

Road Safety Audit

Federal Drive Upgrade Concept Design



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1. Project Information

1.1 Background

Byron Shire Council (Council) has engaged GeoLINK to undertake a Road Safety Audit (RSA) for the proposed upgrade works on Federal Drive within the village of Federal. The works are proposed predominantly within the road reserve between Binna Burra Road in the south and Coachwood Court in the north, extending a distance of approximately 325m.

The RSA will be carried out on the Draft Concept Plans dated November 2021.

The audit is to be prepared in accordance with the current Austroads Guidelines, identifying any safety deficiencies from the perspective of all road users.

1.2 Site Description

The village of Federal is a small regional centre and popular tourist stop in the Byron Shire hinterland. It is approximately 30 minutes' drive from the nearby towns of Byron Bay, Ballina/Lennox Head and Lismore.

Figure 1.1 below shows the site in context of the wider locality, and **Figure 1.2** overleaf shows the site in more detail.



Figure 1.1 Site Locality [source: Whereis.com]

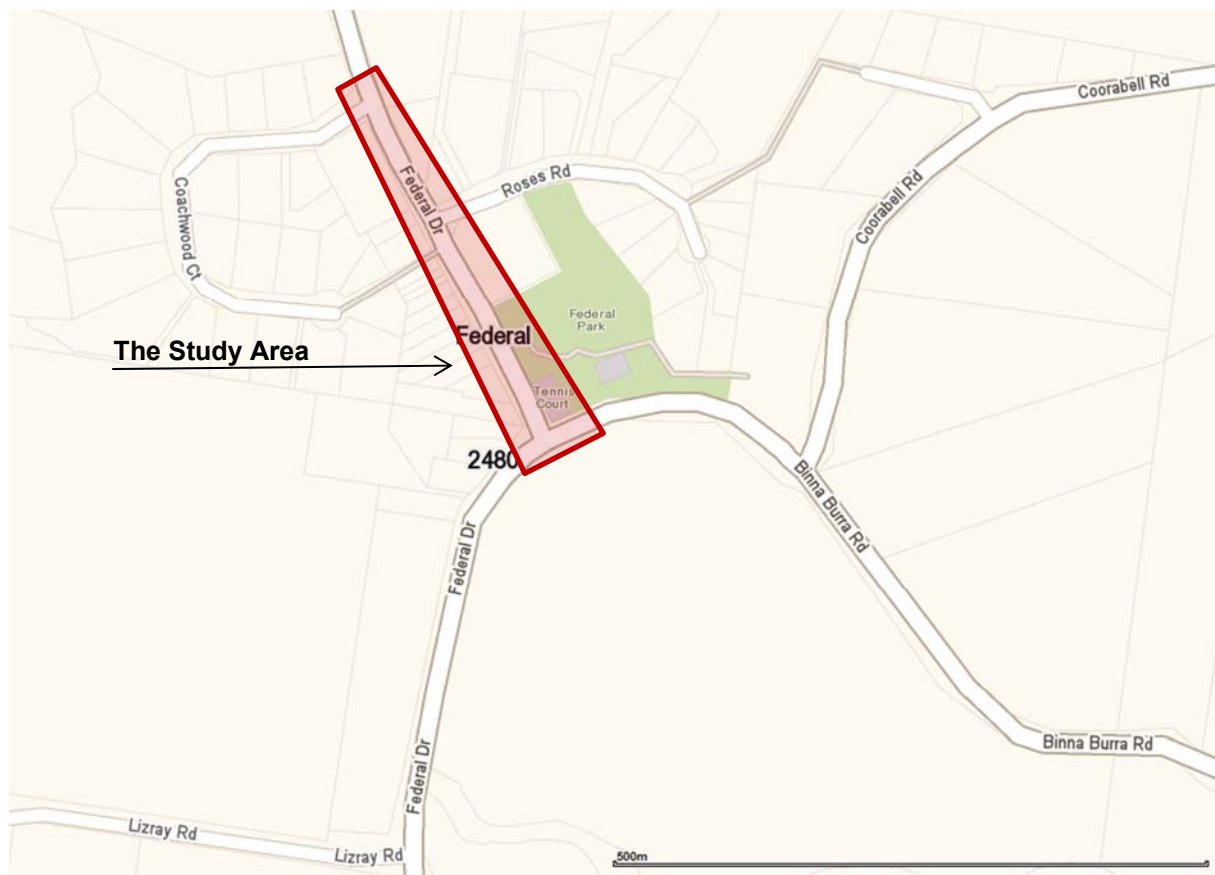


Figure 1.2 Study Area [source: Whereis.com]

The study area of Federal Drive between Binna Burra Road and Coachwood Court provides access to around 50 residential land holdings.

The road pavement is in fair condition, however linemarkings are very faded and the informal edges has caused the spread of red soils across the surface.

On the western side of the street there is a general store/post office/bottle shop, two cafes, some boutique homewares and fashion outlets, a phone booth and a 30m bus zone.

The eastern side of the street between Binna Burra Road and Roses Road includes Federal Park (comprising a tennis court, skate park, tourist information board, playground and open space parkland) and a private vacant block. Just north of Roses Road are community facilities Jasper Corner and Federal Hall. There is a another 30m bus zone in front of the vacant block, which is also used by the mobile library service on alternating Fridays between 9:00 and 10:00 AM.

Both bus zones are limited to specific times on school days only, being 7:30 to 9:30 AM and 2:30 to 4:30 PM.

Existing parking provisions include a sealed parallel parking lane on the western side of Federal Drive extending no more than 100m and shared with a 30m bus zone at the southern end, and informal unsealed (gravel or grassed) parallel parking on the verge north of the general store. Parking on the eastern side of Federal Drive comprises from south to north: informal unsealed 90-degree angle parking, formal sealed 90-degree angle parking including 1 x accessible parking bay, more informal unsealed 90-degree angle parking shared with the bus zone, and informal sealed parallel parking up to Roses Road.

1.3 Information Provided by the Client

Council provided the audit team with the following documents to assist with understanding the site and the background of the project:

- Federal Village Masterplan – Movement Study (May 2021, Federal Village Masterplan Steering Committee)
- Federal Village Masterplan – Vision, Principles, Character Statement and Actions (Final draft), (November 2021, Federal Village Masterplan Steering Committee)
- Federal Drive Concept Plan (November 2021, Better Cities Group in collaboration with the Federal Village Masterplan Group)
- Federal Main Street – Background Slides for GeoLINK (December 2021, Council)

The latter document includes the following pertinent information:

- Existing traffic on Federal Drive at 1,863 vehicles per day with an average speed of 46 km/h
- 60-170 pedestrians crossing the street per hour
- Cars parking in bus zones (currently 2 x 30m bus zones, one on either side of Federal Drive)
- 14 school buses per weekday, with 6 buses at 8:00 AM peak and 4 buses at 4:15 PM peak
- Buses make 2 x three-point-turns at the Binna Burra Road intersection each weekday
- Buses make 5-6 x three-point-turns at the Roses Road intersection each weekday
- Currently no bus movements at Coachwood Court.


Table 1.1 Draft Concept Design Plans Audited

Plan Title	Date
Concept Plan: Plan 1 – Layout	November 2021
Concept Plan: Plan 1 – Section AA Federal Drive	November 2021
Concept Plan: Plan 1 – Illustrative Perspective	November 2021
Concept Plan: Plan 2 – Layout	November 2021
Concept Plan: Plan 2 – Section BB Federal Drive	November 2021
Concept Plan: Plan 3 – Layout	November 2021

1.4 Proposed Works

The proposal aims to meet the following project objectives:

- Improve general pedestrian safety by reducing the overall traffic speed.
- Provide safe and accessible pedestrian connections between the shop-side and park-side of the main street, creating a safe space for pedestrians on both sides of the main street and reduce the number of people walking on the road.
- Improve accessibility so that people with a disability or people with mobility restrictions can easily move about the main street and feel safe and included.
- Provide a formalised bus zone and shelter in an optimal location improving safety and accessibility.
- Provide safer and more legible car parking options with limited net loss of spaces.
- Provide options for safer U-turns for cars and buses away from the village centre.
- Retain and enhance the features that set the look and feel of the main street
- Provide a consistent landscape character for the main street that offers shade and amenity
- Create informal places for people to socialise in the street.



The primary focus of the design is to separate and formalise bus, passenger vehicle and pedestrian movements within the village centre, to be achieved by providing facilities for buses to make the necessary U-turns required by the bus routes away from the high-pedestrian activity area.

In general, the works will include the following:

- Construction of 'mini-roundabout' at the intersection of Binna Burra Road and Federal Drive, designed to allow small and medium vehicles to turn, but prevent buses from making a U-turn.
- Construction of 'mini-roundabout' at the Roses Road intersection allowing small and medium vehicles to U-turn, while preventing buses from U-turning.
- Upgrade of the Coachwood Court and Federal Drive T-intersection to better facilitate bus U-turns.
- Introduction of 30 km/h High Pedestrian Activity Area on Federal Drive between Binna Burra Road and Coachwood Court, including signage and on-road thresholds at either end.
- Construction of footpaths (1.5m min. width) on both sides of Federal Drive, continuously between Binna Burra Road and Coachwood Court.
- Provision of a zebra crossing in accordance with the relevant standards linking the shop-side of the street at the general store to the parkland and parking, in addition to 2 x informal crossing blisters (one opposite Federal Hall and one opposite the Moonshine Coffee Roasters Café).
- Construction of a retaining wall along the frontage of the vacant private block to manage the level difference between the proposed footpath and the land to the east.
- Works to narrow the throat at Roses Road to improve pedestrian linkage to/from Jasper Corner.
- Construction of a number of 'informal gathering spaces', including seating, gardens, and links to footpaths.
- Provision of secure bike/scooter storage.
- Formalising parking to provide a mix of parallel and 90-degree parking bays on both sides of Federal Drive, including kerbs, linemarking, bollards (as required) and links to adjacent footpaths.
- Provision of formalise 90-degree parking on Roses Road and Coachwood Court.
- Replacing the 2 x existing bus zones with formalised parking and constructing a new 40m single bus zone and bus shelter on the eastern side of Federal Drive just south of Roses Road. The new bus zone will be paved/sealed, clearly linemarked and adjacent to an accessible footpath. As per the current situation, parallel parking will be allowed outside of the bus times.

1.5 Audit Scope

This RSA will assess the detailed design plans for construction of the proposed works.

The scope of the RSA is limited to the proposed works as shown on the draft concept design plans listed in **Table 1.1**, and the effect of these works on nearby road network from the perspective of all road users.

The objective of the RSA is to identify any potential road safety issues or design deficiencies associated with the proposal that may need to be investigated and rectified prior to finalising the detailed design and construction of the works.

Although the RSA will not check the design against relevant standards and guidelines, some design issues may be raised during the audit process.

Positive aspects of the design have not been recorded.



1.6 Audit Team

The audit has been carried out by suitably qualified team members registered as Road Safety Auditors by Transport for NSW.

1. Michelle Erwin

BE(Civil)(Hons), MTraf, CPEng
Senior Civil Engineer, GeoLINK
Level 3 Lead Road Safety Auditor

2. Jarrod Connell

BE(Civil)
Civil Engineer, GeoLINK
Level 2 Road Safety Auditor



2. Audit Process

2.1 Methodology and Responsibilities

The RSA has been undertaken in accordance with:

- Austroads *Guide to Road Safety Part 6A: Implementing Road Safety Audits (2019)*; and
- NSW RMS *Guidelines for Road Safety Audit Practices (2011)*.

The RSA process includes the steps listed in the table below together with the party responsible for each task.

Table 2.1 Steps and responsibilities

Steps	Responsibility
Select the audit team	Client or Designer
Provide background information	Client or Designer
Hold a commencement meeting	Client and/or Designer and the Audit Team
Assess the documents / Inspect the site	Audit Team
Write the audit report and issue to client	Audit Team
Hold a completion meeting	Client and/or Designer and the Audit Team
Write the responses	Client and Designer
Implement the changes	Client or Designer

The client is Byron Shire Council and their representatives for this project are Andrew FitzGibbon and Isabelle Hawton. The designer is Better Cities Group in collaboration with the Federal Village Masterplan Group.

2.2 Previous Audits

No previous RSAs have been carried out for this site.

2.3 Commencement Meeting

An initial meeting was held on site between Michelle Erwin from GeoLINK (lead auditor) and two Council representatives (Andrew FitzGibbon and Isabelle Hawton) on Tuesday 7 December 2021 between 1:30 and 2:30 PM. During the meeting, the scope of the audit was confirmed.

Council's representatives briefly outlined the following issues identified within the study area:

- High pedestrian numbers and poor pedestrian safety
- Limited accessible infrastructure
- Bus and pedestrian / passenger vehicle conflicts
- Informal parking affecting the functionality of the street.

