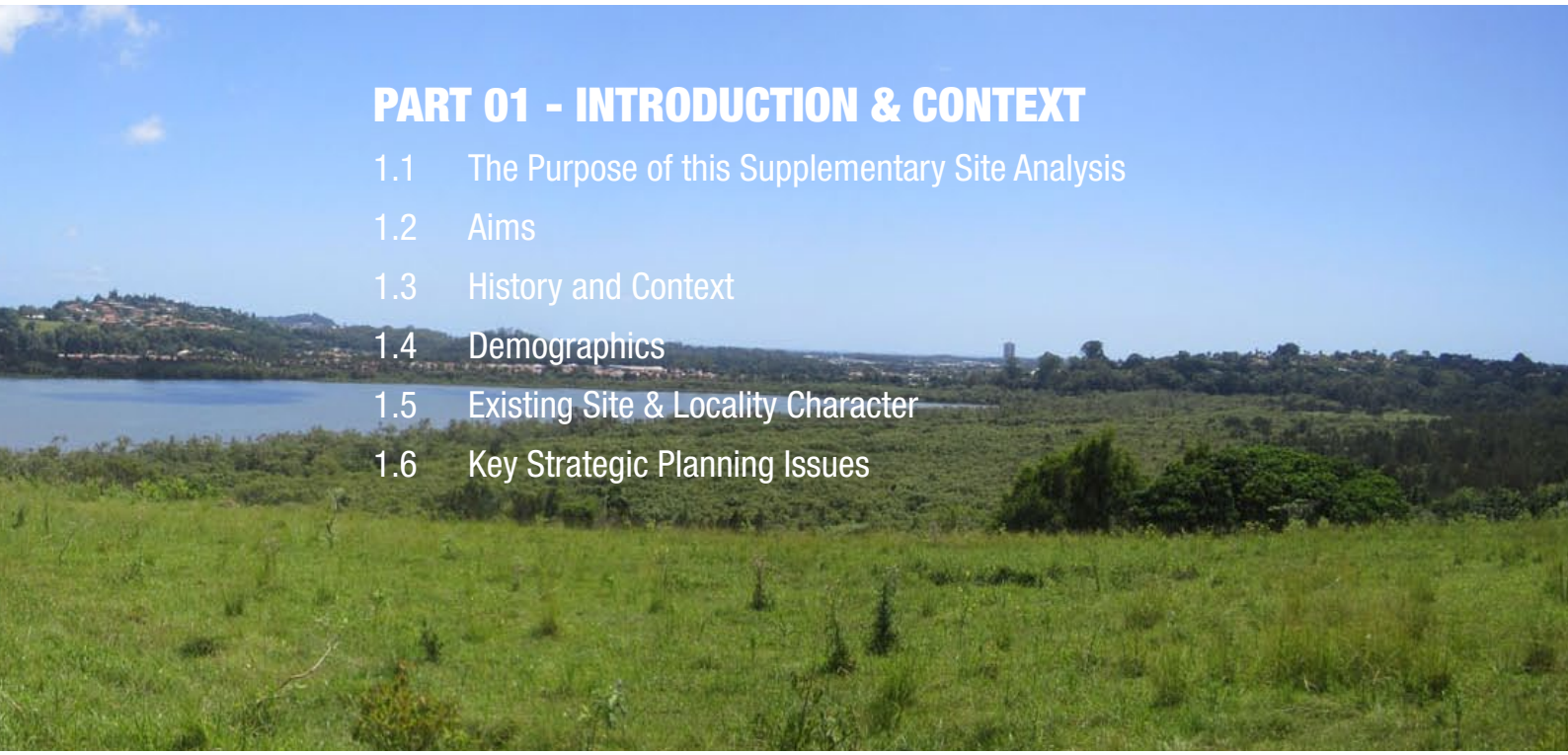
TWEED
SHIRE COUNCIL

Area E Urban Release Development Code

Supplementary Site Analysis

PART 01 - INTRODUCTION & CONTEXT

PART 02 - SITE ANALYSIS



PART 01 - INTRODUCTION & CONTEXT

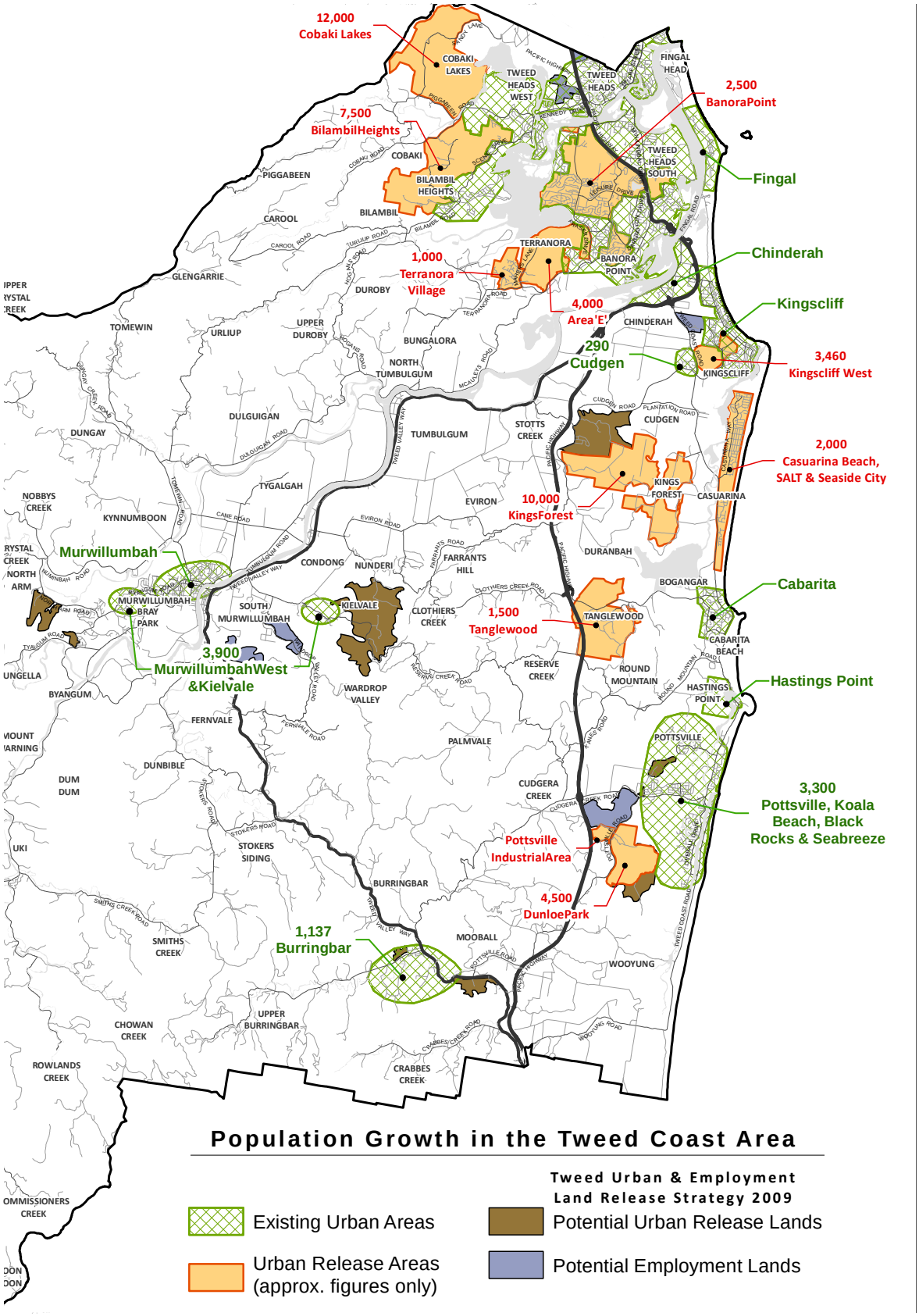


Figure 1.1 Regional Context & Future Growth
Area E represents one of the key urban growth areas within the Tweed Shire identified to accommodate population growth over the next 20 years Note: Numbers are indicative only

1.1 The Purpose of this Supplementary Site Analysis

This Supplementary Site Analysis (SSA) has been prepared in conjunction with, and to inform, Section B24 of the Tweed Development Control Plan - Area E Urban Release Development Code (the Code). The SSA is intended to compliment the Code by providing additional information relating to the existing context and physical characteristics of the site.

