams generally travel to and from the Site by mini-bus or the like, which reduces parking requirements for construction staff; while local construction contractors will also often travel in small teams (i.e. 2 or 3 persons per vehicle). It is noted that the proportion of specialist or local construction staff often changes throughout a construction period.

For the February survey day, Manildra was again able to conduct a simultaneous survey of construction on the SS Site, which has been provided to ARC. This survey shows that on the survey day: -

- 11 construction staff were completing fane and silencer changeout (1 company vehicle at construction location, 3 staff vehicles parked in car parks, 8 staff bused to/from Site);

- 18 (ARA) construction staff were working on the Starch Dryer project (3 company vehicles at construction location, 13 vehicles parked in car parks);
- 6 construction staff (IMEEC and MME) were working on the Starch Dryer (3 vehicles parked in car parks); and
- 11 construction staff (IEE) were working on the Starch Dryers and RD#2 (3 company vehicles at construction location, 6 vehicles parked in car parks)
- **In summary, the 46 construction staff on-site generated a demand for 25 formal parking spaces on the survey day.**

With reference to the marginally higher on-site construction staff peak (as opposed to that observed on the survey day) identified in **Section 1.2.3**, it is estimated that the peak 50 construction staff could generate a formal parking demand for up to 30 parking spaces.

1.3.4 Peak On-Site Parking Demand

Importantly, and with reference to **Section 2** below, the total parking surveyed across the Starches Sites by ARC on the February survey day essentially matched the (staff) survey data provided by Manildra, with an estimated demand for all staff (operational + administration + contractor + construction) for 216 parking spaces, and a surveyed peak parking occupancy of 220 spaces. During the subsequent March survey (Thursday 9th March 2017) the total surveyed parking occupancy (231 spaces) similarly matches the information provided by Manildra given the higher mid-week peak contract staff attendance.

Further to the above – and providing what is in our opinion an appropriate level of sensitivity to the parking assessment - ARC estimates the peak daily parking demand for the broader Starches operations as: -

- A total of 205 - 215 parking spaces during non-construction periods.
- A total of 240 - 250 parking spaces during a single construction project peak
- A total of 280 - 290 parking spaces during a dual construction project peak.

2 Existing Parking Conditions

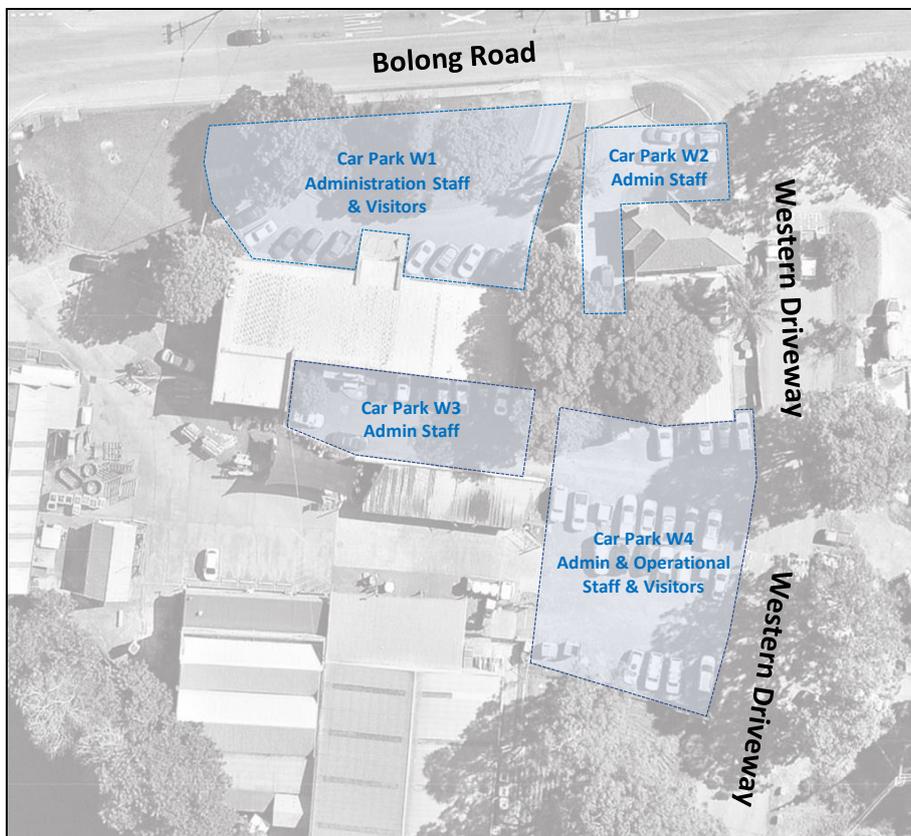
2.1 Existing Car Parks

2.1.1 Western Car Parks

2.1.1.1 Location

A number of small car parking areas are located on the SS Site west of the Western Driveway. Car Park W1 is accessed via Bolong Road, as are some of the spaces in Car Park W2, while all other spaces are accessed via Western Driveway. These car parking areas are primarily used by administration and operational staff, and are shown in **Figure 2.1.1**.

Figure 2.1.1 Western Car Parks



Source: Nearmap

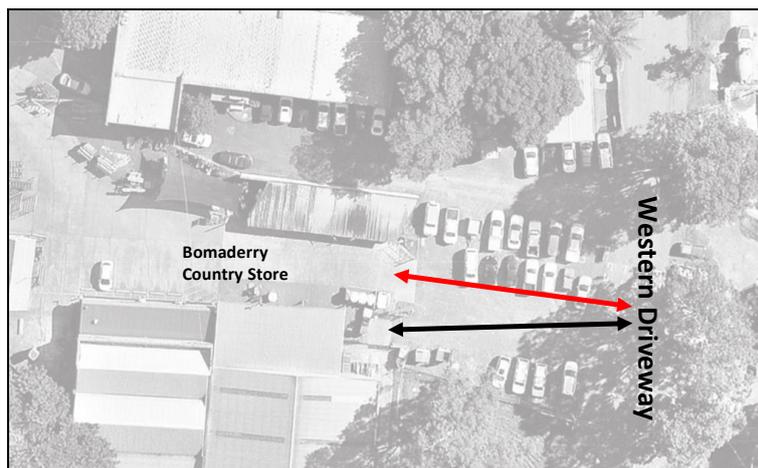
2.1.1.2 Parking Capacity

The Western Car Parks currently provide an estimated capacity of 57 spaces, comprising: -

- 12 spaces in Car Park W1
- 7 spaces in Car Park W2
- 8 spaces in Car Park W3
- 30 spaces in Car Park W4

It is noted that an access driveway is provided through Car Park W4 linking the Western Driveway with a small industrial site (Bomaderry Country Store). As shown in the aerial photo below (Nearmap image from May 2016), at times a second row of parking (in the centre of Car Park W4) has the potential to partially block access to the (northern) access gate to Bomaderry Country Store.

Figure 2.1.1.2 Car Park W4 Parking Potentially Reducing Bomaderry Country Store Access



Source: Nearmap

2.1.1.3 Parking Design

Parking spaces in Car Park W1 and Car Park W3 are sealed and line marked. Parking spaces in Car Park W2 are provided on either a sealed or paved surface, but are not line marked.

Parking spaces in Car Park W4 are provided on a road base surface and are not line marked; as discussed above, this can result in a second row of parking in the central part of Car Park W4, which reduces access to the northern access gate to the Bomaderry Country Store, though ARC has no information to suggest that this has in the past impacted Bomaderry Country Store operations.

2.1.2 Moorehouse Car Park

2.1.2.1 Location

The Moorehouse Car Park is located on the Moorehouse Site; all access to the Moorehouse Car Park is via a two-way driveway to Bolong Road.

The Moorehouse Car Park is primarily used by operational and contract staff, and is shown in **Figure 2.1.2.1**, noting that the parking shown (in the Nearthmap image from May 2016) generally reflects the currently available car parking, i.e. with reduced size during the Modification 7 (Starch Dryer 5) construction period.