In addition to the proposed works as detailed in the Concept Design Plan set, it was agreed that the audit would consider the following alternative design options:

1. Coachwood Court and Federal Drive intersection:
 - a) to be upgraded to a roundabout allowing for buses to U-turn; OR
 - b) to be upgraded to allow for buses to U-turn while remaining as a T-intersection.
2. Bus zones:
 - a) to remain in their current locations;
 - b) to be relocated to the north of the village centre (one on either side of the road); OR
 - c) to be relocated / consolidated to the eastern side of the road only, as per the plans.



Figure 2.1 Bus Zone Design Alternatives

2.4 Site Inspections

A site inspection is not required for a design stage audit. However, it was considered prudent in this case to gain an understanding of the current conditions and movement of vehicular and pedestrian traffic. The site inspection was carried out after the commencement meeting on the afternoon of Tuesday 7/12/2021.

Observations included:

- High pedestrian activity, including locals and tourists accessing the shops, cafes and parklands.
- Available formal and unformal parking well-utilised.
- Informal road cross section including unsealed gravel parking/verges offering poor amenity.
- No obvious pedestrian crossing point.
- Poor connectivity for pedestrians (i.e. existing footpaths disjointed).
- Many vehicles making U-turns within the carriageway.
- Lots of vehicles parked within the two bus zones.

2.5 Completion Meeting

The objective of the completion meeting is to allow the auditor(s) to discuss the findings with the client's representative for corrective action, where required. Although the meeting is not an occasion for the client and/or designer to disagree with the audit findings, it is an opportunity for misunderstandings to be explained.

The completion meeting was held over the phone on the 17/12/2021 between Michelle Erwin and Andrew FitzGibbon following submission of the audit report (V1).

3. Risk Matrix

The audit findings include a risk ranking, determined using **Table 3.1** to **Table 3.4**, reproduced from The Austroads *Guide to Road Safety Part 6A*.

Table 3.1 How often is the problem likely to lead to a crash?

Frequency	Description
Frequent	Once or more per week
Probable	Once or more per year (but less than once per week)
Occasional	Once every five to ten years
Improbable	Less often than once every ten years

Table 3.2 What is the likely severity of the resulting crash type?

Severity	Description	Examples
Catastrophic	Likely multiple deaths	<ul style="list-style-type: none"> High-speed, multi-vehicle crash on a freeway. Car runs into crowded bus stop. Bus and petrol tanker collide. Collapse of a bridge or tunnel.
Serious	Likely death or serious injury	<ul style="list-style-type: none"> High or medium-speed vehicle/vehicle collision. High or medium-speed collision with a fixed roadside object. Pedestrian or cyclist struck by a car.
Minor	Likely minor injury	<ul style="list-style-type: none"> Some low-speed vehicle collisions. Cyclist falls from bicycle at low speed. Left-turn rear-end crash in a slip lane.
Limited	Likely trivial injury or property damage only	<ul style="list-style-type: none"> Some low-speed vehicle collisions. Pedestrian walks into object (no head injury). Car reverses into post.

Table 3.3 Resulting level of risk

	Frequent	Probable	Occasional	Improbable
Catastrophic	Intolerable	Intolerable	Intolerable	High
Serious	Intolerable	Intolerable	High	Medium
Minor	Intolerable	High	Medium	Low
Limited	High	Medium	Low	Low

Table 3.4 Treatment approach

Frequency	Description
Intolerable	Must be corrected
High	Should be corrected or the risk significantly reduced, even if the treatment cost is high
Medium	Should be corrected or the risk significantly reduced, if the treatment cost is moderate but not high
Low	Should be corrected or the risk reduced, if the treatment cost is low



4. Audit Findings

The following table details the RSA findings.

Table 4.1 Audit findings

Audit findings	Risk Ranking
1. Informal Pedestrian Crossing Blisters The informal blisters may erroneously give the impression to pedestrians that they have priority over vehicles travelling on Federal Drive. There is a risk that pedestrians may step in front of moving vehicles and receive serious injury.	<i>Occasional Serious</i> High
2. Landscaping at Formal and Informal Crossing Points The proposed landscaping at the proposed zebra crossing and informal crossing blisters is understood to include solid low walls and planted shrubs and trees. There is a risk that the landscaping will obscure the presence of pedestrians (particularly small children and people in wheelchairs), resulting in a vehicle not stopping when a pedestrian enters the travel way, striking the pedestrian and causing serious injury.	<i>Improbable Serious</i> Medium
3. Proximity of Parked Vehicles to Informal Crossing Points Parallel parking is proposed immediately adjacent to the three proposed informal crossing points. There is a risk that pedestrians will not be visible to drivers and/or vice versa if a vehicle is parked close to the crossing point, resulting in a pedestrian being struck by a moving vehicle.	<i>Improbable Serious</i> Medium
4. 'Gathering Spaces' Adjacent to Zebra Crossing 'Plan 1 – Layout' shows proposed gathering spaces at either end of the proposed zebra crossing. There is a risk that groups of people gathering in these locations may deter pedestrians wishing to cross Federal Drive from doing so at this location, compelling them to cross at other, less safe points where they may be struck by a moving vehicle.	<i>Improbable Serious</i> Medium



Audit findings	Risk Ranking
<p>5. Zebra Crossing</p> <p>The high volume of pedestrians crossing Federal Drive during and outside of peak hours conflicts with the high volume of vehicular traffic arriving and leaving the Federal village centre.</p> <p>There is a risk that drivers concentrating on locating an available parking bay may not stop at the designated zebra crossing. Further, pedestrians observing drivers travelling very slowly may misinterpret the slow speed as an indication from the driver that the pedestrian may safely cross in front of the vehicle. There is a risk that the driver focussed on parking may not have noticed the pedestrian and/or that a vehicle travelling in the opposite direction strikes the pedestrian.</p>	<p><i>Improbable Serious</i></p> <p>Medium</p>
<p>6. Proximity of Landscape Features to Edge of Travel Lane</p> <p>'Plan 1 – Illustrative Perspective' shows proposed low, solid walls/seats constructed at the edge of the travel lanes on either side of the proposed zebra crossing to be used as informal social gathering spaces.</p> <p>If located too close to the edge of the travel lane, there is a risk that a passing vehicle may collide with one of the walls, causing injury to nearby pedestrians.</p>	<p><i>Improbable Minor</i></p> <p>Low</p>
<p>7. Bus U-turns at Coachwood Court (Alternative Design Option 1b - Without Roundabout)</p> <p>The proposal will require buses that travel north into Federal Drive to pick-up/drop-off patrons and then need to turn around and exit Federal Drive to the south, to make a U-turn at Coachwood Court.</p> <p>At present, and as per the proposal shown in the draft concept design plans, although the Coachwood Court and Federal Drive intersection will be upgraded it will remain as a T-intersection, whereby vehicles travelling south on Federal Drive have priority.</p> <p>There is a risk that vehicle travelling south on the downhill gradient on Federal Drive towards the Coachwood Court intersection may collide with a bus making a U-turn at this location.</p> <p>It is noted that provision of a roundabout at this intersection as per Alternative Design Option 1a will require vehicles travelling south on Federal Drive to give-way to all vehicles, including buses making U-turns. The presence of the roundabout and associated advance signage will also likely cause drivers to slow down appropriately.</p>	<p><i>Occasional Serious</i></p> <p>High</p>




Audit findings	Risk Ranking
<p>8. Bus Zones to Remain in Current Location (Alternative Design Option 2a)</p> <p>The proposal as per the concept design plans shows the two existing bus zones removed and replaced by a single, consolidated bus zone on the eastern side of Federal Drive towards the northern extremity of the village centre. However, the audit team has been requested to consider the option of retaining the two existing bus zones in their existing locations.</p> <p>The two existing bus zones are within the centre of the village amongst a lot of other vehicular and pedestrian activity. There is a risk of a conflict between a bus and a vehicle and/or pedestrian, given the high volumes of all traffic modes.</p>	<p><i>Occasional Serious</i></p> <p>High</p>
<p>9. Separation of 90-degree Parking and Adjacent Footpaths</p> <p>'Plan 1 – Layout' in the Draft Concept Plan set specifies that the formalised 90-degree parking bays fronting the open space parkland will include flush kerb and bollards preventing vehicles from overhanging into the footpath. It is not clear, however if all proposed 90-degree parking bays constructed directly abutting proposed footpaths will include some kind of barrier between the two.</p> <p>Without bollards, wheelstops or similar, vehicles may protrude into the footpath space with a risk of striking a passing pedestrian.</p>	<p><i>Improbable Minor</i></p> <p>Low</p>
<p>10. Power Poles Potentially Within the Clear Zone</p> <p>The plans show a number of electricity poles potentially within the clear zone of the travel lanes. These poles were also observed during the site visit to be very close to the existing edge of lane.</p> <p>There is a risk that an errant vehicle may leave the travel lane and strike a pole, resulting in serious injury and property damage.</p>	<p><i>Improbable Serious</i></p> <p>Medium</p>

5. Recommendations

The following recommendations are proposed for consideration by the client in relation to improving the safety for road users within the audit area.

Table 5.1 Recommendations for client consideration to improve road safety

Audit finding	Recommendations
1	<p>If the final design includes the proposed informal blister pedestrian crossing points, it is recommended that these be designed to provide for clear sight distances for pedestrians (including children and people in wheelchairs) and drivers (including passenger vehicles, trucks and buses).</p> <p>This will require consideration of the height, type and location of proposed planting and other landscape features, and the proximity of formal parking spaces to the crossing point. Signage and/or pavement marking may be warranted to highlight that traffic travelling on Federal Drive has right-of-way rather than pedestrians wishing to cross at the blisters.</p> <p>It is also recommended that the proposed formal crossing point – the zebra crossing – be easily seen and accessible from anywhere within the village centre, such that pedestrians are aware that they have the option to cross with priority.</p>
2	<i>Refer recommendation relating to Audit Finding 1, above.</i>
3	<i>Refer recommendation relating to Audit Finding 1, above.</i>
4	<p>It is recommended that the detailed design gives due consideration to the 'gathering spaces' proposed at either end of the zebra crossing, such that there is sufficient space to allow and encourage pedestrians, including parents with prams, people in wheelchairs etc. to cross at this location unimpeded by groups of people.</p>
5	<p>It is understood the proposed pedestrian crossing will provide priority for pedestrians wishing to cross Federal Drive over the traffic travelling north and south on Federal Drive. It is recommended that consideration be given to the design of the crossing to ensure it is prominent for approaching motorists.</p> <p>The proposed 30 km/h speed zone and pavement threshold are thoroughly endorsed and will assist with drawing the attention of motorists to the presence of pedestrians.</p> <p>If the zebra crossing is installed with good visibility and sight distances for motorists and pedestrians with all applicable signage and pavement markings, and if the signage and pavement markings are maintained, it is considered that the proposed zebra crossing is appropriate for this situation.</p>
6	<p>It is recommended that the detailed design of the low walls, seating and other landscape features proposed close to the roadway considers the offset from the travel lanes, with a recommended 1.0 metre minimum separation from the edgelines to non-frangible objects.</p>



Audit finding	Recommendations
7	<p>Due to the existing geometry including the downhill gradient of the Federal Drive southbound approach to the Coachwood Court intersection and the priority of traffic on Federal Drive, it is recommended that the intersection of Coachwood and Federal Drive be upgraded to a roundabout. Thus, buses U-turning at this location would have priority over southbound traffic on Federal Drive. Additionally, southbound traffic will be required to slow down in order to navigate the roundabout, which will have further safety benefits for the village.</p> <p>If a roundabout is not feasible, then it is recommended that works be undertaken to ensure 12.5m heavy rigid vehicles (buses, garbage trucks, fire trucks etc.) can easily make the U-turn at the intersection within the roadway. Signage should also be installed to the north of the intersection to indicate to southbound Federal Drive motorists that a 30 km/h High Pedestrian Activity Area is ahead and they should reduce their speed accordingly.</p>
8	<p>From a road safety perspective, for this location it is recommended that the bus zones be relocated outside the main centre of the village. Alternative Design Options 2b and 2c (as outlined in Section 2.3) both meet this recommendation.</p> <p>A single, consolidated bus zone (Option 2c) is considered to offer a higher level of safety in this case, but focusing the pick-up and drop-off activity to a single location. The proposed location is at the northern end of the village but still within an easy walking distance to the pedestrian crossing. This option also appears to allow for the provision of additional parking bays.</p> <p>If not already considered, it is recommended that the option of relocating the bus bay(s) onto Binna Burra Road either side of the Federal Drive intersection be investigated, as this is expected to remove several bus movements from Federal Drive.</p>
9	<p>Bollards, wheelstops or similar are recommended between all 90-degree parking bays and footpaths to prevent encroachment by vehicles into the footway.</p> <p>It is also recommended that the location of parallel parking bays adjacent to footpaths be considered, such that sufficient space is required for opening car doors and passing pedestrians.</p>
10	<p>It is understood that there is a possibility that the overhead powerlines may be replaced by underground electricity cabling. Such works, although likely to be expensive, are supported from a road safety perspective as it will result in the removal of several non-frangible objects from within the clear zone of the roadway.</p> <p>If the power poles are to stay, it is recommended that consideration be given to their proximity to the edge of the travel lanes and whether protection (reflective markers, guard rail etc.) or relocation of individual poles is warranted.</p>
-	<p>It is recommended that another RSA be undertaken at the detailed design stage of this project.</p>

*Note that audit findings are colour coded according to the risk ranking determined in **Section 4: Low, Medium, High.***



6. Concluding Statement

6.1 Identified Deficiencies

The audit process seeks to identify potential safety hazards. However, there is no guarantee that every deficiency has been identified. Further, even if all audit findings are addressed, this will not necessarily ensure that the design will yield a safe site. Rather, addressing the findings of this report should improve the level of safety offered by the proposal.