The SSA forms part of a strategic framework for guiding the future development of the Area E Urban Release Area, however does not contain any development control provisions. For development control matters, please refer to the Code.

1.2 Aims

The aims of the SSA are to:

1. Document the existing condition and contextual information of the Area E Urban Release Area;
2. Provide a basis for landowner driven on-ground survey and ground-truthing investigations;
3. Further identify the opportunities and constraints of the Area E Urban Release Area to assist in the preparation of the Code, future applications and their assessment;
4. Provide further linkages and discussion relating to the specific recommendations, design principles and strategies within the Code; and
5. To provide a context to the formulation and application of the development controls in the Code.

1.3 History and Context

The Area E Urban Release Area was identified in the 1991 Tweed Residential Development Strategy (TRDS) for urban residential development. The site was identified as 'Area E', alphabetically within the TRDS, a name that has carried through to the current planning for the site. In 2006 Area E was also identified within the NSW Far North Coast Regional Strategy for proposed future urban development.

Settlement of the Terranora area dates from the mid 1800s, with land used mainly for dairy farming and crop growing. Significant development did not occur until the 1970s, with substantial growth from the 1980s. Further growth took place from the early 1990s, with the population doubling between 1991 and 2006.

Locally, Area E sits as an infill area between the Banora Point and Terranora residential areas. Area E presents an opportunity to consolidate the urban footprint and is able to be readily serviced with the augmentation of existing infrastructure. Whilst

possessing land suitable for urban purposes, Area E also contains extensive areas of environmentally significant vegetation and State Environmental Planning Policy (SEPP) 14 wetlands. These attributes offer a unique opportunity to integrate high quality urban development with valued environmental land.

Area E forms one of the key urban growth areas for the Tweed Local Government Area as depicted in Figure 1.1 and represents one of the major areas to accommodate population growth over the next 20 years. Future development needs to respect the environmental attributes and existing urban fabric, whilst ensuring the efficient and orderly development and use of the land.

1.4 Demographics

At the 2006 census the Terranora area (including Area E) had a "place of usual residence" population of 2,670 persons, compared to 2,472 in 2001 and 1,905 persons in 1996. This represents an average annual growth rate of 3.3%.

Banora Point had a place of usual residence population of 8,800 in 1996, 11,168 in 2001 and 14,682 in 2006, and average annual growth of 5.5%. Based on these rates, Banora Point has sustained a growth rate higher than the Tweed average (3.75%) for over 10 years.

Population gowth to 2031, forcasts an average annual growth rate of 2.77% for Terranora, a slight decrease, and 0.35% for the combined Banora Point/ South Tweed Heads area. This represents a significant reduction in population increase for Banora as zoned urban land is taken up and residential settlement is completed.

Future development in Area E needs to have regard to the roles and functions of both 'settlements' and of the broader settlement pattern. Both subdivision and dwelling design will also need to be design responsive to ensure the services and houses provided are compatible with the changes in demographically driven demands, such as households for first home owners, empty nesters, aged, single parent and families.

1.5 Existing Site & Locality Character

Area E is located southwest of Tweed Heads and at the northern most point of Terranora. Regionally Area E is located approximately 7km south-west of Coolangatta Airport, approximately 7km south-west of Tweed Heads District Hospital and approximately 5km southwest of the Tweed City Shopping Centre at Tweed Heads South.

Area E is located at the eastern end of the McPherson Range, typically comprised of sub-coastal foothills. As a result, the topography of the site is undulating, with a dominant series of north-south oriented spurs and ridgelines. The dominant spurs are generally located in the vicinity of Mahers and Parkes Lanes, with Fraser Drive situated near the crest of another ridgeline forming the eastern perimeter of Area E.

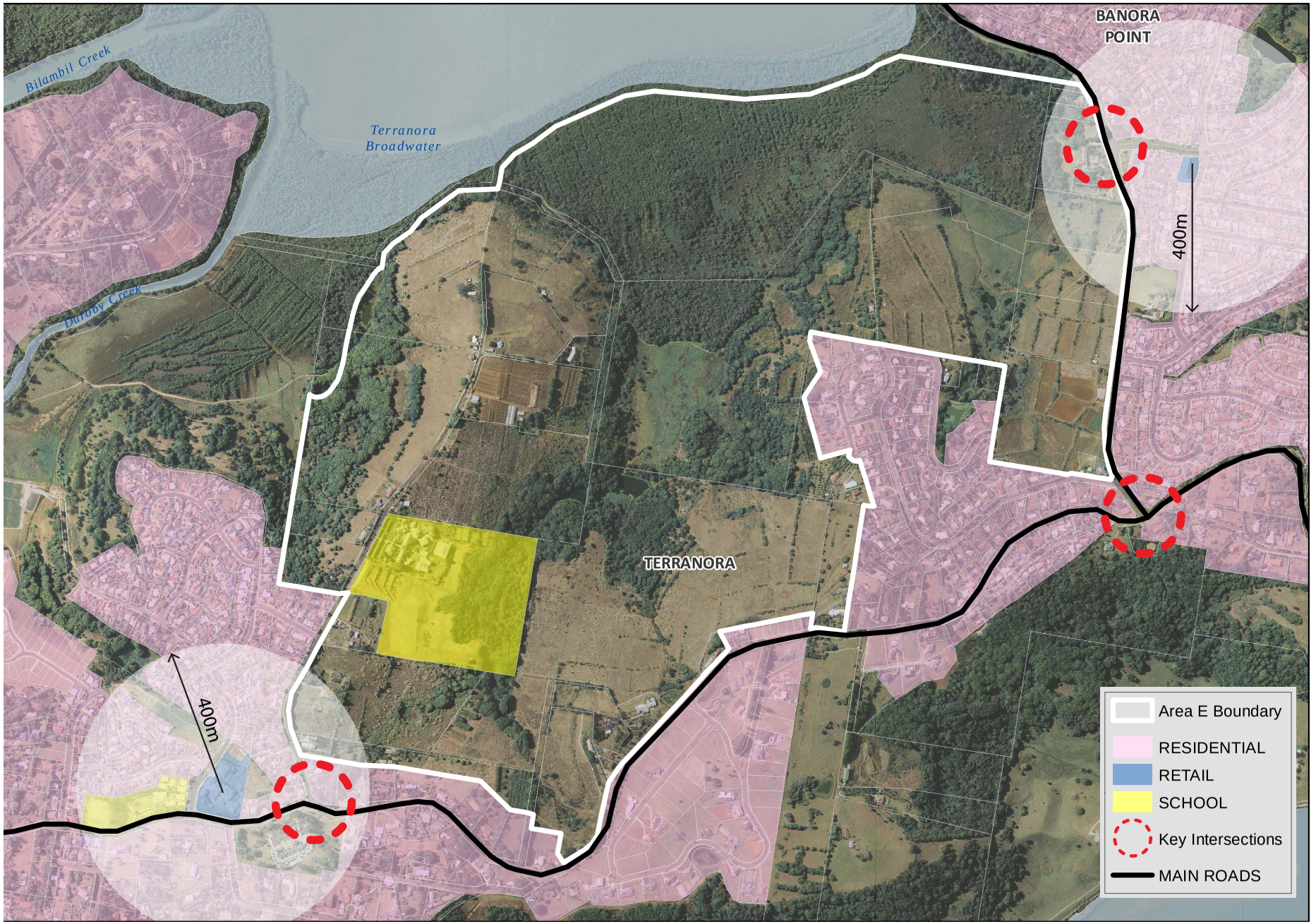


Figure 1.2 - Broad Components of the Surrounding Locality
This Figure illustrates the broad land use relationship with the sites surrounds.