Figure 2.1.2.1 Moorehouse Car Park



Source: Nearthmap

2.1.1.2 Parking Capacity

The Moorehouse Car Park currently provides an estimated capacity of 80 spaces.

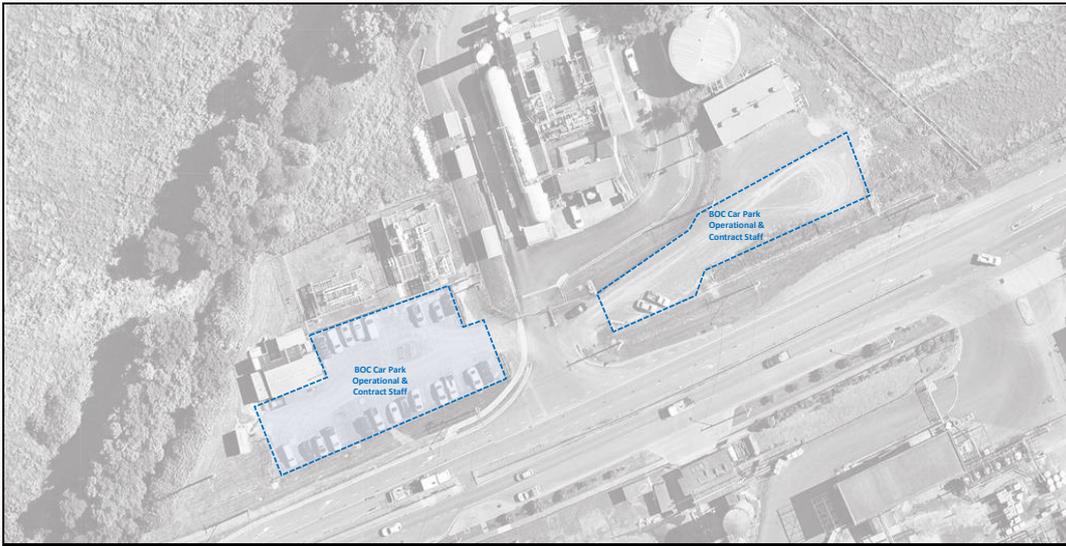
2.1.1.3 Parking Design

The Moorehouse Car Park spaces are provided on a road base surface and are not line marked.

2.1.3 BOC Car Park

2.1.3.1 Location

The BOC Car Park is located on the BOC Site; all access to the BOC Car Park is via a two-way driveway to Bolong Road. The BOC Car Park is primarily used by operational and contract staff, and is shown in **Figure 2.1.3.1**.

Figure 2.1.3.1 BOC Car Park

Source: Nearmap

2.1.3.2 Parking Capacity

The BOC Car Park currently provides an estimated capacity of 60 spaces, noting that while parking west of the access driveway is provided in a manner that would generally reflect a design compliant with [AS 2890.1](#) (i.e. standard 90° angled parking) the parking on the eastern side of the access driveway would be slightly more hap-hazard based on the alignment of this area to Bolong Road, and the access requirements to the on-site fire pump buildings.

2.1.3.3 Parking Design

As suggested above, the BOC Car Park spaces are provided on a road base surface and are not line marked.

2.1.4 Services Area Parking**2.1.4.1 Location**

The Services Area does not provide any 'formal' parking per se, but rather general parking is located across the broader Services Area. All access to the Services Area is currently provided via the Ethanol Driveway and the internal Service Driveway, as there is currently no access available between the DF Site and the Services Area. The Services Area is primarily used by operational and contract staff, with general parking locations across Services Area shown in **Figure 2.1.4.1**.

Figure 2.1.4.1 Services Area Observed Parking Locations

Source: Nearmap

2.1.4.2 Parking Capacity

The Services Area would in theory have a relatively high capacity, but considering the retention of (existing) access paths, storage areas and inaccessible locations across the Services Area, it is estimated that the Services Area currently has a parking capacity for approximately 40 spaces.

2.1.4.3 Parking Design

Services Area parking is provided on both road base and gravel surfaces; there are no line marked spaces.

2.1.5 Temporary Car Park

2.1.5.1 Location

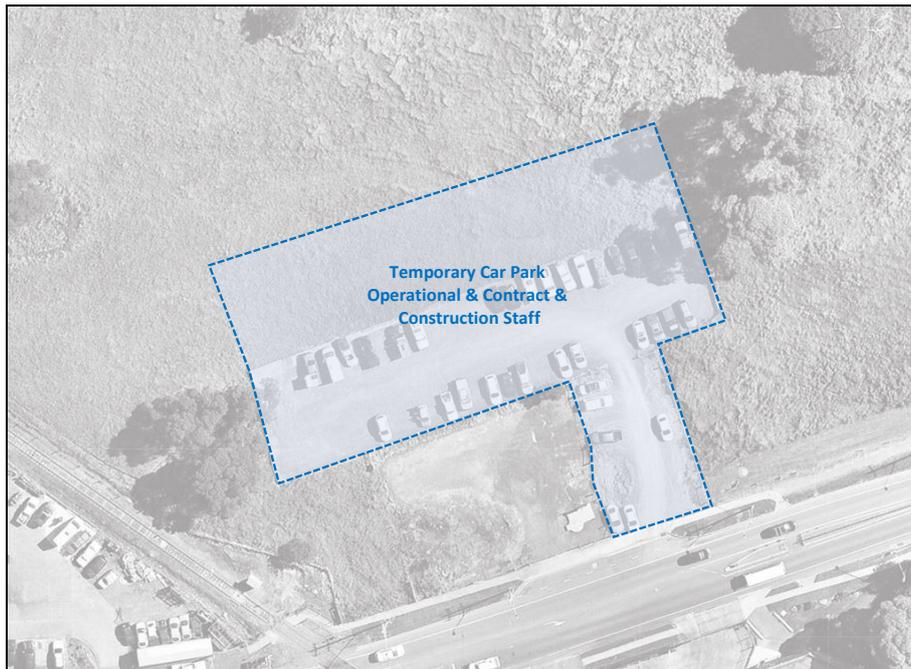
A Temporary Car Park is located on the PP Site immediately north of Bolong Road, with all access via a two-way driveway to Bolong Road (at the location of the future ingress only access driveway to the approved PP Site).

The construction and use of the Temporary Car Park is provided for in the Modification 6 (Moorehouse Demolition) and Modification 7 (Starch Dryer 5) Approvals. However, ARC notes that the parking capacity currently available within the Temporary Car Park is in excess of the 60 parking spaces designated in the Modification 6 (Moorehouse Demolition) and Modification 7 (Starch Dryer 5) Approvals, further to what has essentially comprised the extension of the available car parking area to the north so as to provide an additional parking aisle (providing 90⁰ angled spaces on each side of that aisle).

Based on our discussions with Manildra, it is our understanding that this additional capacity was provided for a short period when additional construction space was required within the Moorehouse Site, i.e. additional parking spaces were relocated from the Moorehouse Car Park for a short period. ARC is not aware of any formal discussions/approvals providing for this expansion.

The Temporary Car Park is used by some operational and contract staff (redistributed further to approved construction works across the eastern portion of the Moorehouse Site) but primarily by construction staff, and is shown in **Figure 2.1.5.1**, noting that no (satellite) image is available of the expanded car park as observed.

Figure 2.1.5.1 Temporary Car Park (Observed Parking Area)



Source: Nearmap, Manildra

2.1.5.2 Parking Capacity

As discussed above, the Temporary Car Park is estimated to provide capacity for 100 spaces.

2.1.5.3 Parking Design

The majority of the Temporary Car Park spaces are provided on a road base surface, though some spaces immediately north of Bolong Road are provided on a mixed gravel and road base surface. No spaces within the Temporary Car Park are line marked.

In addition, our observations indicated that the access driveway to the Temporary Car Park was in generally poor condition, noting that this driveway does not provide a formal sealed/concrete driveway approach to Bolong Road such as provided at other car parks (i.e. at Moorehouse Car Park or BOC Car Park) as shown in **Figure 2.1.5.3** below.