As per **Section 4**, a small number of deficiencies have been identified. The risk associated with each issue has been assessed. As per **Table 3.4**, any issue with a risk ranking of 'medium' should be corrected if the cost of treatment is moderate. Issues with a risk rating of 'high' or 'intolerable' should be corrected or the risk significantly reduced even if the cost of treatment is high.

6.2 Responding to the Audit

As set out in the RSA guidelines, responsibility for the road design always rests with the client, and not with the auditor. A client is under no obligation to accept all the audit findings. Also, it is not the role of the auditor to agree to or approve of the client's response to the audit. Rather, the audit provides the opportunity to highlight potential problems and have them formally considered by the client, in conjunction with all other project considerations.

A written response to this RSA should be prepared by the client, giving reasons for each rejection of an audit finding or recommendation. Acceptance of a finding may require no further comment, but explanation of how or when the action will be taken may be useful. The audit response does not need to be provided to the audit team but should be kept on file as a record of due diligence.

6.3 Concluding Statement

Each member of the audit team has examined the plans listed in **Table 1.1** and provided in **Appendix A**. The audit has been carried out for the sole purpose of identifying any features of the design which could be altered or removed to improve the safety of the proposal. The identified issues have been noted in this report and given a risk rating. The accompanying findings are provided to for the consideration by the client for implementation.



17 December 2021

Michelle Erwin (Audit Team Leader)



17 December 2021

Jarrod Connell (Audit Team Member)



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Appendix A

Concept Design Drawing Set

Federal Drive CONCEPT PLAN

Prepared by Better Cities Group
on behalf of Byron Shire Council

November 2021



IN COLLABORATION WITH

Federal Village
MASTERPLAN

GROUP

CONCEPT PLAN

The concept plan seeks to reduce vehicle speeds through the heart of the village and provide an improved pedestrian environment. It has been developed to improve connection from the commercial side of the street to the park and in doing so foster social interaction, something which the street is loved for.

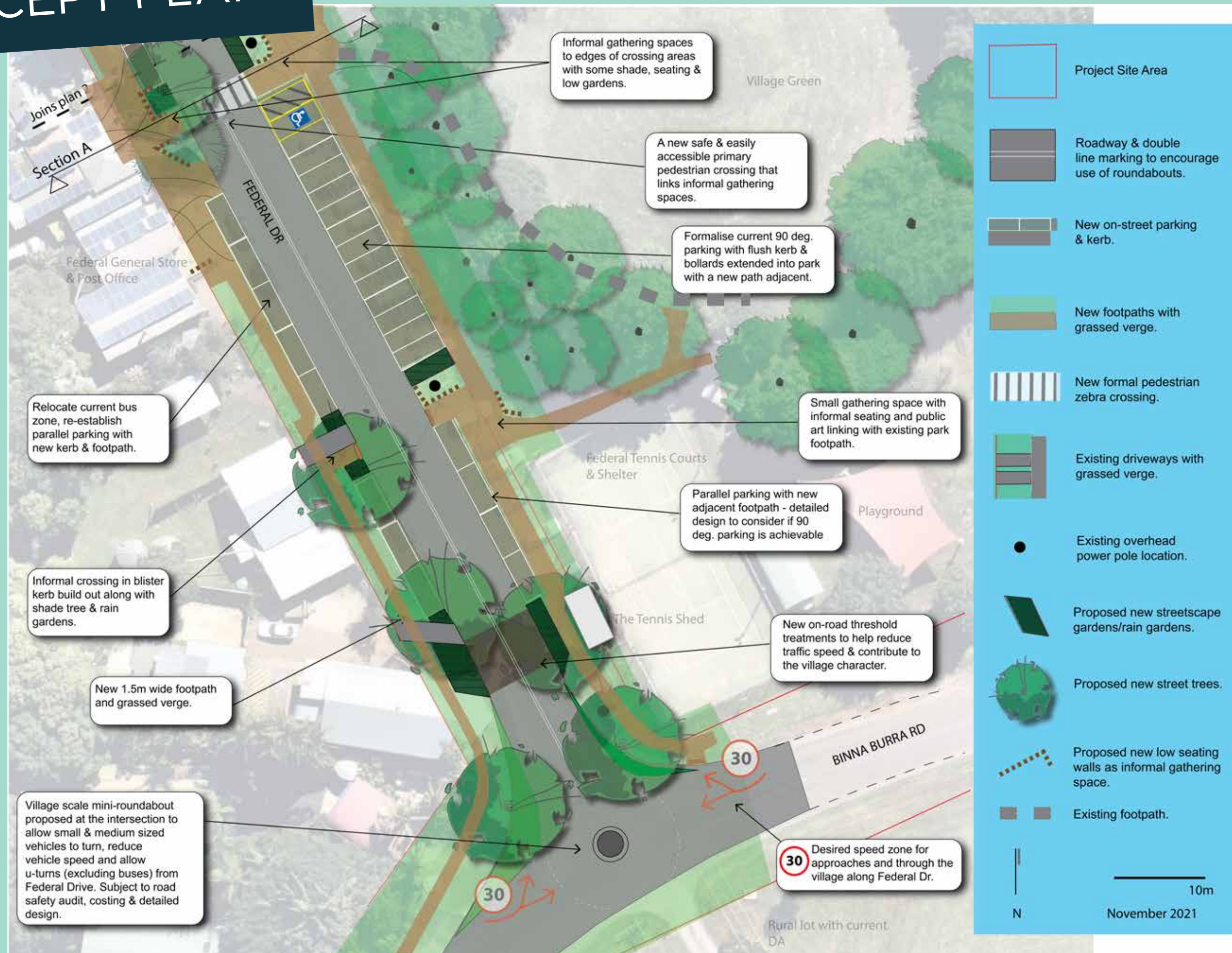
Significant effort has been taken to reduce u-turn movements and provide a safer environment for bus drop-offs. A key element of the concept is to improve accessibility around the street for people of all abilities.

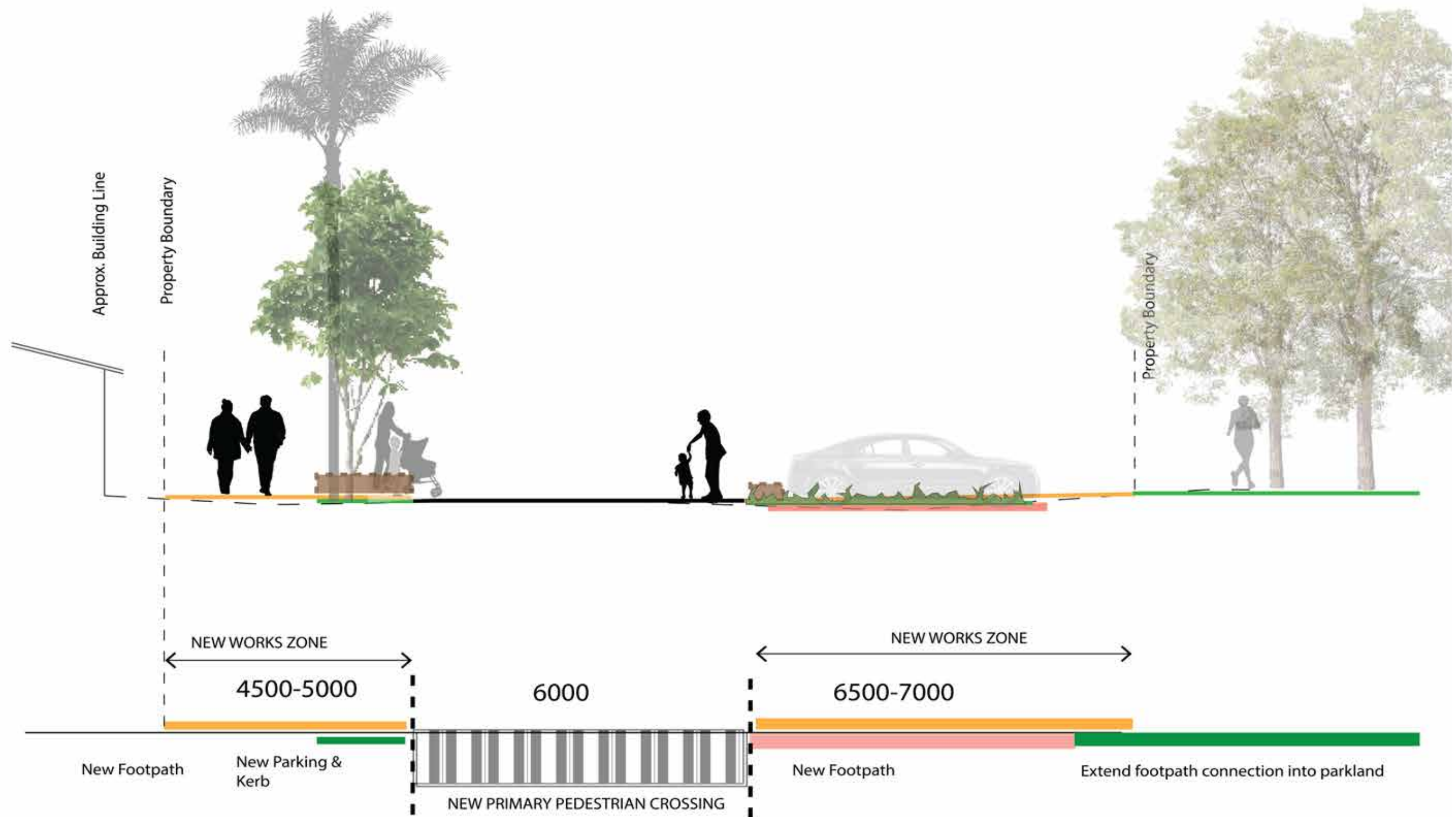
Finally, from a character perspective it is critical that the design capture the “tin and timber” setting and be responsive to the current relaxed nature and is “not too shiny”.



CONCEPT PLAN

PLAN 1





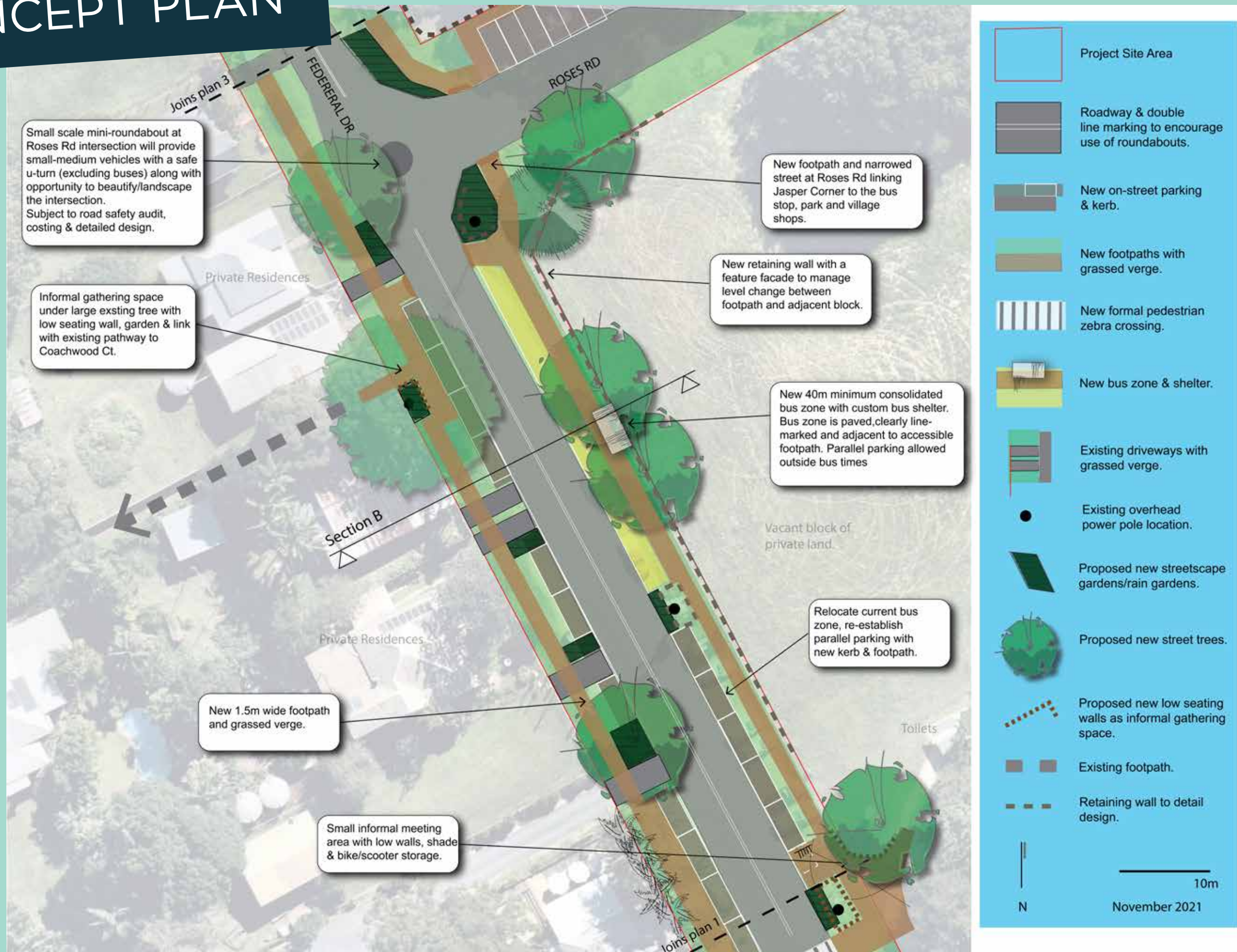
SECTION AA: FEDERAL DRIVE
General Store - Federal Drive - Park