A significant natural wetland on the Terranora Broadwater forms the northern boundary of Area E, providing a high quality visual aspect from all areas of the site. The wetland values of this area of land are recognised in the Tweed LEP by an Environmental Protection zoning and by its identification as a wetland protected by State Environmental Planning Policy (SEPP) 14 - Coastal Wetlands (Wetland No 23).

The site was previously zoned Agricultural Protection 1(b1), and as such, the site still retains its historic use for agricultural production. Whilst the site has previously been utilised for dairying, intensive row crops and a variety of vegetables, field investigations indicate that agricultural practices have been decreasing in scale, with a significant proportion of the síte having lay fallow for many years. Changes in the industry and ownership have left the site underutilised, resulting in a mixture of highly modified and disturbed remnant vegetation, generally including estuarine complexes, melaleuca and swamp she oak forests, sedgelands and related communities and rainforest and riparian communities.

Residential dwellings are dispursed throughout the area and are typically associated with the historic agricultural uses.

In terms of surrounding landuses, Area E is positioned between existing residential settlements of Banora Point and Terranora and has interfaces with a range of residential densities and lot sizes.

The urban areas of both Banora Point and Terranora generally have a low scale suburban residential density, with lots typically ranging between 600 – 700m^2. Larger rural residential lots occur along Parkes Lane, Market Parade and along Terranora Road where lots range between 1,000 – 3,000m^2. Larger rural residential lots can also be found on top of the ridgeline at Azure Estate, where lots are within the 4,000m^2 range, as shown in Figure 1.2.

Lindisfarne Anglican Secondary School fronts Mahers Lane in the west of of the site and a wholesale rose farm is located further north of the school, adding to the diversity of Area E.

Other significant land uses within the proximity of Area E include the Terranora Village retail centre to the west, which includes a small supermarket, medical centre, a number of smaller retail, food and beverage uses, a tavern and a post office. The Terranora Primary School is also located within close proximity to the west of Area E and fronts Terranora Road.

Additional retail land uses within the local context are found at the Amaroo Drive local centre, to the east of the site. The Amaroo Drive local centre includes; a small supermarket and a number of smaller retail uses, newsagent, hairdresser, bakery and hot food and beverage outlet.

Surrounding landuses to the site are illustrated in Figure 1.2.

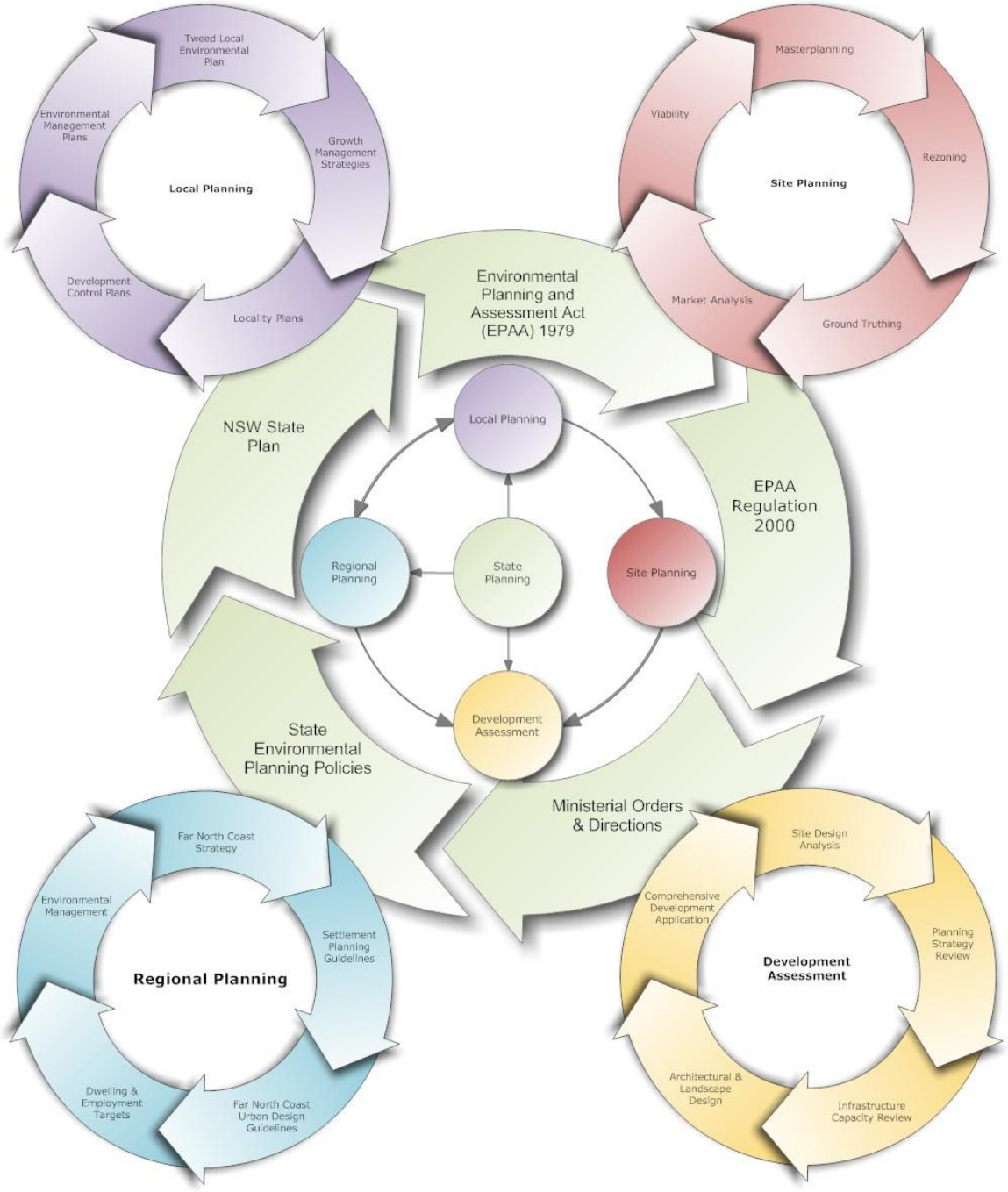
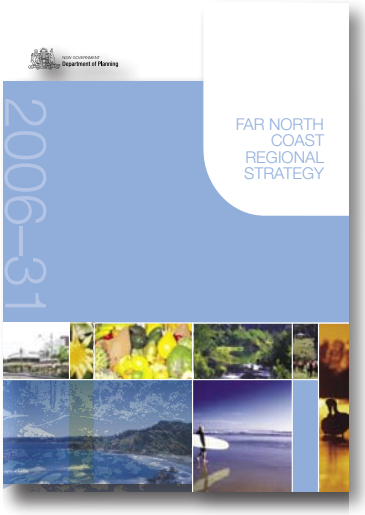


Figure 1.3 - The relationship between State, Regional and Local Strategic and Develoment Control planning

1.6 Key Strategic Planning Issues

1.6.1 The Far North Coast Regional Strategy

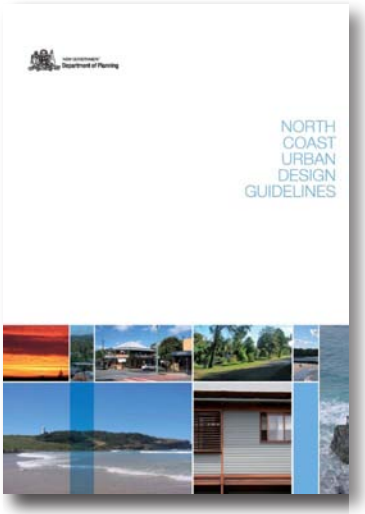


The Far North Coast Regional Strategy (FNCRS) was adopted by the NSW State Government in December 2006. The FNCRS states its purpose as "to manage the Region's expected high growth rate in a sustainable manner." The FNCRS defines the location and form of future development within the region, taking into account environmental assets, character, cultural values and natural resources, while also providing for economic opportunities. The FNCRS incorporates specific regional infrastructure requirements identified in the State Infrastructure Strategy and will inform future infrastructure investment decision making for the Far North Coast.