Figure 2.1.5.3 Temporary Car Park Access Driveway



2.1.6 Parking Capacity Summary

With reference to sections above, **Table 2.1.6** provides a summary of the existing car parking areas across the Starches Sites.

Table 2.1.6 Existing Starches Sites Parking Summary

| Starches Sites Existing Car Parks | Sealed/Paved | Road base | Mixed Surface | Line-Marked | General Staff Designation | Capacity |
|--------------------------------------|--------------|-----------|---------------|-------------|---------------------------|------------|
| Car Park W1 | ✓ | | | ✓ | Admin & Visitor | 12 |
| Car Park W2 | ✓ | | | | Admin | 7 |
| Car Park W3 | ✓ | | | ✓ | Admin | 8 |
| Car Park W4 | | ✓ | | | Operational & Visitor | 30 |
| Moorehouse Car Park | | ✓ | | | All staff | 80 |
| BOC Car Park | | ✓ | | | Operational & Contractor | 60 |
| Service Area Car Park | | | ✓ | | Starches & Contractor | 40 |
| Temporary Car Park | | | ✓ | | All staff | 100 |
| Total | | | | | | 337 |

2.2 Parking Survey

2.2.1 Parking Surveys

As stated, ARC conducted parking surveys across the Starches Sites on February 17th 2017 and March 9th 2017. The surveys were undertaken across broader morning peak periods (8:00am through 1:00pm), which based on all information (including past traffic surveys) is the peak on-site attendance period (for operational, contractor and construction staff).

2.2.2 Parking Demand

Table 2.2.2 below provides a summary of the peak surveyed parking demand on the two survey days.

Table 2.2.2 Starches Sites Parking Survey Results

| Starches Sites Existing Parking Demand | General Staff Designation | Capacity | Friday 17th February | Thursday 9th March |
|--|---------------------------|----------|----------------------|--------------------|
| Car Park W1 | Admin & Visitor | 12 | 15 | 13 |
| Car Park W2 | Admin | 7 | 7 | 7 |
| Car Park W3 | Admin | 8 | 8 | 8 |
| Car Park W4 | Operational & Visitor | 30 | 20 | 19 |
| Moorehouse Car Park | All staff | 80 | 77 | 78 |
| BOC Car Park | Operational & Contractor | 60 | 19 | 21 |
| Service Area Car Park | Starches & Contractor | 40 | 18 | 17 |
| Temporary Car Park | All staff | 100 | 56 | 68 |
| Total | | 337 | 220 | 231 |

With reference to **Table 2.2.2**: -

- As noted previously, the parking demand across the Starches Sites on the February survey day essentially matched the information provided by Manildra in regard to total staff numbers (operational + administration + contractor + construction) on-site on the survey day.
- The majority of car parks had a similar peak demand on both survey days, with the only significant difference being the additional demand on the March survey day, where the higher number of contract staff would have been responsible for the increased demand, augmented potentially by a minor increase in construction staff or visitor demand. This additional parking demand primarily saw an increase in parking primarily in the Temporary Car Park.

3 Revised Modification 12 Parking Proposals

This section details the parking proposed in the revised Modification 12 (Beverage Grade Ethanol Plant), with specific reference to the access and parking issues identified by Council and the RMS.

3.1 Proposed Parking Provision

3.1.1 Peak Parking Demand

As detailed in sections above, there is a significant parking demand across the Starches Sites to be accommodated, particularly in the short-term (mid-2017 to end 2017) during which time Manildra proposes the simultaneous construction of the Modification 10 (Flour Mill B) and Modification 12 (Beverage Grade Ethanol Plant) infrastructure. During this period, the peak number of staff on-site (across the Starches Sites) at any one time is expected to comprise: -

- Up to 185 operational and administration staff.
- Up to 30 contract and maintenance staff.
- Up to 100 construction staff, essentially comprising up to 50 construction staff for the Modification 10 (Flour Mill B) construction, and 50 construction staff for the Modification 12 (Beverage Grade Ethanol Plant) construction.
- A peak total of up to 315 operational + administration + contract + construction staff on-site at any one time.

As discussed in sections above, there is evidence that the peak on-site parking demand does not simply equate to the peak number of on-site staff, specifically as a result of a many contract staff working 'within' the SS Site (and therefore not requiring formal car parking); and further to the use of group transport by contract and construction staff.

Notwithstanding, to provide a worst-case assessment the allocation of 1 parking space per on-site staff would provide a peak demand estimate for 315 parking spaces.

3.1.2 Revised Modification 12 Parking Provision

Revised Modification 12 (Beverage Grade Ethanol Plant) provides for some 380 parking spaces across the Starches Sites, plus an additional 30 spaces to be constructed on the PP Site.

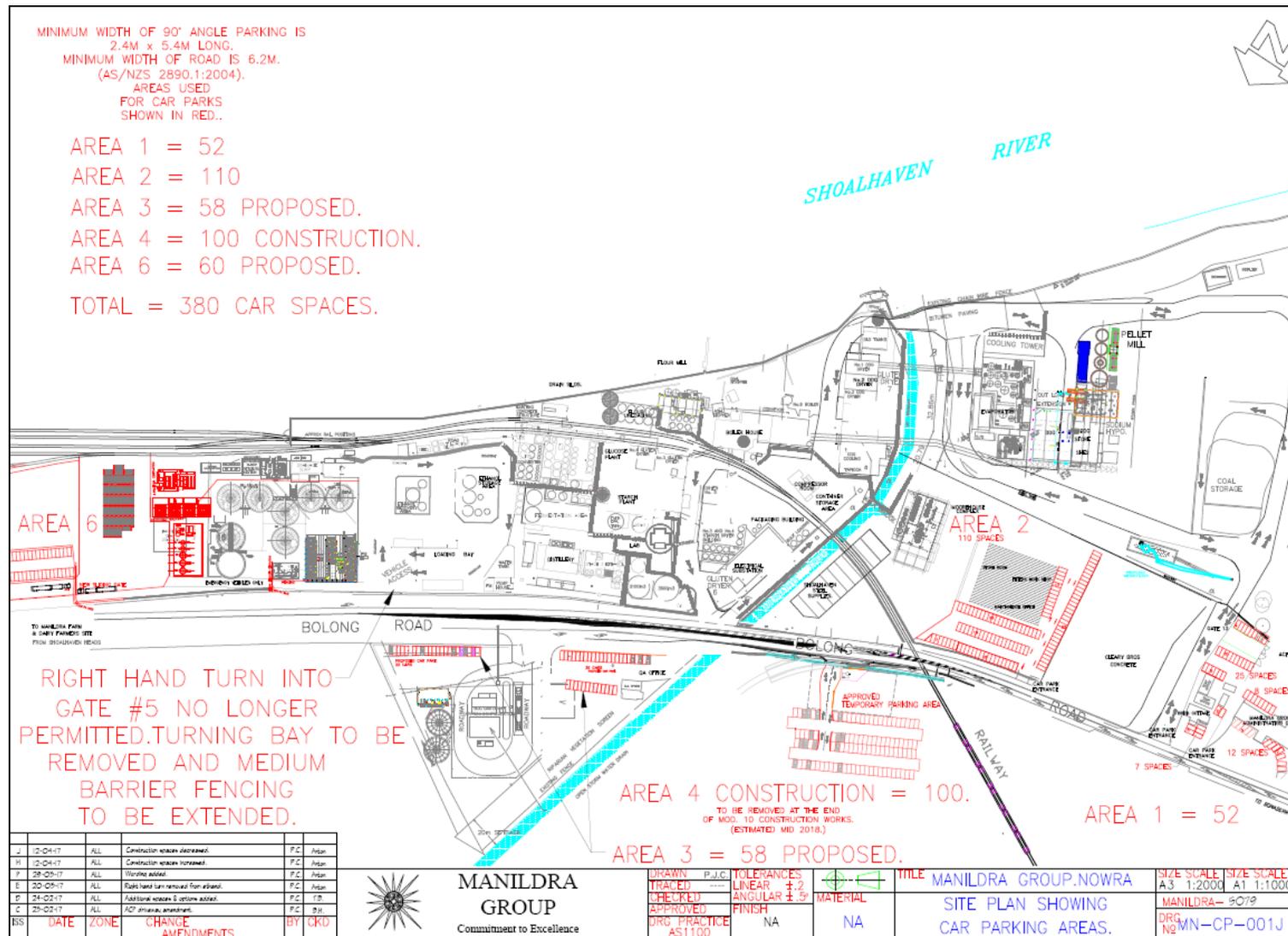
It is of course acknowledged that this level of parking provision is in excess of that determined by ARC (as a peak requirement) and indeed in excess of the existing SSEP Approval Condition 31 requirement. However, the proposed parking will provide not only more than enough capacity across the Starches Sites to meet peak demand, but also provides for parking in relative proximity to key parts of the SS Site, particularly during the identified short-term construction peak (mid-2017 to end 2017) when both Modification 12 (Beverage Grade Ethanol) and Modification 10 (Flour Mill B) construction works are being undertaken.