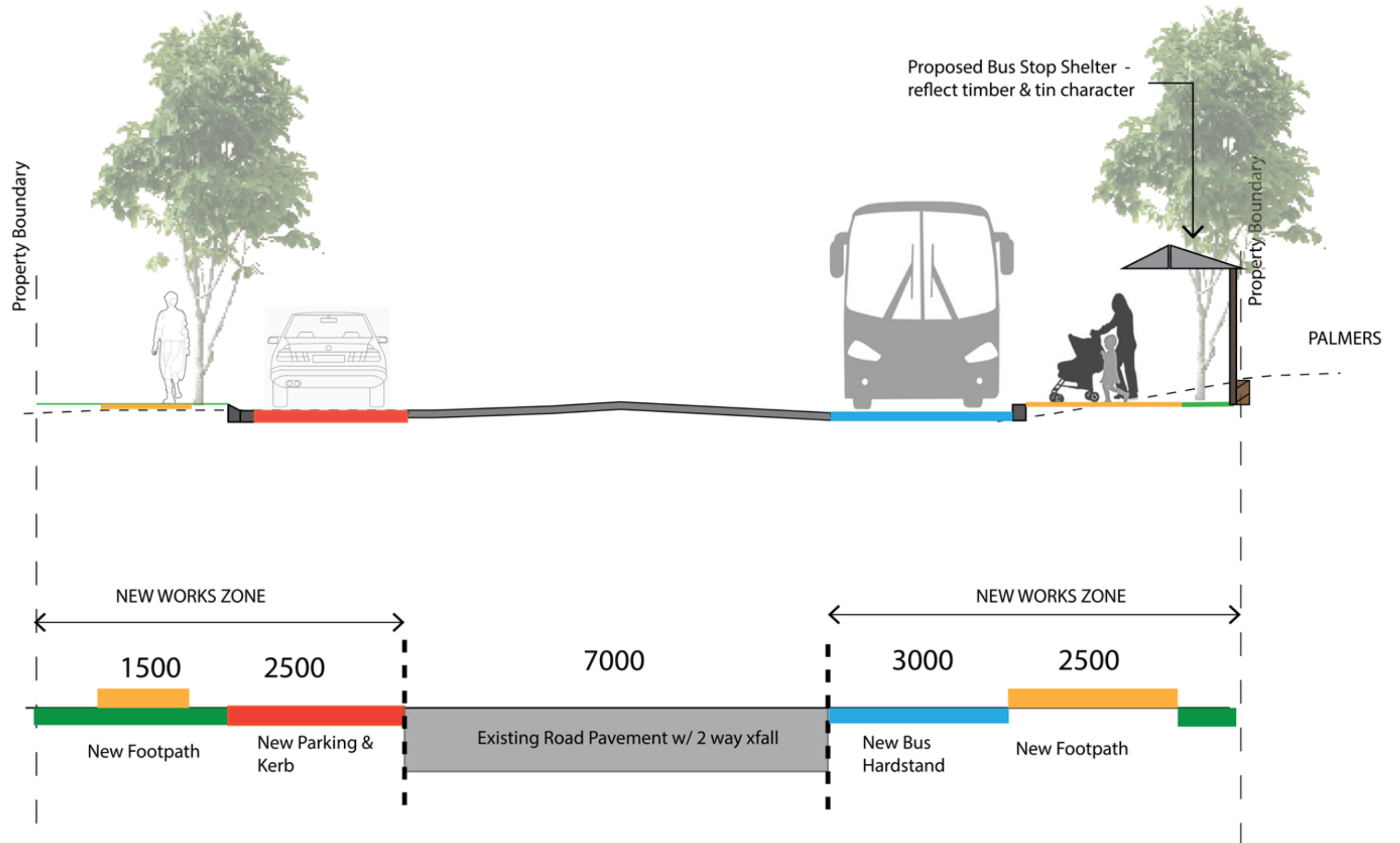
ILLUSTRATIVE PERSPECTIVE
VIEW OF NEW CROSSING FROM PARK TO GENERAL STORE

CONCEPT PLAN

PLAN 2



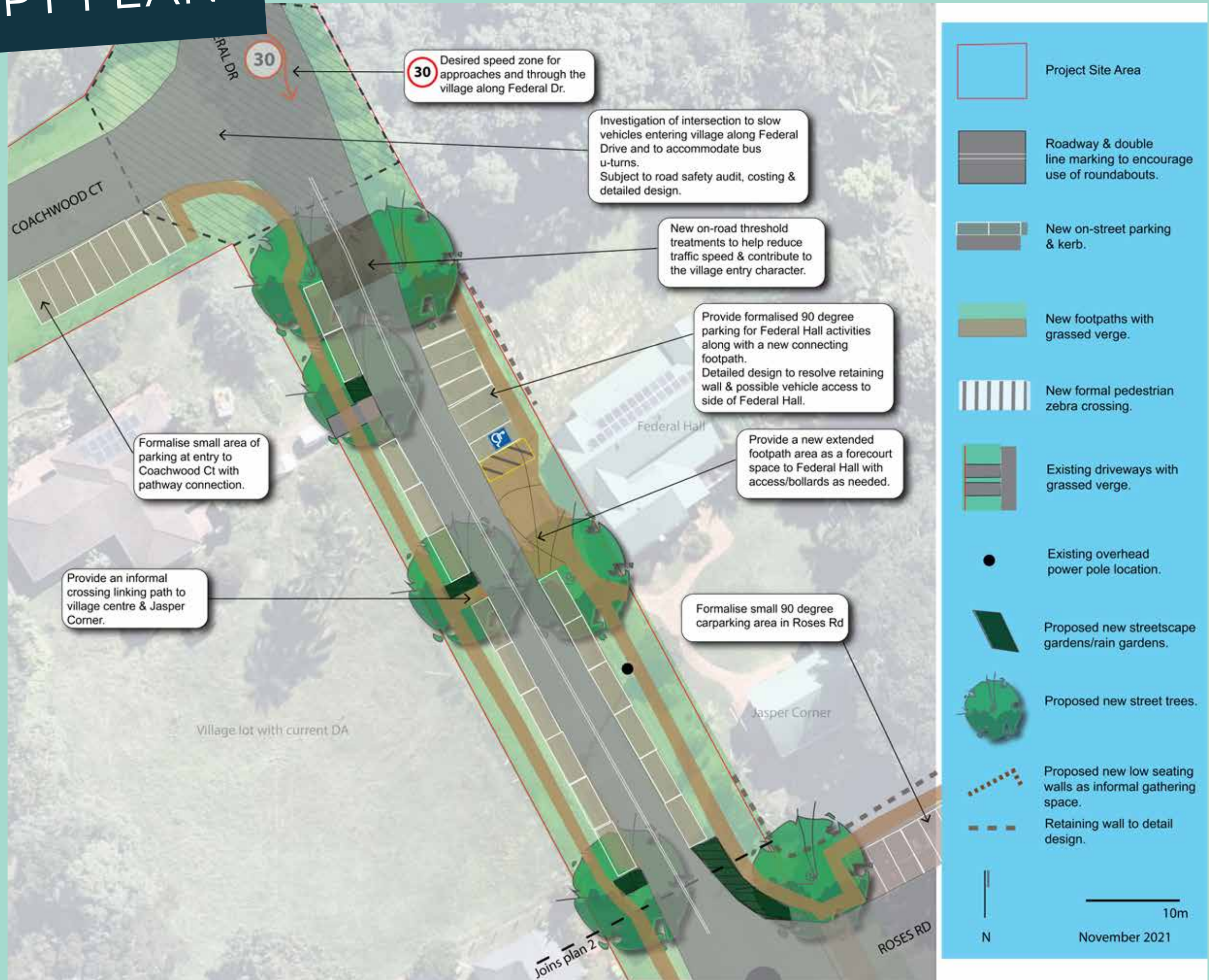
PLAN 2



SECTION BB: FEDERAL DRIVE
Local Residential - Federal Drive - Palmers

CONCEPT PLAN

PLAN 3





Appendix B

Site Photographs



Federal Drive / Binna Burra Drive Intersection – view to the north along Federal Drive



Federal Drive – view to the north



Federal Drive – view to the north



Federal Drive – view to the north



Federal Drive – view to the north



Federal Drive – view to the north



Pedestrian link through to Coachwood Court – view to the west



Federal Drive / Rose Road Intersection – view to the north along Federal Drive



Federal Drive / Coachwood Court Intersection – view to the north along Federal Drive



Federal Drive / Coachwood Court Intersection – view to the west along Coachwood Court



North of Federal Drive / Coachwood Court Intersection – view to the north along Federal Drive



South of Federal Drive / Coachwood Court Intersection – view to the south along Federal Drive



Federal Drive / Rose Road Intersection – view to the east along Rose Drive



Federal Drive – shared bus zone / informal parking, view to the south



Federal Drive – view to the south



Federal Drive – shared bus zone / informal parking, view to the east



Federal Drive – shared bus zone / informal parking and formal parking, view to the east



Federal Drive – formal parking, view to the south



Federal Drive – General Store and Post Office, view to the south



Federal Drive – view to the south



Federal Drive – informal parking on both sides, view to the south



Federal Drive / Binna Burra Road intersection – view to the south



Federal Drive / Binna Burra Road intersection – view to the south



Federal Drive / Binna Burra Road intersection – view to the east along Binna Burra Road



Federal Drive / Binna Burra Drive intersection – view to the west



Federal Drive / Binna Burra Drive intersection – view to the west



Federal Drive – bus zone signage

Safe System Assessment Federal Drive Upgrade Concept Design



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Appendices

Appendix A Concept Design Drawing Set

1. Project Information

1.1 Background

Byron Shire Council (Council) has engaged GeoLINK to undertake a Road Safety Audit (RSA) and a Safe System Assessment (SSA) for the proposed upgrade works on Federal Drive within the village of Federal. The works are proposed predominantly within the road reserve between Binna Burra Road in the south and Coachwood Court in the north, extending a distance of approximately 325m.

This report details the process and outcomes of the SSA which has been carried out following completion of the RSA.

1.2 Site Description

The village of Federal is a small regional centre and popular tourist stop in the Byron Shire hinterland. It is approximately 30 minutes' drive from the nearby towns of Byron Bay, Ballina/Lennox Head and Lismore.

Figure 1.1 below shows the site in context of the wider locality, and **Figure 1.2** overleaf shows the site in more detail.