The FNCRS is considered by State Government to be the overarching strategic planning document for the Region and has been prepared to both complement and inform other state and local planning instruments, including the Tweed Local Environmental Plan. The FNCRS identifes a growth boundary for towns and villages, which Area E falls within.

The FNCRS is a 25 year document, forcasting growth through to 2031. The FNCRS sets targets for both dwelling and employment (jobs). Within the Tweed it is forcast that 19,100 additional dwellings will be required by 2031. The residential land release within Area E, estimated to provide approximately 1,600 dwellings, makes a substantial contribution towards meeting the Tweed dwelling targets. In addition, development within Area E will need to consider the objectives of the FNCRS, particularly for dwelling mix, settlement form and urban design.

1.6.2 North Coast Urban Design Guidelines



With the aniticipation of high growth pressure for the north coast region, the NSW Department of Planning & Infrastructure prepared the North Coast Urban Design Guidelines to support the Far North Coast and Mid North Coast Regional Strategies. Maintaining a prosperous economy and protecting the unique North Coast environment through good planning and urban design is the overriding purpose.

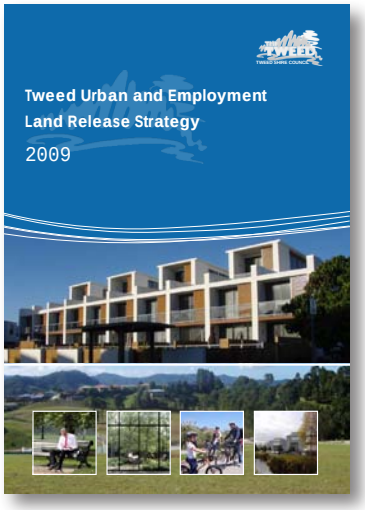
The FNCRS and the Urban Design Guidelines work together with Tweed's local planning. The FNCRS sets up the regional planning framework, which both informs and is informed by Tweed growth and conservation strategies and the Tweed LEP. Similarly, the Urban Design Guidlines inform the site planing assessment and framework of the Tweed's strategic policy and development controls. There is an interconnected relationship between the planning documents, with each informing the others. This is demonstrated in Figure 1.3.

Whilst not an exact match to the examples cited within the Guidelines, Terranora is considered to best fit the described 'Inland Village' typology, whilst Banora Point forms the periphery of the Regional Centre of Tweed Heads. Area E's positioning between this

range of urban and peri-urban uses requires a balanced approach to guide infill development which responds to the varied surrounding context.

Any future development application would need to take into account the design principles for 'Inland Villages' as defined within the North Coast Urban Design Guidelines. Future structure and masterplanning should establish a character that is reflective of the sites urban and climatic contexts in order to guide the form of future development.

1.6.3 Tweed Urban and Employment Land Release Strategy 2009



In March 2009, Tweed Shire Council adopted the Tweed Urban and Employment Land Release Strategy 2009 (Tweed UELRS). The Tweed UELRS provides a desktop analysis of opportunities and constraints for the whole Tweed Shire to establish land suitable for urban and employment purposes.

Direction 11.3 of the Tweed UELRS, 'Rely on Existing Zoned Areas and Increase the Density of Development in Key Urban Areas' was adopted as the key delivery method of population growth. Whilst Area E is not specifically identified as a 'Key Urban Area' within Tweed UELRS it is identified as a 'Proposed Future Urban Release Area' in the Far North Coast Regional Strategy.

Area E is a significant urban release area within the Shire and provides the opportunity for achieving best practice infill greenfield development with increased population and services, whilst maintaining and enhancing environmental and recreational lands.


Tweed Local Environmental Plan 2000

under the

Environmental Planning and Assessment Act 1979

Minister for Urban Affairs and Planning

Sydney, 2000

Document Revised: 13 March 2009

1.6.4 The Tweed Local Environmental Plan

Tweed Local Environmental Plan 2000 (TLEP) is the principle local planning instrument applying to Area E and provides the overarching land use controls, through a range of zoning and development standards.

The Code provides an urban footprint for future development as well as development controls. Whilst the Code sets the future development structure, it is possible that some land use and building height control recommendations and objectives may not be permissible under the current TLEP. In this instance an amendment to the Tweed LEP may need to be sought, utilising the findings of the Code as the basis for a strategic planning justification.

1.6.5 Area E Local Environmental Study 2004

The Area E Local Environmental Study (LES), dated March 2004, was prepared by Parsons Brinckerhoff for Tweed Shire Council and formed the basis for the rezoning of Area E to enable urban development. The LES makes a number of recommendations in relation to the site, holistic planning/masterplanning and future

development controls. Of note, the LES identifies the following:

With the residual land area balance equalling 205.6ha, excluding the development constraints, and a nominal 25% of this area being allocated to infrastructure the following approximate land use distribution was envisaged:

- *130.45ha being utilised for residential development at varying lot densities;*
- *16ha being utilised for open space;*
- *15.15ha being utilised for educational purposes;*
- *1,000m^2 being utilised for a local commercial centre; and*
- *1,000m^2 being utilised for local community purpose infrastructure.*

These findings have formed the baseline of the Code. With regards to residential development, the LES references *'Policy & Action 122'* of the *Tweed Shire 2000+ Strategic Plan*, which details an average lot size of 800m^2, with a minimum of 600m^2 and a maximum of 1000m^2. The LES also recommends 95% of lots (1,550 lots) being utilised for for detached dwellings and 5% (81 lots x 3 tenements per lot = 243) being utilised for medium density.

As detailed earlier, the more contemporary NSW FNCRS contains the Tweed residential targets for dwelling mix, being 60% single dwellings and 40% multi-unit. This variation between targets is significant and has been reconciled within the Code to inform future planning processes by providing objectives for housing variety, mix and density. The Code concludes that based on review of the NSW FNCRS, the LES and site analysis, that an approximate dwelling mix of 65% single dwellings and 35% multi-unit (small-lot housing and neighbourhood plan housing being included within multi-unit).

Council's '*Whole of Shire Cultural and Community Facilities Plan 2007* (C&CF Plan) provides recommendations for the provision of community infrastructure within the Shire. The C&CF Plan details that additional school facilities are not required for the Urban North catchment, which Area E falls within, however it is understood that NSW Department of Education is investigating options through the development of a localised Schools Service Strategy, expected to be availale in late 2012.

In response to the LES and as identified the C&CF Plan, one 'Community Meeting Room'/'Multi-purpose Hall' as well as one 'Neighbourhood Centre' are to be included within Area E. The final subdivision layout is also to cater for a preschool.