At the conclusion of the Modification 10 (Flour Mill B) construction works (mid-2018) the Temporary Car Park would be closed, with 280 parking spaces retained across the Starches Sites (plus 30 spaces on the PP Site), again in excess of the peak parking demand (as determined by ARC) during a period with a single construction project taking place.

3.2 Car Park Locations & Access

Figure 3.2 provides a summary of the proposed car park locations across the Starches Sites; each of these proposed car parks are then detailed further in sections below.

Figure 3.2 Revised Modification 12 (Beverage Grade Ethanol Plant) Proposed Car Parks



Source: Manildra

3.2.1 Western Car Parks (52 spaces)

Western Car Parks W1 (12 spaces), W2 (7 spaces) and W3 (8 spaces) are not affected by revised Modification 12 (Beverage Grade Ethanol Plant). It is proposed that Car Park W4 be redesigned to ensure appropriate access is retained to the Bomaderry Country Store; a total of 25 parking spaces can be provided in W4 Car Park. Access to the Western Car Parks would be unchanged. The Western Car Parks would continue to provide primarily for administration and operational staff working across the western portion of the SS Site.

3.2.2 Moorehouse Car Park (110 spaces)

Further to the identification of additional infrastructure requirements within and immediately adjacent to the Moorehouse Site as part of future Modifications (currently being prepared by Manildra); and further to the review of parking which can be provided on-site in compliance with [AS 2890.1](#), the Moorehouse Car Park provides a total of 110 parking spaces. Access to the Moorehouse Car Park would be unchanged, and it would continue to provide primarily for operational and contract staff in the central portion of the SS Site.

3.2.3 BOC Car Park (58 spaces)

The original Modification 12 (Beverage Grade Ethanol Plant) indicates the provision of some 77 spaces across the BOC Site. In order to retain access to key infrastructure within the BOC Site (including the fire pump sheds), and moreover to provide on-site parking in compliance with [AS 2890.1](#), the BOC Car Park capacity has been reduced to a total of 58 parking spaces, which would provide primarily for operational and contract staff working in the central and eastern portions of the SS Site.

Critically, ARC has determined that the intensified use of the BOC Car Park as proposed in the original Modification 12 (Beverage Grade Ethanol Plant) would potentially impact the adjacent intersection of Bolong Road & Ethanol Driveway. These potential impacts relate not only to the pre-existing issue of U-turns at the intersection, but moreover to the short distance between the BOC Site Driveway and Ethanol Driveway; vehicles merging across the Bolong Road eastbound lane to the right turn lane to Ethanol Driveway over a short distance in our opinion poses a potential safety concern.

As such, and as previously discussed between Manildra and Council as a *low cost and viable* (as described in Council's submission to the DP&E) alternative to more significant intersection upgrades in this section of Bolong Road, the revised Modification 12 (Beverage Grade Ethanol Plant) provides for the extension of the existing Bolong Road median across Ethanol Driveway, i.e. the removal of the right turn Bolong Road to Ethanol Driveway. This proposal will eliminate the merging movement identified by ARC, as well as eliminating contentious U-Turns at Ethanol Driveway.

As a result of the median extension, departure trips to the west from the BOC Site, and trucks travelling to the Ethanol Driveway (exclusively from the west) will proceed to the custom designed on-site turn facility at the DF Site, and then return to enter Ethanol Driveway via a left turn. These movements would be essentially identical to those movements at the adjacent Glutton Driveway, for which the DF Site on-site turn facility was specifically designed.

3.2.4 Dairy Farmers Car Park

The revised Modification 12 (Beverage Grade Ethanol Plant) provides for the 'reinstatement' of the DF Car Park, generally as per the Modification 3 (DF Car Park) Approval, though with a minor change in siting to accommodate the Modification 12 (Beverage Grade Ethanol Plant) infrastructure proposed across the (existing) Services Area.

As per the Modification 3 (DF Car Park) Approval, the DF Car Park will be accessed exclusively via the DF Site intersection to Bolong Road; this in turn also requires the reinstatement of the left turn auxiliary lane, Bolong Road to DF Site, which as agreed with Council was not 'warranted' further to the original Modification 12 (Beverage Grade Ethanol Plant) proposal to relocate the DF Site parking to the BOC Site.

The DF Car Park would provide primarily for operational, contract and construction staff working in the eastern portion of the SS Site.

3.2.5 Temporary Car Park

As discussed previously, Modification 7 (Starch Dryer 5) Approval conditions require the removal of the Temporary Car Park upon completion of the Modification 7 (Starch Dryer 5) construction works.

In preparing recent reports in regard to Modification 10 (Flour Mill B), Modification 11 (DDG Dryers) and Modification 12 (Beverage Grade Ethanol Plant), ARC has been provided with information by Manildra that construction staff parking requirements (for each of these Modifications) would be provided within existing parking areas, i.e. that the Temporary Car Park would not be required following the completion of the Modification 7 (Starch Dryer 5) construction works.

Manildra now proposes the continued use of the Temporary Car Park to provide for construction staff for the Modification 10 (Flour Mill B) construction, which (further to approval) would commence immediately following the completion of the Modification 7 (Starch Dryer 5) approved works. Simultaneously, the DF Car Park and BOC Car Park would be constructed/upgraded in accordance with the recommendations of ARC as part of the revised Modification 12 (Beverage Grade Ethanol) construction works. Upon completion of the Modification 10 (Flour Mill B) construction works in mid-2018, the Temporary Car Park would be closed.

The Temporary Car Park would continue to provide primarily for construction staff working in the central portion of the SS Site, and specifically on Modification 7 (Starch Dryer 5) and Modification 10 (Flour Mill B). The operation of this car park would essentially be unchanged from its operations per the Modification 6 (Moorehouse Demolition) and Modification 7 (Starch Dryer 5) Approvals.

Notwithstanding the above, it is the recommendation of ARC that further to the proposed retention of the Temporary Car Park for the duration of the Modification 10 (Flour Mill B) construction, a formal sealed/concrete driveway be constructed for a distance of no less than 12m from Bolong Road to the Temporary Car Park, i.e. as provided at the Moorehouse Car Park and BOC Car Park. This would reduce to a minimum the potential for gravel or the like to be transferred to the Bolong Road carriageway.

3.3 Internal Car Park Design

3.3.1 Car Park Surfacing

The existing Western Car Parks W1, W2 and W3 provide a sealed/paved surface; it is the understanding of ARC that Council has raised no specific issues in regard to the surfacing of these car parks. With regard to other existing (and proposed) car parks, Council has raised the issue of sealing the car parks to a higher standard than the road base surface currently provided in existing car parks (and proposed at the DF Car Park and BOC Car Park).

Chapter G21 of DCP 2014 provides the following in regard to car parking construction: -

Industrial:

a. Heavy duty concrete, or

b. Industrial hotmix AC10 with minimum pavement thickness of 200mm subject to pavement testing for a design load of 6 x 104 ESA.