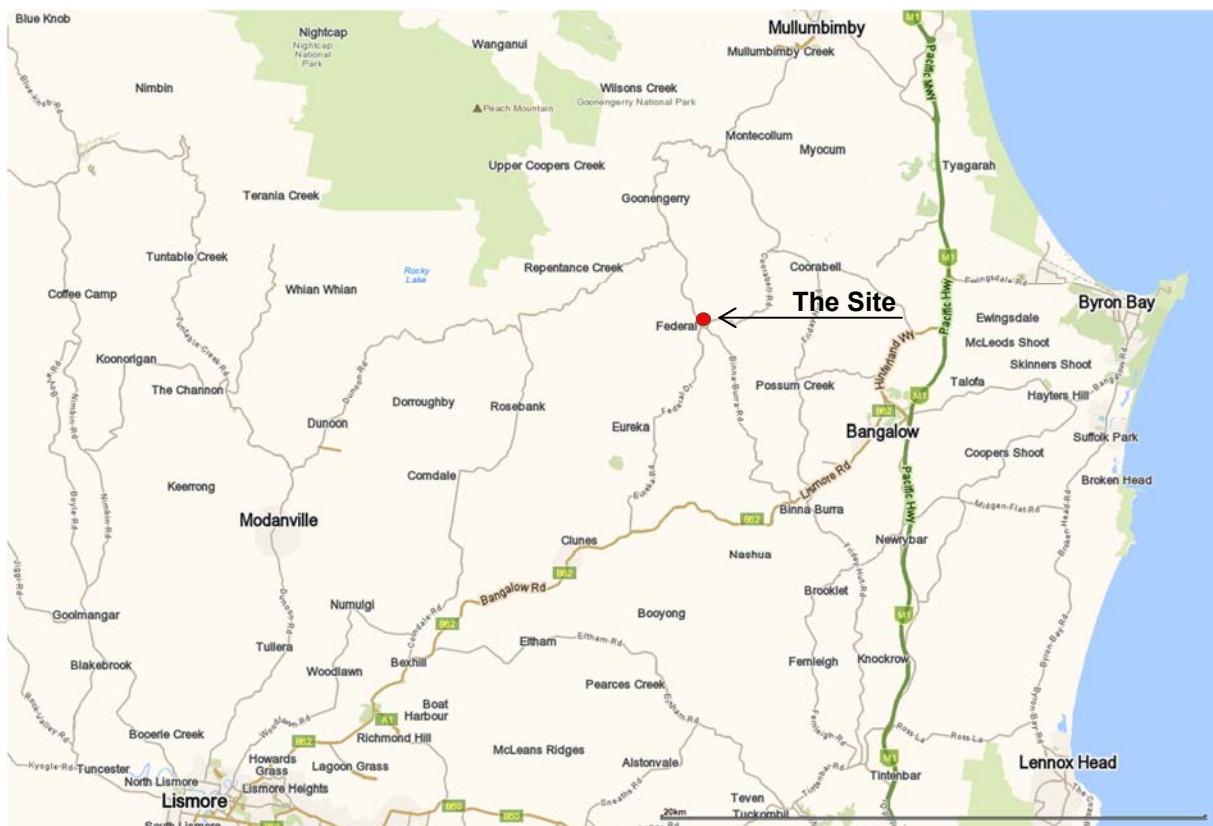


Figure 1.1 Site Locality [source: Whereis.com]

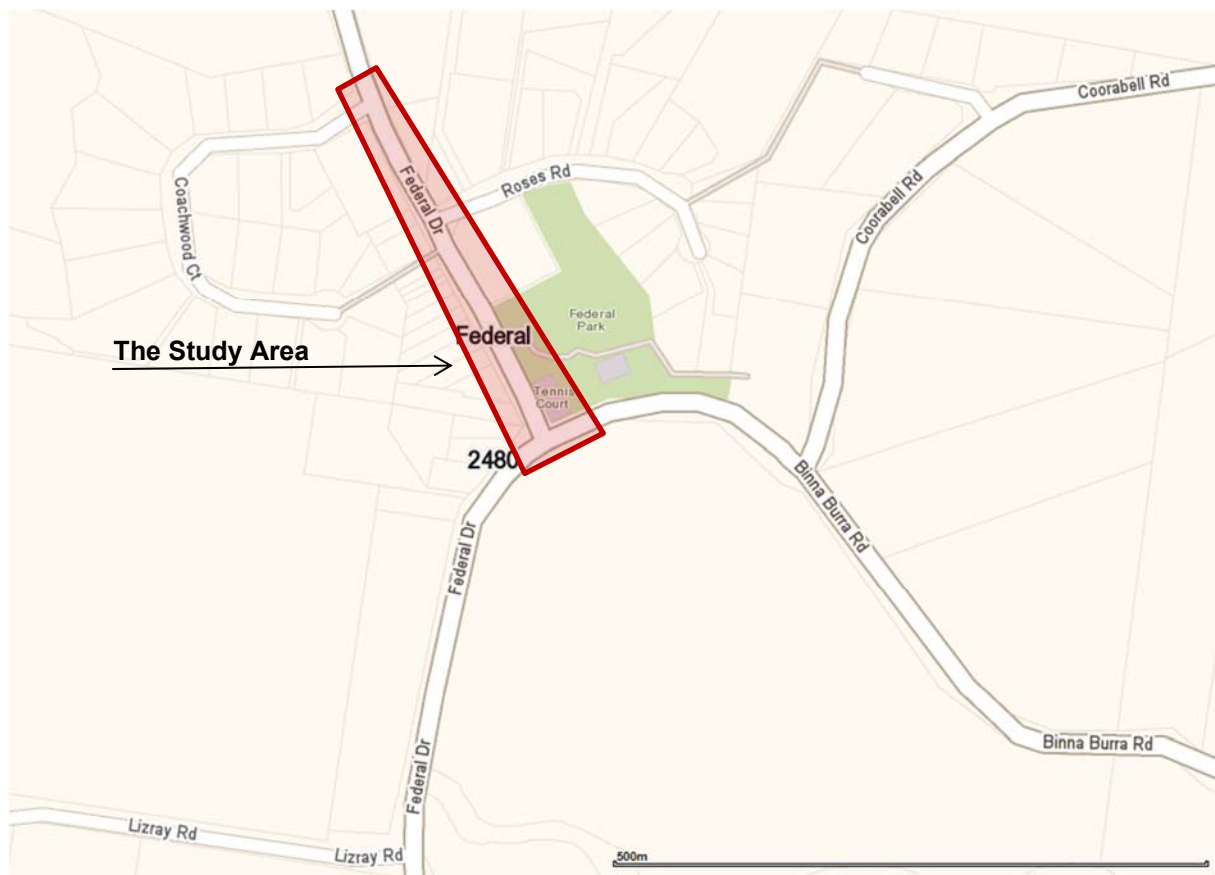


Figure 1.2 Study Area [source: Whereis.com]

The study area of Federal Drive between Binna Burra Road and Coachwood Court provides access to around 50 residential land holdings.

The road pavement is in fair condition, however linemarkings are very faded and the informal edges has caused the spread of red soils across the surface.

On the western side of the street there is a general store/post office/bottle shop, two cafes, some boutique homewares and fashion outlets, a phone booth and a 30m bus zone.

The eastern side of the street between Binna Burra Road and Roses Road includes Federal Park (comprising a tennis court, skate park, tourist information board, playground and open space parkland) and a private vacant block. Just north of Roses Road are community facilities Jasper Corner and Federal Hall. There is a another 30m bus zone in front of the vacant block, which is also used by the mobile library service on alternating Fridays between 9:00 and 10:00 AM.

Both bus zones are limited to specific times on school days only, being 7:30 to 9:30 AM and 2:30 to 4:30 PM.

Existing parking provisions include a sealed parallel parking lane on the western side of Federal Drive extending no more than 100m and shared with a 30m bus zone at the southern end, and informal unsealed (gravel or grassed) parallel parking on the verge north of the general store. Parking on the eastern side of Federal Drive comprises from south to north: informal unsealed 90-degree angle parking, formal sealed 90-degree angle parking including 1 x accessible parking bay, more informal unsealed 90-degree angle parking shared with the bus zone, and informal sealed parallel parking up to Roses Road.

1.3 Site Inspection

A site inspection was carried out on the afternoon of Tuesday 7/12/2021. Observations included:

- High pedestrian activity, including locals and tourists accessing the shops, cafes and parklands.
- Available formal and informal parking well-utilised.
- Informal road cross section including unsealed gravel parking/verges offering poor amenity.
- No obvious pedestrian crossing point.
- Poor connectivity for pedestrians (i.e. existing footpaths disjointed).
- Many vehicles making U-turns within the carriageway.
- Lots of vehicles parked within the two bus zones.

1.4 Information Provided by the Client

Council provided the team with the following documents to assist with understanding the site and the background of the project:

- Federal Village Masterplan – Movement Study (May 2021, Federal Village Masterplan Steering Committee)
- Federal Village Masterplan – Vision, Principles, Character Statement and Actions (Final draft), (November 2021, Federal Village Masterplan Steering Committee)
- Federal Drive Concept Plan (November 2021, Better Cities Group in collaboration with the Federal Village Masterplan Group)
- Federal Main Street – Background Slides for GeoLINK (December 2021, Council)

The latter document includes the following pertinent information:

- Existing traffic on Federal Drive at 1,863 vehicles per day with an average speed of 46 km/h
- 60-170 pedestrians crossing the street per hour
- Cars parking in bus zones (currently 2 x 30m bus zones, one on either side of Federal Drive)
- 14 school buses per weekday, with 6 buses at 8:00 AM peak and 4 buses at 4:15 PM peak
- Buses make 2 x three-point-turns at the Binna Burra Road intersection each weekday
- Buses make 5-6 x three-point-turns at the Roses Road intersection each weekday
- Currently no bus movements at Coachwood Court.

Table 1.1 Draft Concept Design Plans Audited

Plan Title	Date
Concept Plan: Plan 1 – Layout	November 2021
Concept Plan: Plan 1 – Section AA Federal Drive	November 2021
Concept Plan: Plan 1 – Illustrative Perspective	November 2021
Concept Plan: Plan 2 – Layout	November 2021
Concept Plan: Plan 2 – Section BB Federal Drive	November 2021
Concept Plan: Plan 3 – Layout	November 2021



1.5 Proposed Works

The proposal aims to meet the following project objectives:

- Improve general pedestrian safety by reducing the overall traffic speed.
- Provide safe and accessible pedestrian connections between the shop-side and park-side of the main street, creating a safe space for pedestrians on both sides of the main street and reduce the number of people walking on the road.
- Improve accessibility so that people with a disability or people with mobility restrictions can easily move about the main street and feel safe and included.
- Provide a formalised bus zone and shelter in an optimal location improving safety and accessibility.
- Provide safer and more legible car parking options with limited net loss of spaces.
- Provide options for safer U-turns for cars and buses away from the village centre.
- Retain and enhance the features that set the look and feel of the main street
- Provide a consistent landscape character for the main street that offers shade and amenity
- Create informal places for people to socialise in the street.

The primary focus of the design is to separate and formalise bus, passenger vehicle and pedestrian movements within the village centre, to be achieved by providing facilities for buses to make the necessary U-turns required by the bus routes away from the high-pedestrian activity area.

In general, the works will include the following:

- Construction of 'mini-roundabout' at the intersection of Binna Burra Road and Federal Drive, designed to allow small and medium vehicles to turn, but prevent buses from making a U-turn.
- Construction of 'mini-roundabout' at the Roses Road intersection allowing small and medium vehicles to U-turn, while preventing buses from U-turning.
- Upgrade of the Coachwood Court and Federal Drive T-intersection to better facilitate bus U-turns.
- Introduction of 30 km/h High Pedestrian Activity Area on Federal Drive between Binna Burra Road and Coachwood Court, including signage and on-road thresholds at either end
- Construction of footpaths (1.5m min. width) on both sides of Federal Drive, continuously between Binna Burra Road and Coachwood Court.
- Provision of a zebra crossing in accordance with the relevant standards linking the shop-side of the street at the general store to the parkland and parking, in addition to 2 x informal crossing blisters (one opposite Federal Hall and one opposite the Moonshine Coffee Roasters Café).
- Construction of a retaining wall along the frontage of the vacant private block to manage the level difference between the proposed footpath and the land to the east.
- Works to narrow the throat at Roses Road to improve pedestrian linkage to/from Jasper Corner.
- Construction of a number of 'informal gathering spaces', including seating, gardens, and links to footpaths.
- Provision of secure bike/scooter storage.
- Formalising parking to provide a mix of parallel and 90-degree parking bays on both sides of Federal Drive, including kerbs, linemarking, bollards (as required) and links to adjacent footpaths.
- Provision of formalise 90-degree parking on Roses Road and Coachwood Court.
- Replacing the 2 x existing bus zones with formalised parking and constructing a new 40m single bus zone and bus shelter on the eastern side of Federal Drive just south of Roses Road. The new bus zone will be paved/sealed, clearly linemarked and adjacent to an accessible footpath. As per the current situation, parallel parking will be allowed outside of the bus times.

In addition to the proposed works as detailed in the Concept Design Plan set, it was agreed that the SSA would consider the following alternative design options:

1. Coachwood Court and Federal Drive intersection:
 - a) to be upgraded to a roundabout allowing for buses to U-turn; OR
 - b) to be upgraded to allow for buses to U-turn while remaining as a T-intersection.
2. Bus zones:
 - a) to remain in their current locations;
 - b) to be relocated to the north of the village centre (one on either side of the road); OR
 - c) to be relocated / consolidated to the eastern side of the road only, as per the plans.




Figure 1.3 Bus Zone Design Alternatives [source: Council]

1.6 Road Safety Audit Findings

The RSA (GeoLINK, Dec. 2021) carried out on the concept design identified a number of deficiencies, providing each with a risk rating. The findings and recommendations are summarised below.