PART 02 - EXISTING CONDITIONS

2.1 Environmental Protection & Attributes

2.2 Topography & Slope

2.3 Aspect & Climatic Influences

2.4 Soil Types & Quality

2.5 Views & Scenic Protection

2.6 Acid Sulfate Soils

2.7 Bushfire Prone Land

2.8 Flood Prone Land

2.9 Soil Stability

2.10 Traffic and Transport

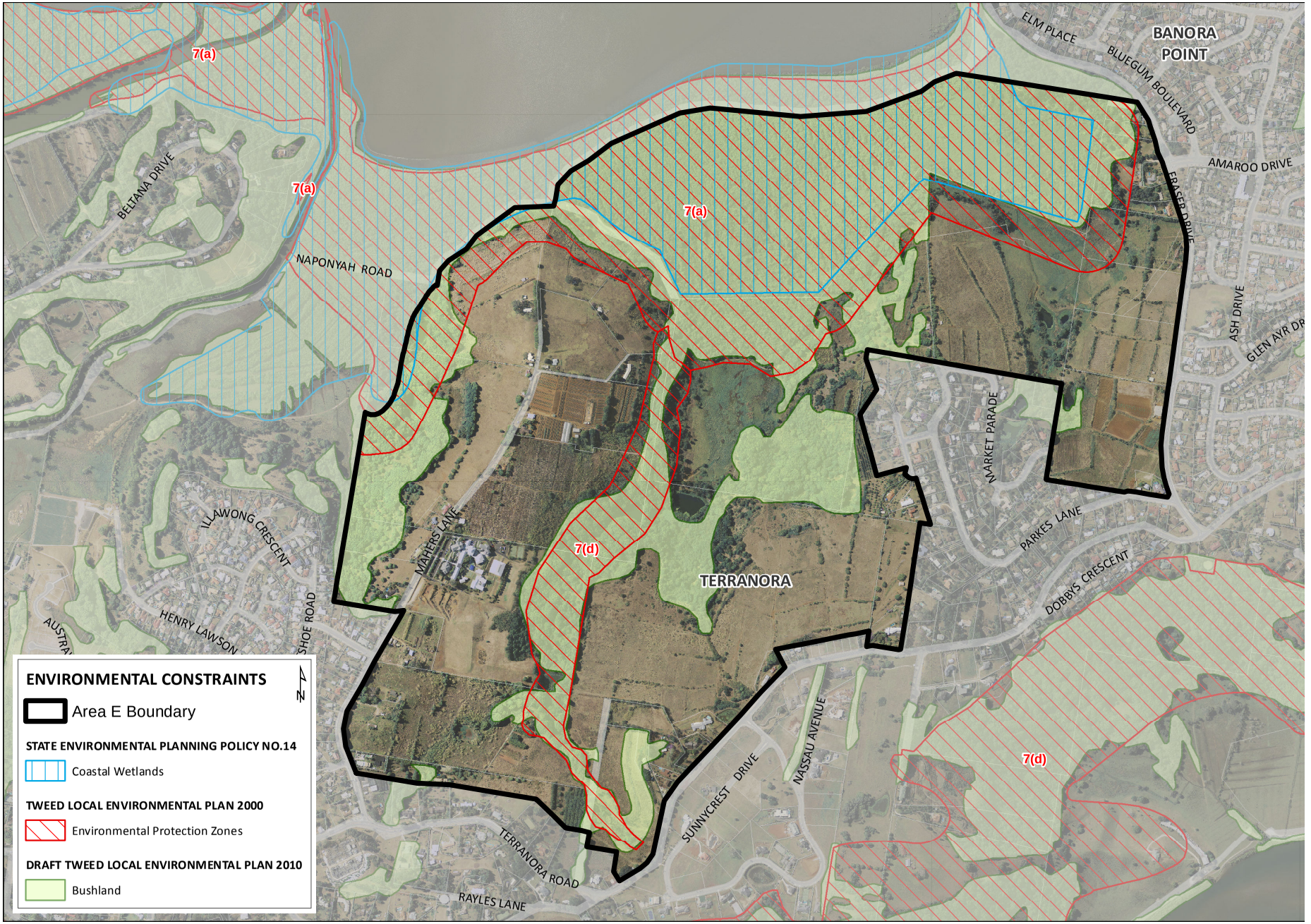


Figure 2.1 - Environmental Attributes

2.1 Environmental Protection & Attributes

Agricultural History

Area E has a history of agricultural use and production that once formed part of the Tweed's major employment sector. These past activities have altered the site substantially and resulted in significant loss of vegetation and creation of new drainage areas. A large area of the floodplain was cleared and drained in the 1980s, but significant regrowth, predominantly of native vegetation, has occurred since this time. Altered hydrology as a result of floodplain drainage works is likely to have also altered the native vegetation communities that have regenerated here, when compared to pre-clearing vegetation types.

Despite these agricultural disturbances, the northern extent of the site contains extensive and contiguous areas of remnant and regrowth floodplain and estuarine vegetation and habitats. Much of this area is SEPP 14 Coastal Wetlands, comprising a number of endangered ecological communities, provides a significant buffer to Trutes Bay and is part of an important flora and fauna movement corridor and habitat area.

The site and its environs today

In the north-eastern extent of the site, and continuous with the wetland areas, wet sclerophyll and rainforest communities occur, extending up to Fraser Drive. In limited areas on the lower slopes of the floodplain, small areas of wet sclerophyll and rainforest communities also occur. Current threats to this significant vegetation and habitat include invasion by exotic plant species, particularly on forest edges, altered hydrology, browsing and trampling from cattle, and untreated agricultural stormwater runoff.

The lower and upper slopes of the site to the Terranora Road ridgeline remain largely cleared, except where Camphor Laurel, in association with early successional rainforest species, have formed areas of regrowth forest. Whilst disturbed and dominated by Camphor Laurel, these forested areas provide important flora and fauna linkages. In particular, a vegetated riparian north-south corridor to the east of Mahers Lane provides an important link between the estuarine and floodplain wetlands of the site surrounding the Terranora Broadwater and the Terranora Road ridgeline which forms the northern boundary of the site and habitat areas beyond.

The vegetated northern and north-eastern extent of the site which adjoins Trutes Bay and Fraser Drive is identified as high to very high conservation status in the Tweed Vegetation Management Strategy (Kingston et. al. 2004).

Extensive and continuous areas of of Endangered Ecological Communities (EEC) listed under the Threatened Species Conservation Act 1995 (TSC Act) have been mapped in this locality including:

- Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney and South East Corner Bioregions;
- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;