While outside of our specific area of expertise, advice from Manildra suggests that the provision of this standard of surface would cost approximately 5 times the amount of the existing (and proposed) road base surface. Moreover, it is our opinion that the use of a road base surface is appropriate for these car parks, based on the following: -

- These car parks are used exclusively by light (staff) vehicles, noting that it would be appropriate to provide a higher order surface treatment (and a higher design load capacity) if heavy vehicle access was required (i.e. under the *Industrial* conditions suggested in DCP 2014), but this is not the case in the existing and proposed car parks.
- No general public access is or will be provided to these car parks.
- During periods where there is little or no construction work on-site, a significant number of parking spaces would not be required.
- There is no evidence that the use of a road base surface has any impact on the local road network, i.e. there is no evidence of loose material being transferred onto the Bolong Road carriageway, noting that such was the case at the Western Driveway prior to the recent upgrade of this driveway. Moreover, any internal damage to the car parks (were it to occur) would be the responsibility of Manildra.

Notwithstanding the above, and as previously discussed, it is the recommendation of ARC that a formal sealed/concrete driveway be constructed for a distance of no less than 12m from Bolong Road to the Temporary Car Park, i.e. as provided at the Moorehouse Site and BOC Site driveways. This would reduce to a minimum the potential for gravel or the like to be transferred to the Bolong Road Carriageway from the Temporary Car Park (noting that during our Site visits there was little evidence of such).

- The potential exists for future Modifications to require the relocation of parking; this is particularly the case in regard to the Moorehouse Car Park. As such, the provision of a higher order surface (that may then require removal) is not financially viable.
- The road base surface is similar to (and indeed in our opinion better than) the surface materials used at a number of Council's own public car parks. For example, large sections of the Entertainment Centre Car Park (providing Council staff and general public parking) provide a gravel or grass/dirt surface with no line-marking, as shown in the figures below. It is in our opinion incongruous that Manildra would be required to provide a high order surface for a private car park while a Council car park available to Council staff and the general public can be provided to a significant lower standard surface.

Figure 3.1.1.1 Entertainment Centre Car Park



Figure 3.1.1.2 Entertainment Centre Car Park



In summary, it is our opinion that the use of a road base surface within the existing and proposed car parks across the Starches Sites is supportable.

3.3.2 Car Park Design

It is the recommendation of ARC that all parking spaces – including those in the Temporary Car Park - be appropriately delineated so as to prescribe parking spaces which comply with AS 2890.1 dimension requirements (minimum 5.5m X 2.4m for User Class 1 – employees). In this regard, and dependent on the surface material available in different car parks, ARC recommends the use of either line-marking (i.e. paint) or plastic disc markers.

As stated previously, in preparing the revised Modification 12 (Beverage Grade Ethanol Plant) ARC has provided advice to Manildra which has resulted in the removal of numerous parking spaces (across the Starches Sites) previously proposed in the original Modification 12 (Beverage Grade Ethanol Plant); this reduction specifically relates to spaces previously proposed in Car Park W4 and the BOC Car Park.

While detailed surveys/plans for each car park are not available at this time, ARC recommends that detailed plans showing complaint spaces and aisle widths (and more generally compliance with AS 2890.1) be provided to Council for approval.

4 Additional Outstanding Issues

4.1 Bolong Road & Dairy Farmers Site Intersection Design

Further to the Modification 3 (DF Car Park) Approval, Manildra submitted (to Council) plans for the upgrade of the intersection of Bolong Road & DF Site, which we understand were subsequently approved for construction. These approved plans include the left turn auxiliary lane, Bolong Road to DF Site, which – further to the reinstatement of the DF Car Park in the revised Modification 10 (Beverage Grade Ethanol Plant) – is again ‘warranted’ (with reference to [GRD4A](#)). It is our understanding that the reapplication of these (approved) plans will require the removal from the original Modification 12 (Beverage Grade Ethanol Plant) application of intersection plans prepared without the left turn auxiliary lane.

Notwithstanding - and as acknowledged by Manildra at the on-site meeting 17th February 2017 - the upgrade of the intersection has not been in strict accordance with the approved plans, with Council nominating (constructed) design deficiencies relating to verge and shoulder widths, cycle provisions and lighting which have not been completed.

Manildra has committed to the additional/remediation works at the intersection to provide full compliance with the approved Modification 3 (DF Car Park) plans, again including the auxiliary left turn lane Bolong Road to DF Site, *to the satisfaction of Council*.

4.2 Traffic Operations

4.2.1 Trip Redistribution

The proposed extension of the Bolong Road median and barrier fence across Ethanol Driveway will require that trucks entering Ethanol Driveway (exclusively from the west) travel to the DF Site turn facility, then depart the DF Site to enter the Ethanol Driveway from the east (i.e. via a left turn in). Truck departure movements from Ethanol Driveway would be unaffected by the proposal. Light vehicle movements (at Ethanol Driveway) would be redistributed in an identical manner, though it is noted that the majority of (previously surveyed) light vehicle movements at the Bolong Road & Ethanol Driveway intersection were in turn to/from the informal parking across the Services Area, which the proposed formal parking (the DF Car Park) will now provide for.

The provision of the BOC Car Park, along with extension of the Bolong Road median and barrier fence across Ethanol Driveway, will require that vehicles departing the BOC Site to the west travel to the DF Site turn facility, then depart the DF Site to proceed west along Bolong Road. Arrival trips from the west would be unaffected. Arrival trips from the east will be required to either turn within the SS Site (west of the rail spur) or proceed to the roundabout of Bolong Road & Meroo Road to return to the BOC Site (noting that no right turn from Bolong Road to BOC Site was provided regardless). Departure trips from the BOC Car Park to the east would be unaffected.

Importantly, this future distribution of trips to the would be similar to that previously assessed by ARC (in the [MOD 3 TIA](#)) and subsequently approved; and moreover, the total trips to the broader network (even during the proposed dual construction project peak period mid-2017 to end 2017) would be fewer than previously assessed by ARC in the [MOD 3 TIA](#), which were based on the [SSEP TIA](#) higher total flows (i.e. accounting for up to 150 construction staff).

4.2.2 Future Bolong Road & DF Site Trips

Surveys conducted by ARC for previous Modification assessments indicate the following general trip generation and distribution characteristics across the Starches Sites: -

- The highest (peak hour) trip generation per parking space of any (existing) Starches Site car park is that of the Moorehouse Car Park, generating a rate of 0.43 trips per parking space in the AM peak hour, and 0.41 trips per parking space in the PM peak hour. Again, this reflects the staggered nature of shift arrival and departure times, i.e. staff do not all arrive or departure in a single peak hour.
- In the AM peak hour, approximately 75% of trips are arrival trips, and 25% departure trips. In the PM peak hour, approximately 20% of trips are arrival trips and 80% departure trips.
- In both peak periods, approximately 75% of trips arrive and depart to the west, and approximately 25% of trips arrive from and depart to the east.

For the assessment of the key Bolong Road & DF Site intersection, ARC has: -

- Redistributed the Ethanol Driveway flows (as most recently reported in the [MOD 12 TIA](#)) as discussed in **Section 4.2.1**.
- Assigned BOC Car Park trips to the intersection based on a trip generation of 0.5 peak hour trips per parking space (i.e. providing additional sensitivity over the previously surveyed peak generation rate per parking space) and then distributed those trips with reference to the future distribution detailed in **Section 4.2.1** and above.
- Assigned DF Car Park trips to the intersection based on a trip generation of 0.5 peak hour trips per parking space (i.e. providing additional sensitivity over the previously surveyed peak generation rate per parking space) and then distributed those trips with reference to the surveyed distribution detailed in **Section 4.2.1** and above.

The assessment therefore includes not only a higher generation from each car park in the peak hour than has previously been surveyed, but also inherently assumes that each of those car parks is fully occupied, which – based on peak total staff numbers across the Starches Sites – is unlikely to be the case. As such, the assessment provides in our opinion for a worst-case scenario.

4.2.3 Future Bolong Road Flows

Further to the commission of traffic surveys at the SS Site and DF Site over many years, and in consultation with Council, ARC has over time developed peak hour (through movement) traffic flows in Bolong Road that reflect 120th Highest Hour (or 'recreational peak') conditions.