Table 1.2 RSA findings

Audit findings	Recommended action
1, 2, 3, 5	<p>It is recommended that proposed informal blister pedestrian crossing points be designed to provide clear sight distances for pedestrians (inc. children and people in wheelchairs) and drivers (incl. passenger vehicles, trucks and buses).</p> <p>It is also recommended that the proposed formal crossing point – the zebra crossing – be easily seen and accessible from anywhere within the village centre, such that pedestrians are aware that they have the option to cross with priority.</p>
4	<p>It is recommended that the detailed design ensures the 'gathering spaces' proposed at either end of the zebra crossing allow sufficient space to encourage pedestrians, including parents with prams, people in wheelchairs etc. to cross at this safer location unimpeded by groups of people.</p>
6	<p>It is recommended that the detailed design of the low walls, seating and other landscape features proposed close to the roadway considers the offset from the travel lanes, with a recommended 1.0 metre minimum separation from the edgelines to non-frangible objects.</p>



Audit findings	Recommended action
7	<p>Due to the existing geometry including the downhill gradient of the Federal Drive southbound approach to the Coachwood Court intersection and the priority of traffic on Federal Drive, it is recommended that the intersection of Coachwood and Federal Drive be upgraded to a roundabout. Thus, buses U-turning at this location would have priority over southbound traffic on Federal Drive. Additionally, southbound traffic will be required to slow down in order to navigate the roundabout, which will have further safety benefits for the village.</p> <p>If a roundabout is not feasible, then it is recommended that works be undertaken to ensure 12.5m heavy rigid vehicles (buses, garbage trucks, fire trucks etc.) can easily make the U-turn at the intersection within the roadway. Signage should also be installed to the north of the intersection to indicate to southbound Federal Drive motorists that a 30 km/h High Pedestrian Activity Zone is ahead and they should reduce their speed accordingly.</p>
8	<p>From a road safety perspective, for this location it is recommended that the bus zones be relocated outside the main centre of the village. Alternative Design Options 2b and 2c (as outlined in Section Error! Reference source not found.) both meet this recommendation.</p> <p>A single, consolidated bus zone (Option 2c) is considered to offer a higher level of safety in this case, but focusing the pick-up and drop-off activity to a single location. The proposed location is at the northern end of the village but still within an easy walking distance to the pedestrian crossing. This option also appears to allow for the provision of additional parking bays.</p> <p>If not already considered, it is recommended that the option of relocating the bus bay(s) onto Binna Burra Road either side of the Federal Drive intersection be investigated, as this is expected to remove several bus movements from Federal Drive.</p>
9	<p>Bollards, wheelstops or similar are recommended between all 90-degree parking bays and footpaths to prevent encroachment by vehicles into the footway.</p> <p>It is also recommended that the location of parallel parking bays adjacent to footpaths be considered, such that sufficient space is required for opening car doors and passing pedestrians.</p>
10	<p>It is understood that there is a possibility that the overhead powerlines may be replaced by underground electricity cabling. Such works, although likely to be expensive, are supported from a road safety perspective as it will result in the removal of several non-frangible objects from within the clear zone of the roadway.</p> <p>If the power poles are to stay, it is recommended that consideration be given to their proximity to the edge of the travel lanes and whether protection (reflective markers, guard rail etc.) or relocation of individual poles is warranted.</p>
-	<p>It is recommended that another RSA be undertaken at the detailed design stage of this project.</p>

Note that audit findings are colour coded according to the risk ranking determined in the RSA for the design as per the concept design plans: Low, Medium, High. Note also that these rankings are likely to improve (i.e. drop) with application of the agreed actions tabled above.

2. Safe System Assessment

2.1 Safe System Assessment Framework (SSAF)

The 'Safe System' (SS) approach is an internationally recognised holistic methodology. The key principles underpinning the SS approach are:

- People make mistakes. Humans will continue to make mistakes, and the transport system must accommodate these. The transport system should not result in death or serious injury because of errors on the roads.
- Human physical frailty. There are known physical limits to the amount of force our bodies can take before we are injured.
- A 'forgiving' road transport system. A SS ensures that the forces in collisions do not exceed the limits of human tolerance. Speeds must be managed so that humans are not exposed to impact forces beyond their physical tolerance. System designers and operators need to consider the limits of the human body in designing and maintaining roads, vehicles and speeds.
- Inclusive view of the whole road transport system and the interactions between all elements: roads and roadsides, vehicles, travel speeds and all users of the system.

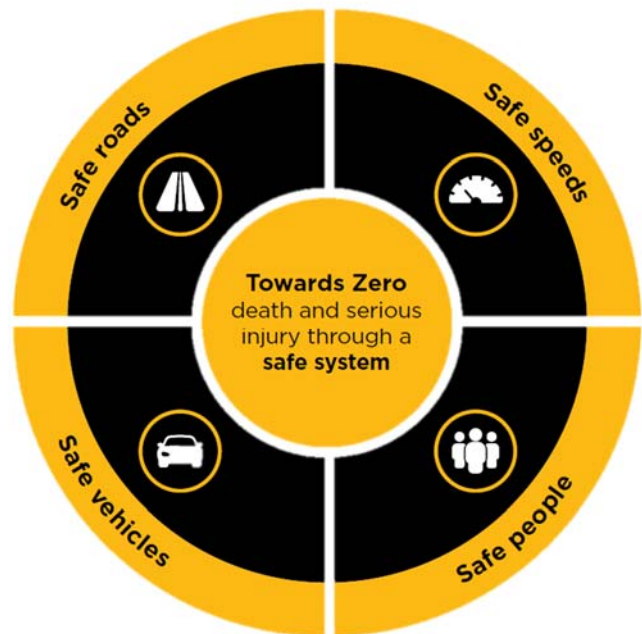


Figure 2.1 The Safe System
[Source: Transport for NSW, 2018]

SS principles recognise that human error in the road environment is inevitable and that road infrastructure should accommodate this error and minimise the consequences. The aim is to eliminate any crash resulting in a fatality or serious injury (FSI) by implementing:

- Safer roads
- Safer vehicles
- Safer road users
- Safer speeds

The *National Road Safety Strategy 2011-2020* (Australian Transport Council, 2011) and the *NSW Road Safety Strategy 2012-2021* (Transport for NSW, 2012) outline a commitment to the adoption and implementation of the SS approach. As a result of this, it is now expected that road safety processes and procedures, including RSAs, be implemented to ensure a high alignment with the SS principles.

While RSAs are proven to reduce road trauma (AGRS06, 2019), they have traditionally focused on a safety-in-design approach and identifying risks and hazards associated with all crash types and severities. However, the SS approach aims to prioritise eliminating FSI crashes.

The SSAF was developed by Austroads to facilitate the incorporation of SS objectives in all road infrastructure and traffic management projects. A SSA is a proactive tool within the framework which uses a matrix to ensure consistent consideration of major crash types and prompts an assessment of crash severity, road user exposure and crash likelihood as they apply to each crash type. It can be carried out on a wide variety of project types and at any stage across the lifespan of a project (planning, design, operation and maintenance).

The main stages of the SSAF are:

- Identification of objectives
- Setting the context
- Applying the SS matrix
- Applying a treatment hierarchy and selection process (not required for this assessment)

The depth of assessment and analysis in a SSA should reflect the project size, complexity and risk of FSI crashes.

The intention of identifying the project context as per **Table 2.1** is to ensure that each aspect of the SS is considered as part of the system (refer **Figure 2.1**).

Table 2.1 Project context

Prompt	Comments
Reason for the project	Improve safety (esp. for pedestrians), efficiency (esp. for buses) and amenity on Federal Drive within the study area, between Binna Burra Rd. and Coachwood Crt.
Function of the road	Rural minor arterial linking rural townships. Main street of small rural village, popular with tourists.
Speed environment	50 km/h. Recorded average speed of 46 km/h.
Road users	Residents of Federal and surrounds, school buses, parents dropping off / picking up school children, tourists, pedestrians.
Vehicle composition	Passenger vehicles, school buses, and low percentage of heavy vehicles Pedestrians accessing shops on western side and car parking, open space parkland on eastern side (i.e. lots of pedestrians crossing the road within the study area)

2.2 Safe System Matrix

In order to ensure that SS elements are considered, or to measure how well a given project aligns with SS principles, a SS matrix has been produced. The purpose of the matrix is to assess major crash types identified as the predominant contributors to FSI outcomes against the exposure to that crash risk, the likelihood of it occurring and the severity of the crash should it occur.

Exposure, likelihood and severity (the rows of the matrix) are defined by Austroads as follows:

- **Road user exposure:** this refers to which road users, in what numbers and for how long they are using the road and are thus exposed to a potential crash. The measures of exposure include AADT, side-road traffic volumes, number of motorcycles, cyclists and pedestrians crossing or walking along the road, length of the road, area and length of time.

- **Crash likelihood:** groups of factors affecting the probability of a crash occurring. They can be elements which moderate opportunity for conflict, such as the number of conflict points, offset to roadside hazards, and separation between opposing traffic. They can also include elements of road user behaviour and/or road environment. Typically, these are the elements which moderate road user error rates. This includes issues such as level of intersection control (e.g. priority/signals/movement ban), speed, sight distance, geometric alignment, driver guidance and warning, and maintenance.
- **Crash severity:** groups of factors affecting the probability of severe injury outcomes should a crash occur. Typically, these factors are associated with the amount of kinetic energy and its transfer in the crash, e.g. impact speeds and angles, severity of roadside hazards.

The matrix columns show the following major crash types:

- Run-off-road (also referred to as 'loss of control', or 'off path on curve/straight')
- Head-on (or 'vehicles from opposing directions')
- Intersection ('vehicles from adjacent directions')
- Other (this incorporates all same direction, manoeuvring, overtaking, on path and other crashes)
- Pedestrian
- Cyclist
- Motorcyclist

A score between zero and four (0-4) is subjectively determined for each cell based on site specific information available at the time of assessment. Zero indicates full alignment with the SS objectives for that component of the risk (exposure, likelihood or severity) for the given crash type or the absence of that category (e.g. no pedestrians). The higher the score, the further away the project is from SS principles. Comments providing a rationale for each score are also provided where deemed appropriate.

Once a score is provided in each cell, the product of each column is calculated and entered in the final row. The purpose of this multiplicative approach is that if a score of zero has been given for any component of a crash type (i.e. exposure, likelihood or severity), that crash type receives a total of zero and is eliminated from the score (as it has reached a SS condition).

The Austroads guidelines suggest that a project with a crash type score of less than 16 can be considered highly aligned with the SS for that crash type. A design can be considered moderately aligned between 16 and 32, and poorly aligned above 32.

The sum of the scores for each crash type is added to calculate the total SSAF score out of a possible 448. It represents the contribution of 'safe speeds' and 'safe roads/roadsides' to the SS for the project.

Total SSAF scores of less than 112 are considered highly aligned, 112 to 224 are considered moderately aligned, and above 224 are considered poorly aligned.

The focus of the SS matrix is on the assessment of infrastructure, and as such, more attention is given to road and roadside infrastructure and vehicle speeds. The road users and vehicle types involved are also considered along with post-crash care, however in many cases, road user and vehicle-related changes will be outside the scope of the project.

A SS Assessment Matrix has been prepared for the existing study area (**Table 2.2**). It has then been reproduced (**Tables 2.3 to 2.6**) to assess the proposed upgrade works as per the Better Cities Group concept design plans and the design alternatives listed in **Section 1.4**, allowing comparison of the 'before' and 'after' scenarios. Note Options 2b and 2c have been grouped together as it is considered both options will return a similar score.

The matrices highlight in **red** where the assessment differs from the baseline (existing) case.

Table 2.2 SSA Matrix – Existing conditions

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclists	Motorcyclist
<i>Road User Exposure</i>	2 / 4	2 / 4	4 / 4	2 / 4	4 / 4	2 / 4	2 / 4
<i>Crash Likelihood</i>	1 / 4	2 / 4	4 / 4	3 / 4	4 / 4	3 / 4	3 / 4
<i>Crash Severity</i>	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	3 / 4	3 / 4
Product	4 / 64	8 / 64	32 / 64	12 / 64	48 / 64	18 / 64	18 / 64

Total SSAF Score = 140 / 448

SS Component	Comment
<i>Road users</i>	<ul style="list-style-type: none"> High volume of all road user groups. AADT between 1,500 and 2,000 vehicles per day. Driver fatigue unlikely due to the surrounding road network characteristic (e.g. speed zone, intersections, curves, topography). Special road users include a high volume of travellers – unfamiliar with the area and likely to be unpredictable. Special road users also include school children, with a high volume of school buses picking-up and dropping-off children each day. Speeding possible for through traffic outside of peak hours. Numerous distractions in roadside environment – signs, advertising, pedestrians etc. Frequently changing carriageway cross section. Pedestrians observed crossing at multiple / convenient locations Buses and cars making U-turns within the roadway
<i>Vehicles</i>	<ul style="list-style-type: none"> Relatively low percentage of heavy vehicles (under 5%) Up to 14 school buses per day stop to pick up and drop off school children, with several buses making a U-turn within the study area. Parking available on both sides of Federal Drive, mostly informal and mostly unsealed. Registration of vehicles in NSW requires annual vehicle safety checks, however the area attracts tourists from other states without this law.
<i>Post-crash care</i>	<ul style="list-style-type: none"> Sufficient space within carriageway to allow access by emergency vehicles, however emergency vehicles may be impeded by parked cars etc. Hospital and ambulance station location in Ewingsdale, ~15 mins. travel distance. Lismore Base Hospital ~30 mins. travel distance. Bangalow Fire and Rescue depot is 16 mins. travel distance, while fire and rescue depots in Brunswick Heads and Byron Bay ~25 mins. away. Bangalow Police Station is 17 mins. travel distance, while police stations in Brunswick Heads, Byron Bay and Lismore are 23-27 mins. away. Westpac Life Saver Rescue Helicopter operates in the area. VMS (variable message signs) available for deployment and broadcasts on local radio stations possible to warn road users of an incident.