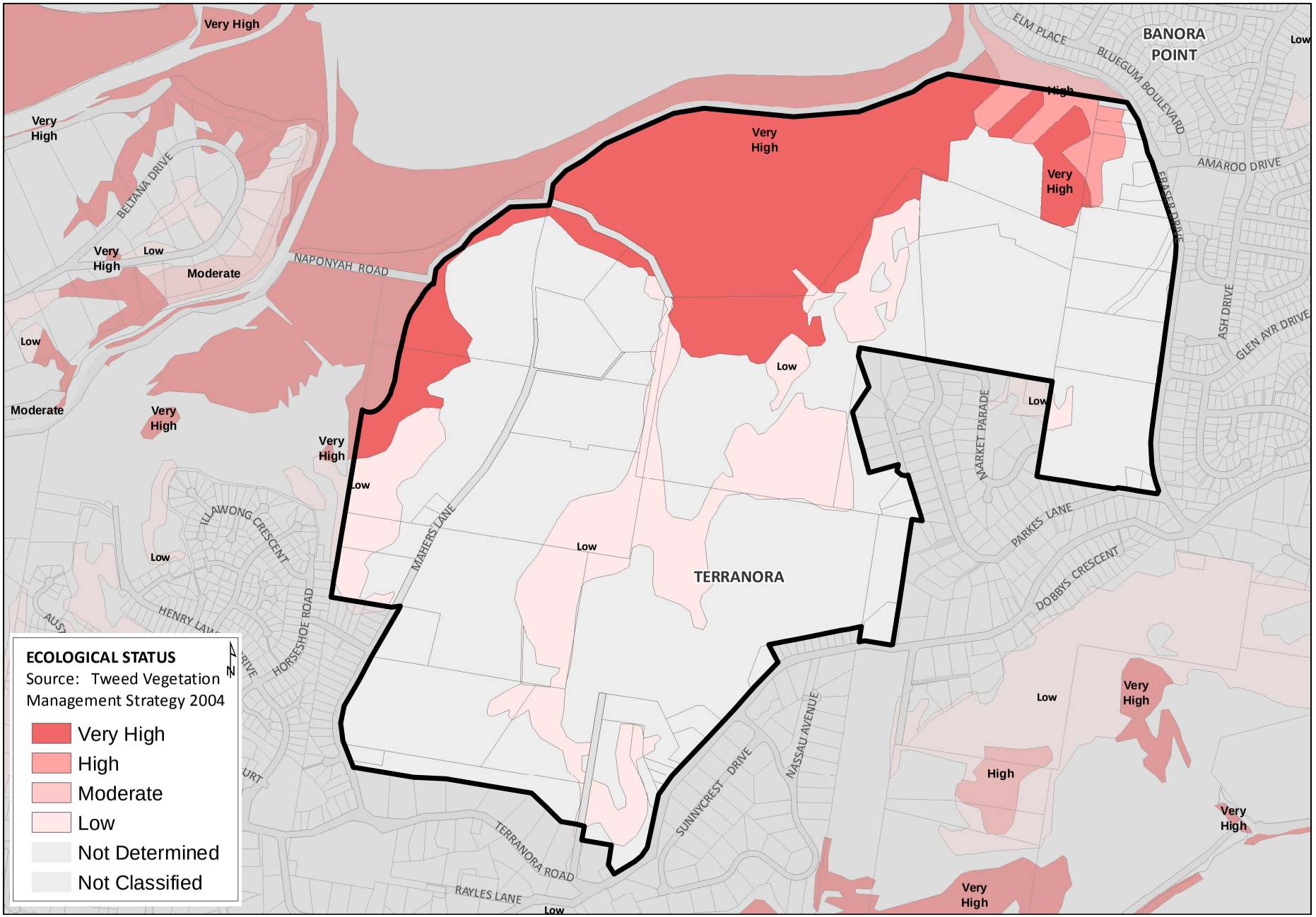


Figure 2.2 - Ecological Status

- Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;
- Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion; and
- Lowland Rainforest in the New South Wales North Coast and Sydney Basin Bioregions.

Much of these floodplain Endangered Ecological Communities are included within the area of SEPP 14 Coastal Wetlands. Mapped SEPP 14 Coastal Wetlands also includes an extensive and continuous community of Mangrove Forest adjacent to Trutes Bay, which extends beyond the site to the west and north.

Populations of three threatened plant species and one rare plant species have been recorded in Lowland rainforest on floodplain and Lowland rainforest EECs in the north eastern extent of the site, including:

- Fine-leaved Tuckeroo (Lepiderema pulchella) listed as 'vulnerable' under TSC Act;
- Coolamon (Syzygium moorei) listed as 'vulnerable' under TSC Act and Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act);
- Rough-shelled Bush Nut (Macadamia tetraphylla) listed as 'vulnerable' under TSC Act and EPBC Act; and
- Tooth-leaved Palm Lily (Cordyline congesta) listed as a 'rare or threatened australian plant' (Briggs and Leigh 1996).

Whilst fauna surveys of the site have been limited, it is possible that this area provides habitat for a large number of fauna species listed as threatened under the TSC Act and/or EPBC Act, including:

- Grey-headed Flying Fox (Pteropus poliocephalus);
- Common Blossom Bat (Syconycteris australis);
- Common Planigale (Planigale maculata);
- Little-Bentwing-Bat (Miniopterus australis);
- Eastern Long-eared Bat (Nyctophilus bifax);
- Koala (Phascolarctos cinereus);
- Bush-hen (Burhinus grallarius);
- Comb-crested Jacana (Irediparra gallinacea);
- Black-necked Stork (Ephippiohynchus asiaticus);
- Osprey (Pandion haliaetus);
- Mangrove Honeyeater (Lichenostomus fasciogularis);
- Collared Kingfisher (Todiramphis chloris);
- Black Bittern (Ixobrychus flavicollis);
- White-eared Monarch (Monarcha leucotis);
- Barred Cuckoo-shrike (Coracina lineata);
- Rose-crowned Fruit-dove (Ptilinopus regina); and

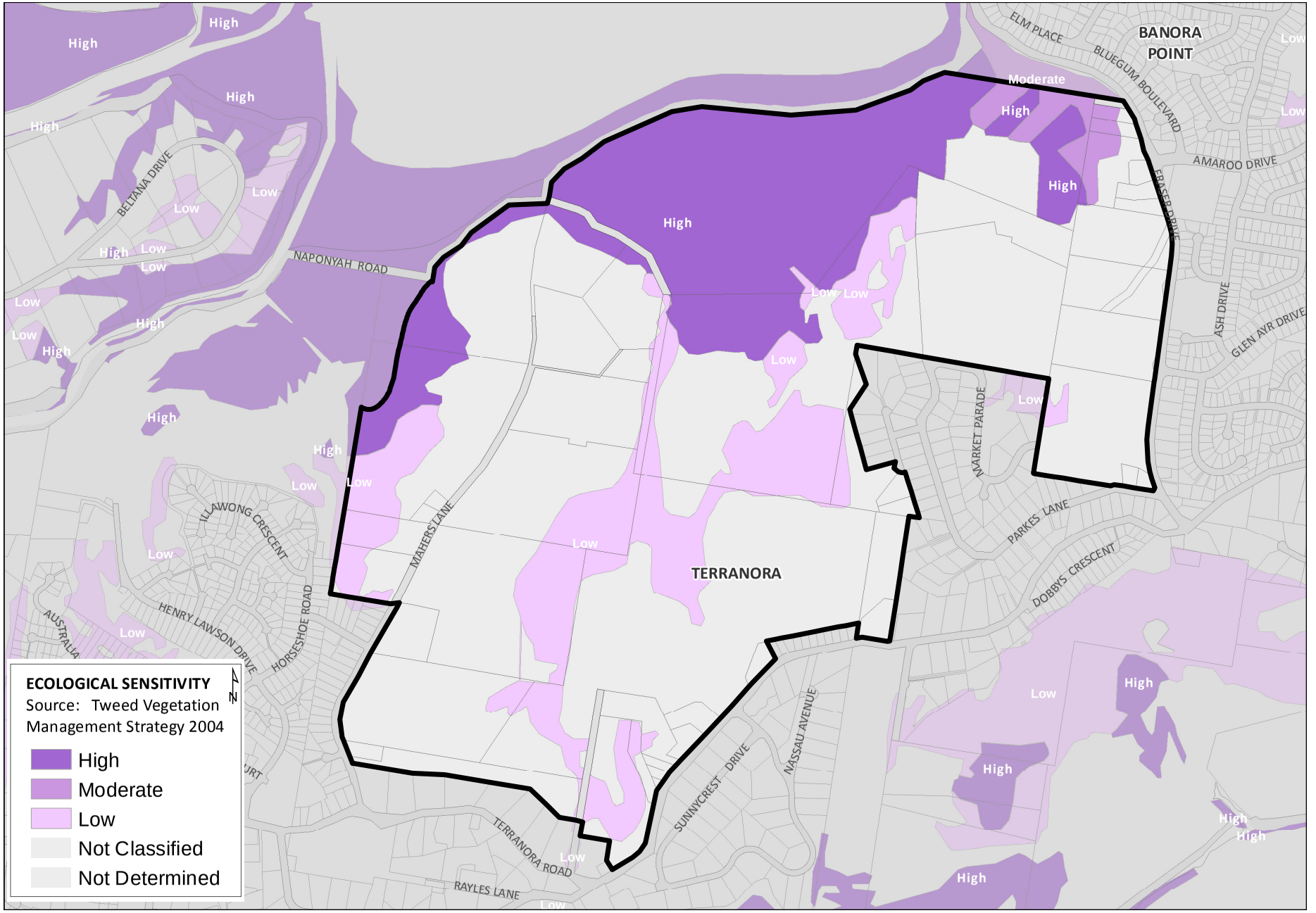


Figure 2.3 - Ecological Sensitivity

- Superb Fruit-dove (Ptilinopus superbus).