In determining forecast flows, in recent assessments ARC has specifically considered the redistribution of trips from Bolong Road (the Sandtrack) further to the staged upgrades of the Princes Highway being undertaken by the RMS. In this regard, the 2013 Princes Highway Upgrade – Berry to Bomaderry Technical paper: Traffic and Transport forecasts that following the completion of the Princes Highway upgrades, the 2019 AADT in Bolong Road will represent less than 60% of the 2013 AADT, reducing from a 2013 AADT of some 9,800 vehicle trips per day (vpd) to a 2019 AADT of only 5,742 vpd. Even with background growth continuing after 2019, the 2029 AADT is estimated to represent only 70% of the 2013 AADT; and the 2039 AADT some 87% of 2013 AADT.

As part of the preparation of the MOD 12 TIA, ARC confirmed these forecasts with the RMS, and we note that the RMS submission makes no comment in regard to the adoption of these forecast flows in the MOD 12 TIA.

Notwithstanding, in our discussions Council has suggested that their (Council's) modelling of the sub-regional road network indicates that the redistribution of trips (from the Sandtrack to the Princes Highway) will not be as significant as indicated in the RMS modelling, and indeed Council forecasts no significant change in the broader proportional distribution of trips between the Princes Highway and the Sandtrack. Council has specifically cited the existing congestion through Bomaderry and at the Nowra Bridge crossing as factors which would result in a higher proportion of trips (than indicated in the RMS modelling) remaining via the Sandtrack, though it is noted that RMS planning of an upgrade of the Shoalhaven River crossings (which would alleviate much of this congestion) is currently well advanced.

Based on all available information, ARC would broadly agree with the opinion of the RMS, i.e. that traffic flows in Bolong Road will be reduced following the completion of the Princes Highway upgrades. Notwithstanding, to provide sensitivity in the assessment (based on the Council position) ARC has prepared forecast year 2027 Bolong Road recreational peak through flows with no redistribution of trips from the Sandtrack, and with an average annual increase of 1.5% (as determined in the Princes Highway Upgrade – Berry to Bomaderry Technical paper: Traffic and Transport).

4.2.4 Forecast Flows

With reference to sections above, **Figure 4.2.4.1** below provides a summary of the 2017 forecast traffic flows, and **Figure 4.2.4.2** provides a summary of the 2027 forecast traffic flows, at the key intersections of Bolong Road with DF Site, Ethanol Driveway and BOC Site. It is noted that outside of this section of Bolong Road, trip generation would essentially be unchanged, and remain within the limits of previous SSEP Approvals.

Figure 4.2.4.1 Intersection Bolong Road & DF Site 2017 Traffic Flows

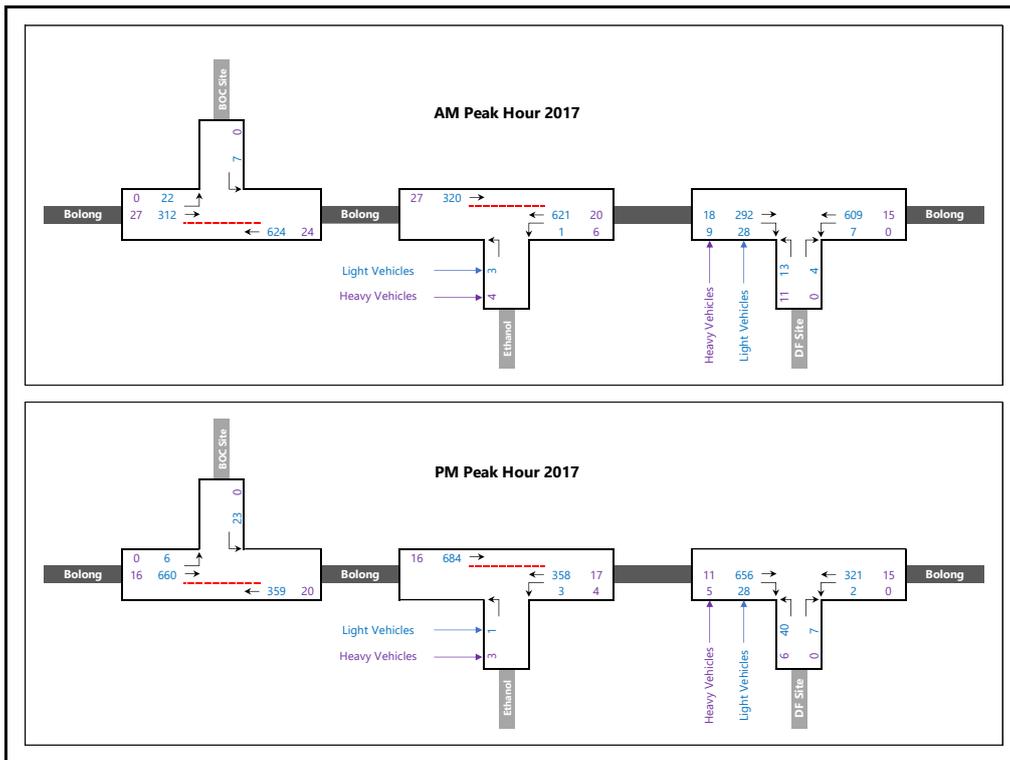
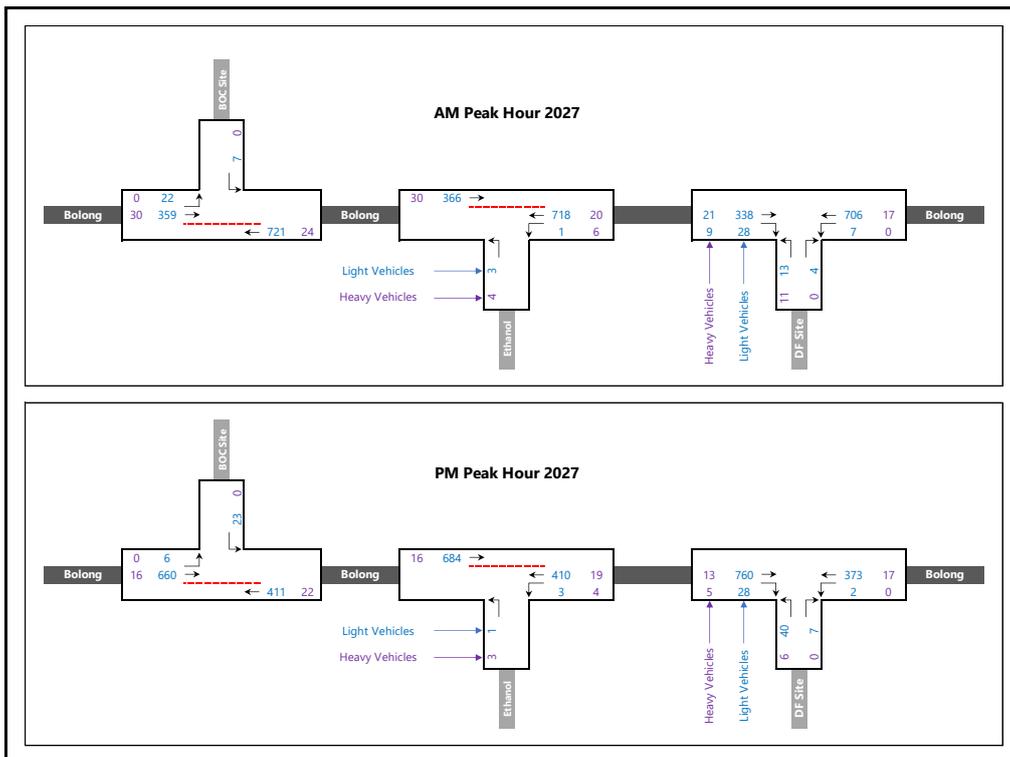


Figure 4.2.4.2 Intersection Bolong Road & DF Site 2027 Traffic Flows



4.2.5 Future Intersection Performance

ARC has examined the performance of the intersection using the SIDRA intersection model. This analysis shows that: -

- In 2017, the intersection of Bolong Road & DF Site operates at a Level of Service 'B' in both the AM and PM peak hour, based on the highest single movement delay, being the right turn movement, DF Site to Bolong Road (21.7s and 24.7s in the AM and PM respectively). Overall, the intersection operates at a high Level of Service ('A') with very minor average delays (0.6s) and significant spare capacity.
- In 2027, the intersection operates at a Level of Service 'C' in both the AM and PM peak hour, based on the highest single movement delay, again being the right turn movement, DF Site to Bolong Road (29.9s and 35.4s in the AM and PM respectively). Overall, the intersection again operates at a high Level of Service ('A') with very minor average delays (0.6s) and significant spare capacity.
- In both the 2017 and 2027 forecast years, the 95th percentile queue length for the right turn DF Site to Bolong Road remains entirely accommodated within the short right turn lane, which ensures that the turn movement (Bolong Road west returning to Bolong Road west) is at no time impacted.