Table 2.3 SSA Matrix – Proposed upgrade – Options 1a and 2a (Roundabout at Coachwood Court, no change to bus zones)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclists	Motorcyclist
<i>Road User Exposure</i>	2 / 4	2 / 4	2 / 4	1 / 4	3 / 4	2 / 4	2 / 4
<i>Crash Likelihood</i>	1 / 4	2 / 4	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4
<i>Crash Severity</i>	2 / 4	1 / 4	1 / 4	1 / 4	3 / 4	2 / 4	2 / 4
Product	4 / 64	4 / 64	4 / 64	2 / 64	27 / 64	8 / 64	8 / 64

Total SSAF Score = **57 / 448**

SS Component	Comment
<i>Road users</i>	<ul style="list-style-type: none"> High volume of all road user groups. AADT between 1,500 and 2,000 vehicles per day. Driver fatigue unlikely due to the surrounding road network characteristic (e.g. speed zone, intersections, curves, topography). Special road users include a high volume of travellers – unfamiliar with the area and likely to be unpredictable. Special road users also include school children, with a high volume of school buses picking-up and dropping-off children each day. Speeding possible for through traffic outside of peak hours. Numerous distractions in roadside environment – signs, advertising, pedestrians etc. Frequently changing carriageway cross section. Pedestrians observed crossing at multiple / convenient locations Cars making U-turns within the roadway
<i>Vehicles</i>	<ul style="list-style-type: none"> Relatively low percentage of heavy vehicles (under 5%) Up to 14 school buses per day stop to pick up and drop off school children. Buses no longer making U-turns with the high-pedestrian activity area. Parking available on both sides of Federal Drive, formalised and sealed. Registration of vehicles in NSW requires annual vehicle safety checks, however the area attracts tourists from other states without this law.
<i>Post-crash care</i>	<ul style="list-style-type: none"> Sufficient space within carriageway to allow access by emergency vehicles. Formalised carriageway will make it less likely for informal parking impeding emergency vehicle passage. Hospital and ambulance station location in Ewingsdale, ~15 mins. travel distance. Lismore Base Hospital ~30 mins. travel distance. Bangalow Fire and Rescue depot is 16 mins. travel distance, while fire and rescue depots in Brunswick Heads and Byron Bay ~25 mins. away. Bangalow Police Station is 17 mins. travel distance, while police stations in Brunswick Heads, Byron Bay and Lismore are 23-27 mins. away. Westpac Life Saver Rescue Helicopter operates in the area. VMS (variable message signs) available for deployment and broadcasts on local radio stations possible to warn road users of an incident.

Table 2.4 SSA Matrix – Proposed upgrade – Options 1b and 2a (Updated T-intersection at Coachwood Court, no change to bus zones)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclists	Motorcyclist
<i>Road User Exposure</i>	2 / 4	2 / 4	3 / 4	1 / 4	3 / 4	2 / 4	2 / 4
<i>Crash Likelihood</i>	1 / 4	2 / 4	3 / 4	3 / 4	3 / 4	2 / 4	2 / 4
<i>Crash Severity</i>	2 / 4	1 / 4	2 / 4	1 / 4	3 / 4	2 / 4	2 / 4
Product	4 / 64	4 / 64	18 / 64	3 / 64	27 / 64	8 / 64	8 / 64

Total SSAF Score = 72 / 448

SS Component	Comment
<i>Road users</i>	<ul style="list-style-type: none"> High volume of all road user groups. AADT between 1,500 and 2,000 vehicles per day. Driver fatigue unlikely due to the surrounding road network characteristic (e.g. speed zone, intersections, curves, topography). Special road users include a high volume of travellers – unfamiliar with the area and likely to be unpredictable. Special road users also include school children, with a high volume of school buses picking-up and dropping-off children each day. Speeding possible for through traffic outside of peak hours. Numerous distractions in roadside environment – signs, advertising, pedestrians etc. Frequently changing carriageway cross section. Pedestrians observed crossing at multiple / convenient locations Cars making U-turns within the roadway
<i>Vehicles</i>	<ul style="list-style-type: none"> Relatively low percentage of heavy vehicles (under 5%) Up to 14 school buses per day stop to pick up and drop off school children. Buses no longer making U-turns with the high-pedestrian activity area. Parking available on both sides of Federal Drive, formalised and sealed. Registration of vehicles in NSW requires annual vehicle safety checks, however the area attracts tourists from other states without this law.
<i>Post-crash care</i>	<ul style="list-style-type: none"> Sufficient space within carriageway to allow access by emergency vehicles. Formalised carriageway will make it less likely for informal parking impeding emergency vehicle passage. Hospital and ambulance station location in Ewingsdale, ~15 mins. travel distance. Lismore Base Hospital ~30 mins. travel distance. Bangalow Fire and Rescue depot is 16 mins. travel distance, while fire and rescue depots in Brunswick Heads and Byron Bay ~25 mins. away. Bangalow Police Station is 17 mins. travel distance, while police stations in Brunswick Heads, Byron Bay and Lismore are 23-27 mins. away. Westpac Life Saver Rescue Helicopter operates in the area. VMS (variable message signs) available for deployment and broadcasts on local radio stations possible to warn road users of an incident.

Table 2.5 SSA Matrix – Proposed upgrade – Options 1a and 2b/c (Roundabout at Coachwood Court, relocated/consolidated bus zones)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclists	Motorcyclist
<i>Road User Exposure</i>	2 / 4	2 / 4	2 / 4	1 / 4	3 / 4	2 / 4	2 / 4
<i>Crash Likelihood</i>	1 / 4	2 / 4	2 / 4	1 / 4	2 / 4	2 / 4	2 / 4
<i>Crash Severity</i>	2 / 4	1 / 4	1 / 4	1 / 4	3 / 4	2 / 4	2 / 4
Product	4 / 64	4 / 64	4 / 64	1 / 64	18 / 64	8 / 64	8 / 64

Total SSAF Score = **47 / 448**

SS Component	Comment
<i>Road users</i>	<ul style="list-style-type: none"> High volume of all road user groups. AADT between 1,500 and 2,000 vehicles per day. Driver fatigue unlikely due to the surrounding road network characteristic (e.g. speed zone, intersections, curves, topography). Special road users include a high volume of travellers – unfamiliar with the area and likely to be unpredictable. Special road users also include school children, with a high volume of school buses picking-up and dropping-off children each day. Speeding possible for through traffic outside of peak hours. Numerous distractions in roadside environment – signs, advertising, pedestrians etc. Frequently changing carriageway cross section. Pedestrians observed crossing at multiple / convenient locations Cars making U-turns within the roadway Improved separation of buses / bus use and other activities (pedestrians crossing roads, cars parking etc.)
<i>Vehicles</i>	<ul style="list-style-type: none"> Relatively low percentage of heavy vehicles (under 5%) Up to 14 school buses per day stop to pick up and drop off school children. Buses no longer making U-turns with the high-pedestrian activity area. Parking available on both sides of Federal Drive, formalised and sealed. Registration of vehicles in NSW requires annual vehicle safety checks, however the area attracts tourists from other states without this law.
<i>Post-crash care</i>	<ul style="list-style-type: none"> Sufficient space within carriageway to allow access by emergency vehicles. Formalised carriageway will make it less likely for informal parking impeding emergency vehicle passage. Hospital and ambulance station location in Ewingsdale, ~15 mins. travel distance. Lismore Base Hospital ~30 mins. travel distance. Bangalow Fire and Rescue depot is 16 mins. travel distance, while fire and rescue depots in Brunswick Heads and Byron Bay ~25 mins. away. Bangalow Police Station is 17 mins. travel distance, while police stations in Brunswick Heads, Byron Bay and Lismore are 23-27 mins. away. Westpac Life Saver Rescue Helicopter operates in the area. VMS (variable message signs) available for deployment and broadcasts on local radio stations possible to warn road users of an incident.

Table 2.6 SSA Matrix – Proposed upgrade – Options 1b and 2b/c (Upgraded T-intersection at Coachwood Court, relocated/consolidated bus zones)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclists	Motorcyclist
<i>Road User Exposure</i>	2 / 4	2 / 4	3 / 4	1 / 4	3 / 4	2 / 4	2 / 4
<i>Crash Likelihood</i>	1 / 4	2 / 4	3 / 4	2 / 4	2 / 4	2 / 4	2 / 4
<i>Crash Severity</i>	2 / 4	1 / 4	2 / 4	1 / 4	3 / 4	2 / 4	2 / 4
Product	4 / 64	4 / 64	18 / 64	2 / 64	18 / 64	8 / 64	8 / 64

Total SSAF Score = 62 / 448

SS Component	Comment
<i>Road users</i>	<ul style="list-style-type: none"> High volume of all road user groups. AADT between 1,500 and 2,000 vehicles per day. Driver fatigue unlikely due to the surrounding road network characteristic (e.g. speed zone, intersections, curves, topography). Special road users include a high volume of travellers – unfamiliar with the area and likely to be unpredictable. Special road users also include school children, with a high volume of school buses picking-up and dropping-off children each day. Speeding possible for through traffic outside of peak hours. Numerous distractions in roadside environment – signs, advertising, pedestrians etc. Frequently changing carriageway cross section. Pedestrians observed crossing at multiple / convenient locations Cars making U-turns within the roadway Improved separation of buses / bus use and other activities (pedestrians crossing roads, cars parking etc.)
<i>Vehicles</i>	<ul style="list-style-type: none"> Relatively low percentage of heavy vehicles (under 5%) Up to 14 school buses per day stop to pick up and drop off school children. Buses no longer making U-turns with the high-pedestrian activity area. Parking available on both sides of Federal Drive, formalised and sealed. Registration of vehicles in NSW requires annual vehicle safety checks, however the area attracts tourists from other states without this law.
<i>Post-crash care</i>	<ul style="list-style-type: none"> Sufficient space within carriageway to allow access by emergency vehicles. Formalised carriageway will make it less likely for informal parking impeding emergency vehicle passage. Hospital and ambulance station location in Ewingsdale, ~15 mins. travel distance. Lismore Base Hospital ~30 mins. travel distance. Bangalow Fire and Rescue depot is 16 mins. travel distance, while fire and rescue depots in Brunswick Heads and Byron Bay ~25 mins. away. Bangalow Police Station is 17 mins. travel distance, while police stations in Brunswick Heads, Byron Bay and Lismore are 23-27 mins. away. Westpac Life Saver Rescue Helicopter operates in the area. VMS (variable message signs) available for deployment and broadcasts on local radio stations possible to warn road users of an incident.

3. Conclusions

The existing road and road-related infrastructure within the Federal Drive study area between Binna Burra Road and Coachwood Court has been assessed to be **moderately** aligned with the Safe System Assessment Framework in accordance with the relevant Austroads road safety guidelines (2019) and the Austroads research report, *Safe System Assessment Framework* (2016).

The existing section of road achieves a SSAF score of 140 out of 448.

The assessment carried out for the proposed upgrade works including the design options indicates that the proposal will improve the safety of the study area, as per the table below.

Table 3.1 Summary of results

Design Option	Reference	SSA Score	Alignment with SSA Framework
Existing (no upgrade)	Table 2.2	140	Moderately aligned
1a and 2a	Table 2.3	57	Highly aligned
1b and 2a	Table 2.5	72	Highly aligned
1a and 2b/c	Table 2.4	47	Highly aligned
1b and 2b/c	Table 2.6	62	Highly aligned

1a = Coachwood Crt and Federal Dr intersection upgraded to include a roundabout allowing safe bus U-turns

1b = Coachwood Crt and Federal Dr intersection to remain as a T, but be upgraded to allow safe bus U-turns

2a = Bus zones to remain in their current locations

2b = Bus zones to be relocated to the north of the village centre (one on either side of the road)

2c = Bus zones to be relocated and consolidated to a single bus zone on the eastern side of Federal Drive

All design options are considered to be **highly** aligned with the SSAF.