Many of the above-listed species are dependant on coastal lowland habitats, including mangrove and swamp forests, lowland rainforest and freshwater wetlands. The site provides extensive, continuous and diverse coastal lowland habitats which have good connectivity to similar habitats in the Terranora Broadwater and Creek. Consequently this area of the site is considered to be of very high ecological value providing habitat and corridors for a large number of significant fauna species.

In addition to the above-listed species, migratory waders associated with estuarine habitats of the Terranora Broadwater are also considered to have a significant association with the site. Trutes Bay has been identified as a major roost site for waders and is considered to be the most important migratory bird roost site in the area. Mangrove Forest on the site provides important habitat to waders utilising Trutes Bay.

Extensive areas of Mangrove Forest on the site which fringe Trutes Bay are also likely to play an important role in maintaining populations of aquatic fauna of the Terranora Broadwater and Tweed River. Additionally, the vegetated northern extent of the site forms part of an identified sub-regional fauna corridor (NSW NPWS 2000).

Due to the high to very high ecological status, development and potential impacts to this area of the site should be minimised through creation of ecological buffers, best practice stormwater management, habitat restoration, ongoing management of threats, and Property Vegetation Plans.

The remainder of the site comprises abandoned small crop plots separated by windrows of regrowth and predominantly non-native vegetation, grazed and ungrazed paddocks, small farm dams on drainage lines, and regrowth forest dominated by Camphor laurel confined mainly to steeper slopes, drainage lines or surrounding dams.

Small farm dams on drainage lines have some conservation value, depending on their location in the landscape, surrounding vegetation and disturbance. Small farm dams may be utilised by a range of fauna and can form part of fauna movement corridors. Wherever possible, waterbodies should be retained on site, rehabilitated where required and be utilised as part of the stormwater conveyance system, within the vegetated open space corridors.

Camphor laurel dominant regrowth forests are also important for fauna movement at a regional scale. Areas of this forest type are included within a regional fauna corridor stretching from the Tweed Coast at Fingal, to Stott's Island on the Tweed River (NSW NPWS 2000).

Whilst Camphor laurel dominant regrowth forests may be highly degraded, concerted restoration efforts over a period of time could transform these areas into regrowth native rainforest. Therefore, dependant on the level of disturbance and extent of weed invasion, presence of native plant species regeneration, and connectivity to significant vegetation and habitats, these areas may be considered of low to moderate conservation value.

It is also possible that threatened frugivorous fauna like the Rose-crowned and Superb Fruit-doves use this area to move from lowland habitats on the site to other suitable habitats in the vicinity.

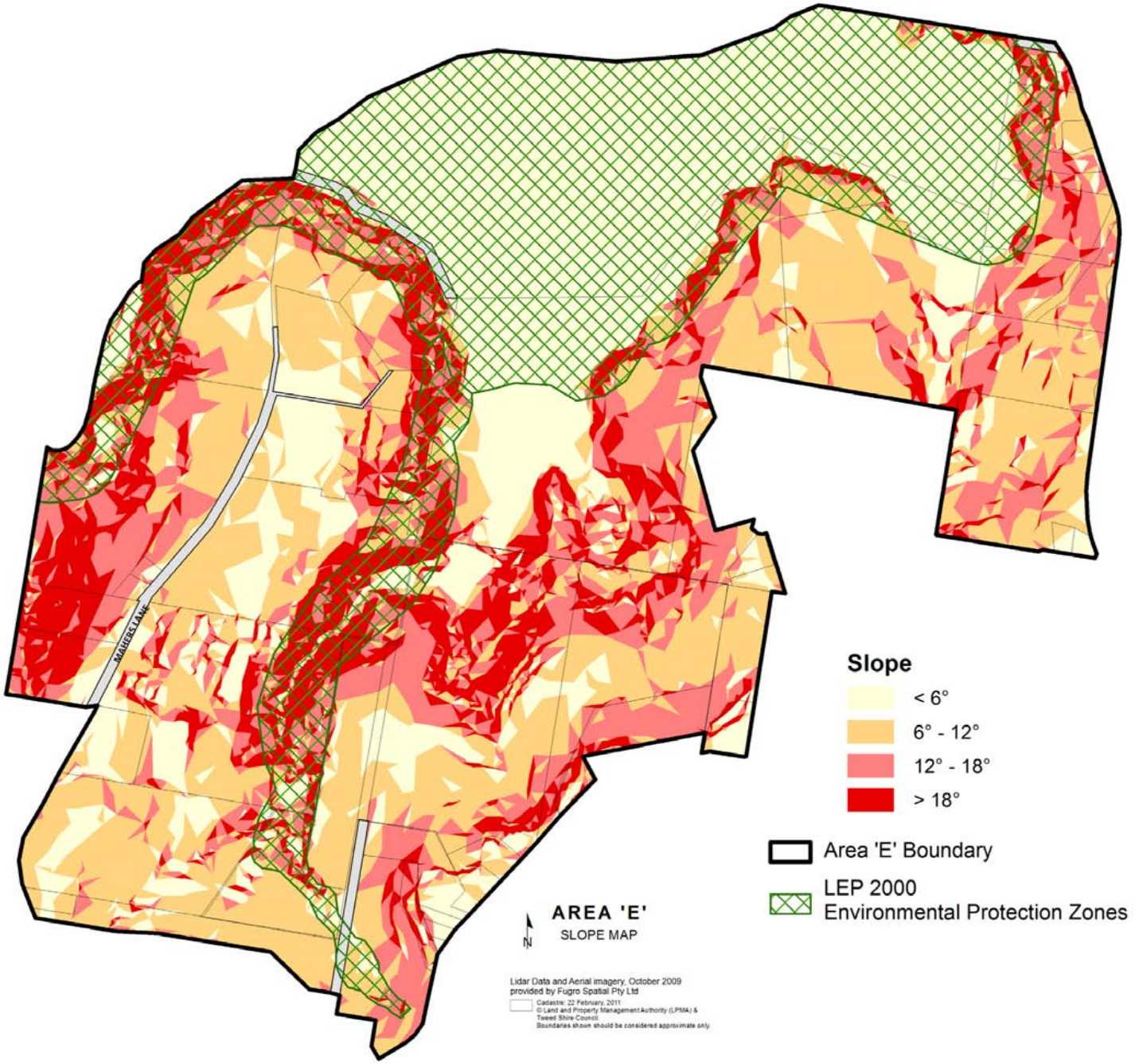


Figure 2.4 - Slope Gradients within Area E

2.2 Topography & Slope

Area E is situated on the northern side of Terranora Road which follows a defined ridge line linking Tweed Heads in the east with the Tweed hinterland to the west. The site is situated between Terranora and Bilambil to the west and Banora Point to the east and generally has a north downward slope towards the Terranora Broadwater. The elevation of the site range from 0-2 m where the site adjoins the Terranora Broadwater, rising to the dominant ridgelines of approximately 138m (near where the site adjoins the Terranora Road/ McAuleys Road intersection). The topography and north facing orientation out and over the Terranora Broadwater allows for regional panoramic views towards Tweed Heads and the Gold Coast to the north and the Border Ranges to the west, as well as views back to the site from these areas.