As discussed in **Section 4.2.3**, it is again noted that this analysis is based on through flows in Bolong Road significantly in excess of those forecast by the RMS. Nonetheless, even under these conditions the key intersection of Bolong Road & DF Site will operate at an acceptable Level of Service, and indeed at an almost identical Level of Service as previous determined in the MOD 3 TIA and SSEP TIA, i.e. at a Level of Service inherently approved.

Briefly, the minor priority intersections to Bolong Road at BOC Site and Ethanol Driveway will also operate at high levels of service providing only left in/left out movements in a low speed environment; while the internal turn facility within the DF Site will also operate (essentially as a roundabout) with no significant delays to any movements. The intersection of Bolong Road & Temporary Car Park would essentially operate in an identical manner to that previously assessed by ARC in the MOD 6 TIA and MOD 7 TIA, and again as inherently approved by the DP&E per the Modification 6 (Moorehouse Demolition) and Modification 7 (Starch Dryer 5) Approvals.

In summary, it is our opinion that the revised Modification 12 (Beverage Grade Ethanol Plant) will have no significant impact on the operations of the key Bolong Road access intersections to the DF Site, BOC Site or Ethanol Driveway, and outside of this section of Bolong Road flows would essentially be unchanged and remain within the limits of previous SSEP Approvals.

4.3 Ethanol Driveway Operations

As discussed in **Section 3.2.3**, the revised Modification 12 (Beverage Grade Ethanol Plant) provides for the extension of the Bolong Road median island and barrier fence across Ethanol Driveway, thereby removing the currently available right turn movement Bolong Road to Ethanol Driveway. These movements will be redistributed to the DF Site turn facility in an identical manner to movements to the Glutton Driveway, and effectively eliminate the issue of U-turns at the intersection.

Notwithstanding, there are still significant issues relating to the use of Service Driveway, which is still providing two-way traffic access to the Services Area as no access from the DF Site has yet been provided. As detailed in a number of past ARC reports, Service Driveway is too narrow for two-way traffic, and the 'intersection' of Ethanol Driveway and Service Driveway operates poorly.

As such, ARC recommends that the new access driveway between the DF Site and the Services Area - and the DF Car Park and proposed Modification 12 (Beverage Grade Ethanol Plant) infrastructure - be constructed as a priority measure so that Service Driveway can be closed for all but emergency vehicle access.

4.4 Additional Issues

4.4.1 Environmental Farm Electronic Gate

An electronic gate provides access to the main entrance to the Environmental Farm from Hanigans Lane north of Bolong Road. As detailed in the [Farm TA](#), this gate was previously located in relatively close proximity to Hanigans Lane, such that a truck waiting for the gate to open had the potential to block Hanigans Lane to through traffic. Subsequently, in mid-2016 Manildra relocated the electric gate to a distance of some 45m from Hanigans Lane, provided significant queuing distance on-site, and thereby removing the potential for trucks to queue onto Hanigans Lane.

It is our opinion that the relocation of the electric gate has effectively responded to this issue as raised by Council.

4.4.2 Pedestrian Infrastructure

While not specifically raised as an issue in regard to current Modifications, it is noted that the reinstatement of the DF Car Park and the formal provision of the BOC Car Park will require appropriate pedestrian infrastructure be installed to link to existing pedestrian paths and Bolong Road pedestrian crossing points.

With regard to the DF Car Park, a formal pedestrian path will be constructed to link the DF Car Park with the existing footpath adjacent to the Ethanol Driveway. This pedestrian path is essentially identical to that detailed per the Modification 3 (DF Car Park) Approval.

With regard to the BOC Site, a formal pedestrian path is provided from the BOC Site to the existing pedestrian refuge crossing of Bolong Road immediate adjacent to the Site. From this location, a formal path will also be provided west from the existing pedestrian path to the existing formal pedestrian path which currently terminates immediate east of the Temporary Car Park entrance.

5 Conclusions & Recommendations

5.1 Conclusions

ARC has completed a detailed and independent assessment of outstanding issues relating to the Shoalhaven Starches Sites as raised by the DP&E, Council and RMS, specifically in response to the recent Modification 12 (Beverage Grade Ethanol Plant).

Further to our preliminary assessment of these issues, ARC provided a suite of recommendations to Manildra, which have subsequently been adopted by Manildra and essentially constitute a revised Modification 12 (Beverage Grade Ethanol Plant). It is the conclusion of ARC that the revised Modification 12 (Beverage Grade Ethanol Plant) appropriately responds to the issues raised by the DP&E, Council and the RMS, and moreover provides access, traffic and parking infrastructure appropriate to the scale of the Starches Sites' operations.

5.1.1 Parking Space Requirements

Condition 31 of the SSEP Approval required the provision of some 345 parking spaces across the Starches Sites. This parking total was determined at a time when construction activity at the SS Site was at 'super-peak' levels, which are no longer evidenced, with current projects employing up to 50 on-site construction staff compared to the 150 on-site construction staff at the time of the SSEP Approval.

Notwithstanding, there is still a significant parking demand across the Starches Sites to be accommodated, and indeed additional demand has been identified in the short-term (mid-2017 to end 2017) when proposed construction works (further to approvals) associated with Modification 10 (Flour Mill B) and Modification 12 (Beverage Grade Ethanol Plant) would overlap. During this short period, the peak number of on-site staff (across the Starches Sites) at any one time is estimated to comprise: -

- Up to 185 operational and administration staff.
- Up to 30 contract and maintenance staff.
- Up to 100 construction staff, essentially comprising up to 50 construction staff for the Modification 10 (Flour Mill B) construction works and 50 construction staff for the Modification 12 (Beverage Grade Ethanol Plant) construction works.

As such, it is estimated that during this short period of dual construction projects up to 315 staff would be on-site at any one time. After this period, i.e. during the ongoing construction of the Modification 10 (Flour Mill B) works alone (continuing to mid-2018) it is estimated that up to 265 staff would be on-site at any one time, while longer term – when there is no construction project underway – it is estimated that up to 215 staff would be on-site at any one time.

While there is evidence to suggest that total on-site staff parking demand (spaces) is lower than total on-site staff numbers, revised Modification 12 (Beverage Grade Ethanol Plant) provides for a minimum of 380 parking spaces to be provided across the Starches Sites during the short-term dual project construction period (mid-2017 to end 2017), which not only exceeds the peak demand estimate during this period, but appropriately responds to the location (of the two proposed construction projects) such that capacity is provided in proximity to each of these locations.

At the end of the Modification 10 (Flour Mill B) construction in mid-2018, the Temporary Car Park would be closed, but 280 parking spaces would be retained across the Starches Sites, again in excess of the peak parking demand during a single construction project period, and significantly in excess of the peak parking demand during a period where there was no construction occurring.

5.1.2 Car Park Locations & Operations

Revised Modification 12 (Beverage Grade Ethanol Plant) provides the following car parking areas: -

5.1.2.1 Western (Administration Area) Car Parks (52 spaces)

While parking immediately adjacent to the administration building will remain unchanged, minor revisions are proposed to the car park at the rear of the administration buildings to ensure aisle widths and parking space dimensions are provided in accordance with [AS 2890.1](#) while retaining access to the Bomaderry Country Store.