The primary improvements contributing to the better scores include:

- Provision of better facilities for pedestrians, such as footpaths and designated crossing points.
- Provision of a pedestrian-priority (zebra) crossing.
- Formalising parking to remove potential confusion and awkward vehicle movements.
- Removing opportunity for vehicles to park on gravel areas, spreading gravel over the roadway.
- Reducing the speed and signposting as a 30 km/h High Pedestrian Activity Area.
- Provision of roundabouts to allow for safe U-turns.
- Pushing bus U-turns out of the busiest part of the village.



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Appendix A

Concept Design Drawing Set

Federal Drive CONCEPT PLAN

Prepared by Better Cities Group
on behalf of Byron Shire Council

November 2021



IN COLLABORATION WITH

Federal Village
MASTERPLAN

GROUP

CONCEPT PLAN

The concept plan seeks to reduce vehicle speeds through the heart of the village and provide an improved pedestrian environment. It has been developed to improve connection from the commercial side of the street to the park and in doing so foster social interaction, something which the street is loved for.

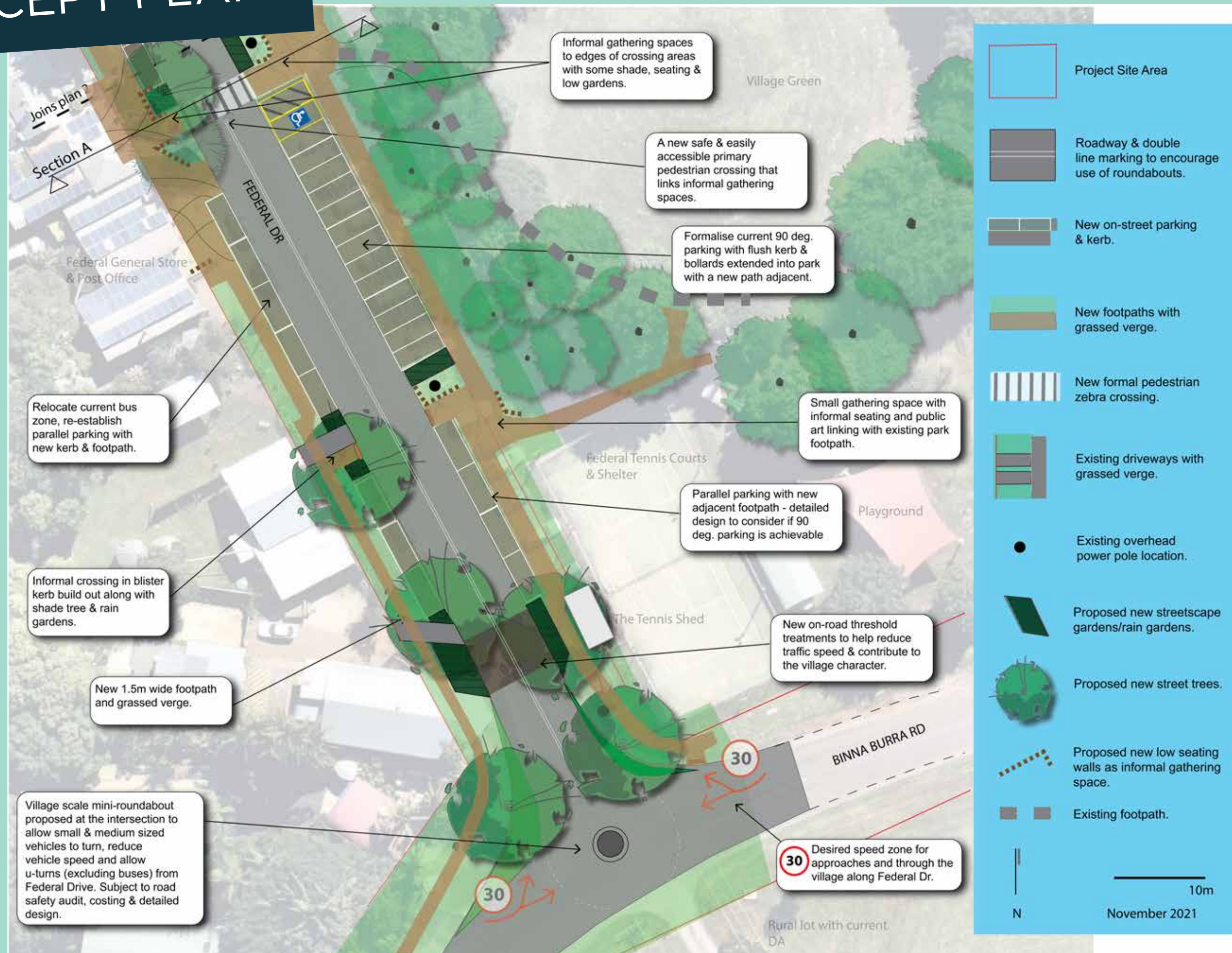
Significant effort has been taken to reduce u-turn movements and provide a safer environment for bus drop-offs. A key element of the concept is to improve accessibility around the street for people of all abilities.

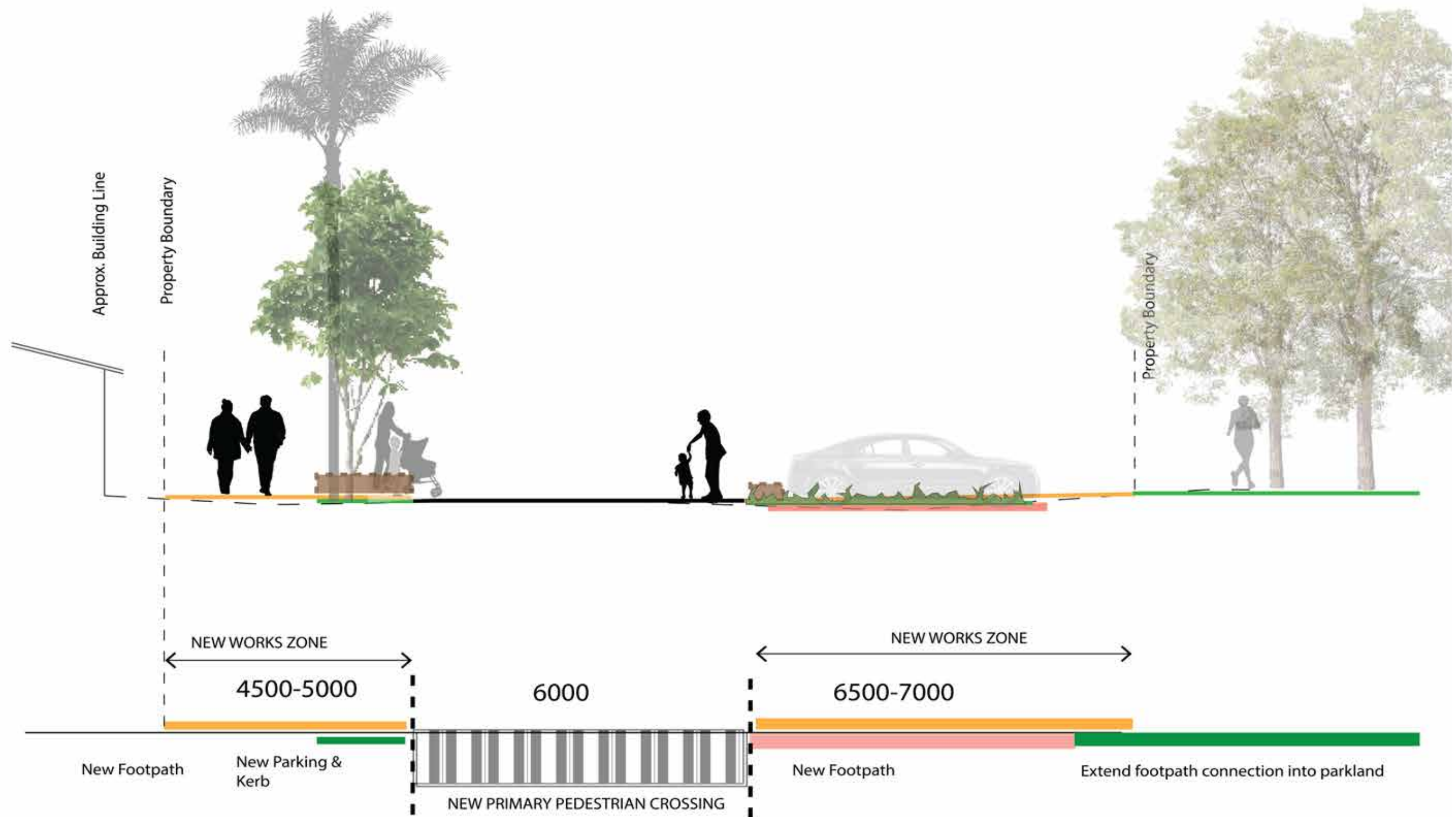
Finally, from a character perspective it is critical that the design capture the “tin and timber” setting and be responsive to the current relaxed nature and is “not too shiny”.



CONCEPT PLAN

PLAN 1





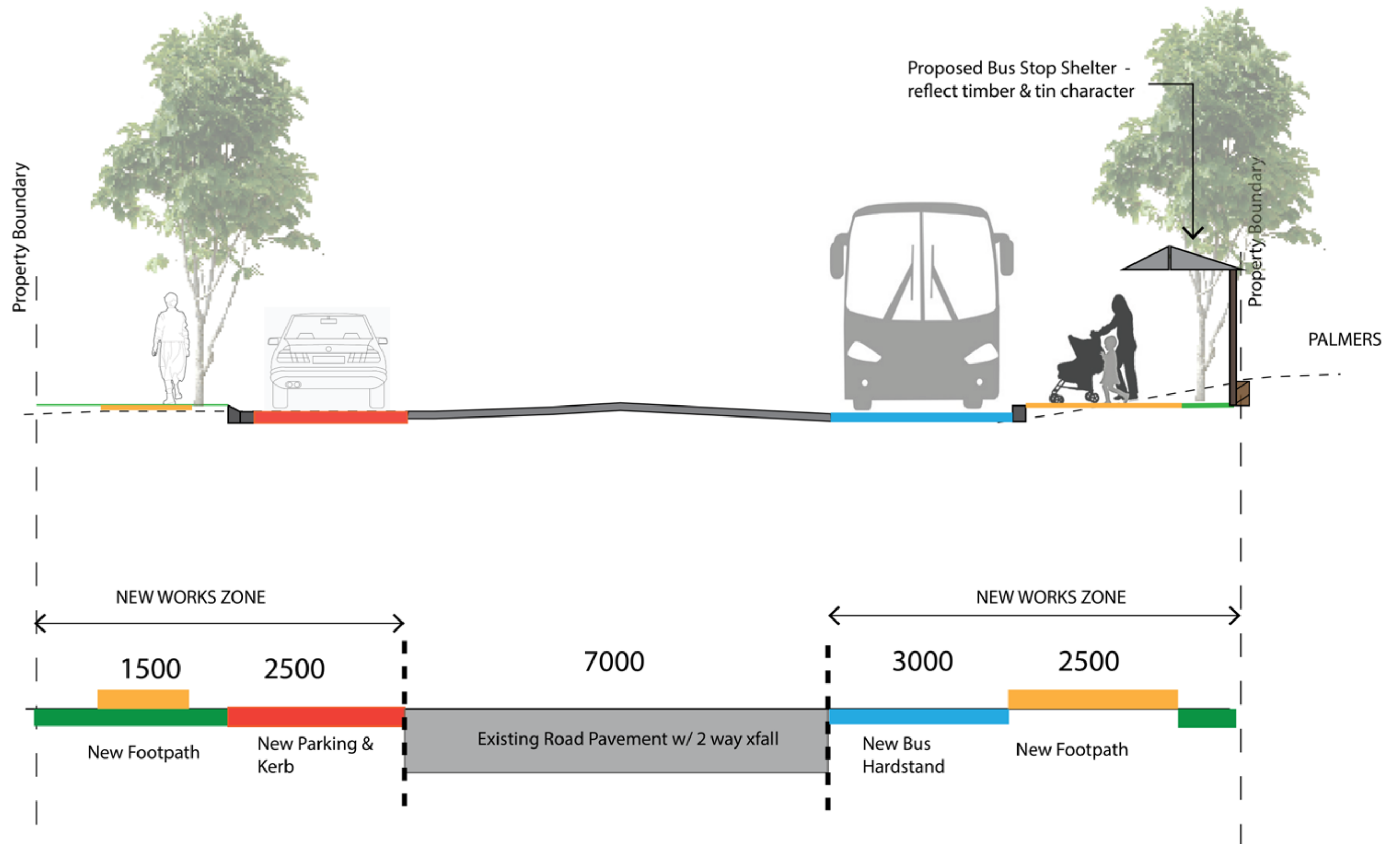
SECTION AA: FEDERAL DRIVE
General Store - Federal Drive - Park



ILLUSTRATIVE PERSPECTIVE
VIEW OF NEW CROSSING FROM PARK TO GENERAL STORE



PLAN 2



SECTION BB: FEDERAL DRIVE
Local Residential - Federal Drive - Palmers

CONCEPT PLAN

PLAN 3