5.1.2.2 Moorehouse Site Car Park (110 spaces)

Minor revisions to the Moorehouse Car Park are proposed to ensure aisle widths and parking space dimensions are provided in accordance with [AS 2890.1](#) while providing for future Modification proposals (currently being prepared by Manildra).

5.1.2.3 Dairy Farmers Car Park (60 spaces)

Revised Modification 12 (Beverage Grade Ethanol Plant) provides for the 'reinstatement' of the DF Car Park, generally as per the existing Modification 3 (DF Car Park) Approval, though with a minor change in siting to provide for the infrastructure proposed under Modification 12 (Beverage Grade Ethanol Plant). As per the Modification 3 (DF Car Park) Approval, this car park will be accessed exclusively via the DF Site intersection to Bolong Road.

5.1.2.4 BOC Car Park (58 spaces)

Revisions to the BOC Car Park as submitted in the original Modification 12 (Beverage Grade Ethanol Plant) are proposed to ensure aisle widths and parking space dimensions are provided in accordance with [AS 2890.1](#), while also retaining access to the on-site fire pump buildings. This car park will be accessed exclusively via the existing BOC Site intersection to Bolong Road.

ARC has determined that the intensified use of the (currently underutilised) BOC Car Park would potentially impact the adjacent intersection of Bolong Road & Ethanol Driveway. As such, and as previously suggested by Council as a *low cost and viable* option, revised Modification 12 (Beverage Grade Ethanol Plant) provides for the extension of the existing Bolong Road median and barrier fence across Ethanol Driveway, i.e. the removal of the right turn Bolong Road to Ethanol Driveway. As a result, trucks travelling to Ethanol Driveway (exclusively from/to the west) and vehicles departing the BOC Car Park would proceed east to the custom designed turn facility at the DF Site, and then return to enter Ethanol Driveway via a left turn, or continue west in Bolong Road. These movements would be essentially identical to movements at the adjacent Glutton Driveway, for which the DF Site turn facility was specifically designed.

5.1.2.5 Temporary Car Park (100 spaces)

Manildra proposes the continued use of the Temporary Car Park to provide for construction staff for the Modification 10 (Flour Mill B) construction works, which (further to approval) would commence immediately following the completion of the Modification 7 (Starch Dryer 5) Approval construction works (mid-2017). The continued use of the Temporary Car Park provides both additional short-term capacity and parking in close proximity to the proposed Modification 10 (Flour Mill B) construction site, and would continue to operate in an essentially identical manner to that provided for by the Modification 6 (Moorehouse Demolition) and Modification 7 (Starch Dryer 5) Approvals.

Upon completion of the Modification 10 (Flour Mill B) construction works, the Temporary Car Park would be closed.

5.1.2.6 Car Park Traffic Operations

ARC has examined the operation of the local road network further to the revised Modification 12 (Beverage Grade Ethanol Plant) car park access provisions, and specifically further to the redistribution of trips to the DF Car Park and BOC Car Park; and further to the proposed access revisions at Bolong Road & Ethanol Driveway.

ARC has determined that the redistribution of vehicle trips (which essentially remain within the trip generation parameters established in the SSEP Approval) can be appropriately accommodated by the local road network, and specifically at the key intersection of Bolong Road & DF Site.

5.1.2.7 Car Park Pedestrian Access

Additional pedestrian infrastructure will be provided to appropriately link the DF Car Park and BOC Car Park to existing pedestrian paths and Bolong Road pedestrian refuge crossings.

5.1.3 Internal Car Park Design

Council has raised the issue of sealing the car parks to a higher standard than currently provided across the existing and proposed DF Site and BOC Site car parks per revised Modification 12 (Beverage Grade Ethanol Plant). It is our opinion that the use of a road base surface is appropriate for these car parks, based on the following: -

- These car parks are used exclusively by staff in light vehicles.
- During periods where this is no construction work, a significant number of parking spaces would be unused.
- There is no evidence that the use of a road base surface within the existing Moorehouse Car Park or BOC Car Park has any impact on the local road network, while any internal damage to the car parks (were it to occur) would be the responsibility of Manildra.
- The potential exists for future Modifications to require the relocation of (existing and proposed) parking areas; as such, the provision of a significantly costlier higher standard surface (that may then require removal) is not financially viable.
- The existing/proposed road base surface is in our opinion superior to the surface materials used at a number of Council's own public car parks; it is in our opinion incongruous that Manildra be required to provide a higher standard surface than required by Council for their own public car parks.

Notwithstanding the above, the Temporary Car Park is not provided with a formal sealed/concrete driveway from Bolong Road, and is generally in poor condition with the potential to transfer gravel onto the Bolong Road carriageway. As such, ARC recommends the provision of a formal sealed/concrete driveway at the Temporary Car Park for a distance of not less than 12m from Bolong Road, as provided at the Moorehouse Site and BOC Site driveways.

In addition, it is the recommendation of ARC that all parking spaces (across the Starches Sites, and including the Temporary Car Park) be appropriately delineated so as to prescribe parking spaces which comply with AS 2890.1 requirements. In this regard, and dependent on the surface material available in different car parks, ARC recommends the use of either line marking or plastic disc markers.

5.1.4 Intersection Bolong Road & Dairy Farmers Site

Further to the Modification 3 (DF Car Park) Approval, Manildra submitted (to Council) plans for the upgrade of the intersection of Bolong Road & Dairy Farmers Site, which were subsequently approved for construction. These approved plans include the left turn auxiliary lane, Bolong Road to DF Site, which – further to the reinstatement of the DF Car Park as described above – is again 'warranted'.

It is acknowledged by Manildra that the subsequent upgrade of the intersection has not been in strict accordance with those approved plans; Manildra has therefore committed to remediation works to provide full compliance with those plans *to the satisfaction of Council*.

5.1.5 Ethanol Driveway Operations

As detailed, the revised Modification 12 (Beverage Grade Ethanol Plant) will provide for the extension of the Bolong Road median and barrier fence across the Ethanol Driveway; this will eliminate U-turn movements at the intersection of Bolong Road & Ethanol Driveway. In addition, the provision of a new access driveway between the DF Site and the Services Area on the eastern portion of the SS Site, which will accommodate the DF Car Park and Modification 12 (Beverage Grade Ethanol Plant) infrastructure, will allow for the closure of the existing Service Driveway to all but emergency vehicles.

5.1.6 Environmental Farm Electric Gate

The electric gate providing access to the Environmental Farm off Hanigans Lane was relocated to a distance of approximately 45m from Hanigans Lane in mid-2016. As previously determined by ARC, this ensures that there is adequate queuing distance so that a truck accessing the Environmental Farm does not impede traffic movements in Hanigans Lane.

5.2 Recommendations

Further to the conclusions outlined above, and noting that the majority of the broader ARC recommendations have already been incorporated into the revised Modification 12 (Beverage Grade Ethanol Plant), ARC provides the following recommended actions further to an approval of revised Modification 12 (Beverage Grade Ethanol Plant) and Modification 10 (Flour Mill B): -

- That Manildra prepare appropriately detailed plans of all new or revised car parks to show compliance with AS 2890.1 in regard to aisle widths, parking space dimensions and general design requirements.
- That Manildra provide a formal sealed/concrete driveway at the Temporary Car Park for a distance of not less than 12m from Bolong Road as provided at the Moorehouse Driveway and BOC Driveway.
- That Manildra immediately prioritise the construction of the internal access driveway between the DF Site and the Services Area, providing for the DF Car Park and Modification 12 (Beverage Grade Ethanol Plant) infrastructure so as to allow for the closure of the Service Driveway to all but emergency vehicles.
- That Manildra consults with Council and the RMS in regard to an appropriate design and schedule for the extension of the Bolong Road median and barrier fence across Ethanol Driveway.

Based on our detailed assessment of the outstanding issues relating to the Starches Sites – and further to the implementation of the recommendations detailed above - it is the opinion of ARC that revised Modification 12 (Beverage Grade Ethanol Plant) and Modification 10 (Flour Mill B) are supportable in regard to access, traffic and parking considerations. Moreover, it is our opinion that the implementation of the suite of ARC recommendations appropriately responds to the issues raised by Council and the RMS.