Area E has a significantly undulating landform, with distinct ridges and vegetated valleys which divide the site into three major catchments. The valleys form the primary drainage conveyance paths from the top of these catchments, which includes external areas in Parkes Lane / Market Parade and south of Terranorra Road. Numerous minor side catchments and agricultural drains feed into these valleys. As the topography flattens, the valleys open out into a broad, low lying floodplain, discharging to wetlands on the edge of Terranorra Broadwater.

The existing slope across the site ranges from slightly sloping on the top of some of the ridgelines (0-10%) to moderate and steeply sloping areas running down the sides of the ridges ranging from 6 degree /10% to over 19 degrees/35%. The slope analysis diagram in Figure 2.4 illustrates the range of slopes across the site.

The majority of the Area E site is sloping, with a significant proportion of the site within the 12-18 degree category. Much of the steep terrain corresponds with north-south corridor of land zoned Environmental Protection under the Tweed LEP, due to the steeply vegetated valleys and areas identified as significant native vegetation.

Generally speaking, residential development is achievable on slopes of up to 18 degrees given the use of an appropriate structural systems. Development on land steeper than the 18 degree threshold, whilst not unachieveable, would undermine the landscape character of Area E by requiring significant earthworks for housing and/or access provision. Any development of land greater than 18 degrees slope will need to embed the retention of the natural undulating topography and avoid significant amounts of bulk earthworks and excessive engineered solutions in terms of retaining walls, roads and driveway accesses.

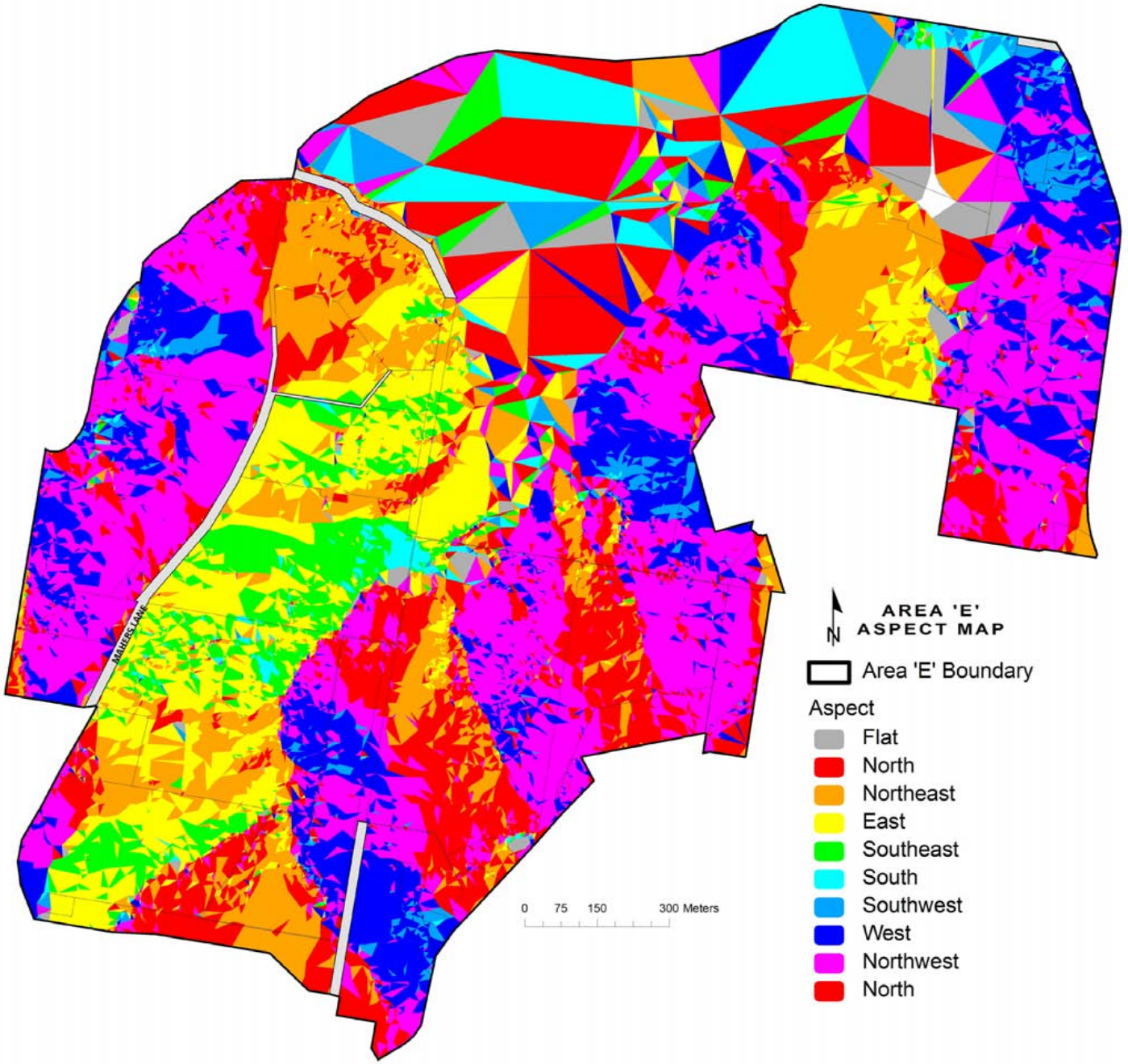


Figure 2.5 - Aspect of Land within Area E

2.3 Aspect & Climatic Influences

Good subdivision design maximises and provides solar access for each individual allotment and dwelling. Consideration needs to be given to the fundamental basics – orientation, shape, size and width of the lot, solar setbacks and building heights.

The Tweed region falls within Zone 2 as defined under the Building Code of Australia and enjoys a sub-tropical climate. The main characteristics of this zone are:

- highly humid with a short dry season;
- high temperatures year round;
- minimal seasonal temperature variation; and
- the lowest diurnal (day/night) temperature range

Tweed temperatures have an average summer maximum of 29 degrees and an average winter minimum of around 9 degrees. Tweed has a 'wet' summer, 'dry' winter pattern with rainfall ranges between an average high of 220mm in February and a low of 43 mm in September. The average number of rain days per month ranges from 12 in March to 5 in August/September.

Area E generally has a good solar orientation, on a northern downward slope. The generally north-south running ridgelines also creates opportunity for both north-south streets running with contours and east west streets running perpendicular to contours.

Generally speaking lots running in an east-west configuration are the easiest to design to solar orientation as houses to both sides of the street would have good solar access in backyards. Figure 2.5 illustrates solar aspect experienced cross the site. Approximately 51.5% of the site has the most desireable north-west to north east solar aspect.

Additional key climatic considerations as part of subdivision and building design are as follows:

- Understanding of topography and microclimatic conditions across the site;
- An assessment of vegetation, aspect and topography factors highlight numerous zones of relative protection from winds, specifically those from the south and west;
- West facing slopes cooler in the mornings and hotter in the afternoon will require careful building design to shade house;
- East facing receives warming morning light;
- High exposure to dry and humid northern winds;
- Cooling effects of wind across the Terranorra Broadwater;
- High exposure to cooling nor-easter breezes during summer;
- Breezes accelerating towards the ridgeline (updrafts);
- Lower lying parts of the site within close proximity to the wetland are vulnerable to higher humidity and heat build up during summer months exacerbated by poor drainage, periodic flooding and less exposure to the cooling nor-easter breeze in summer months.

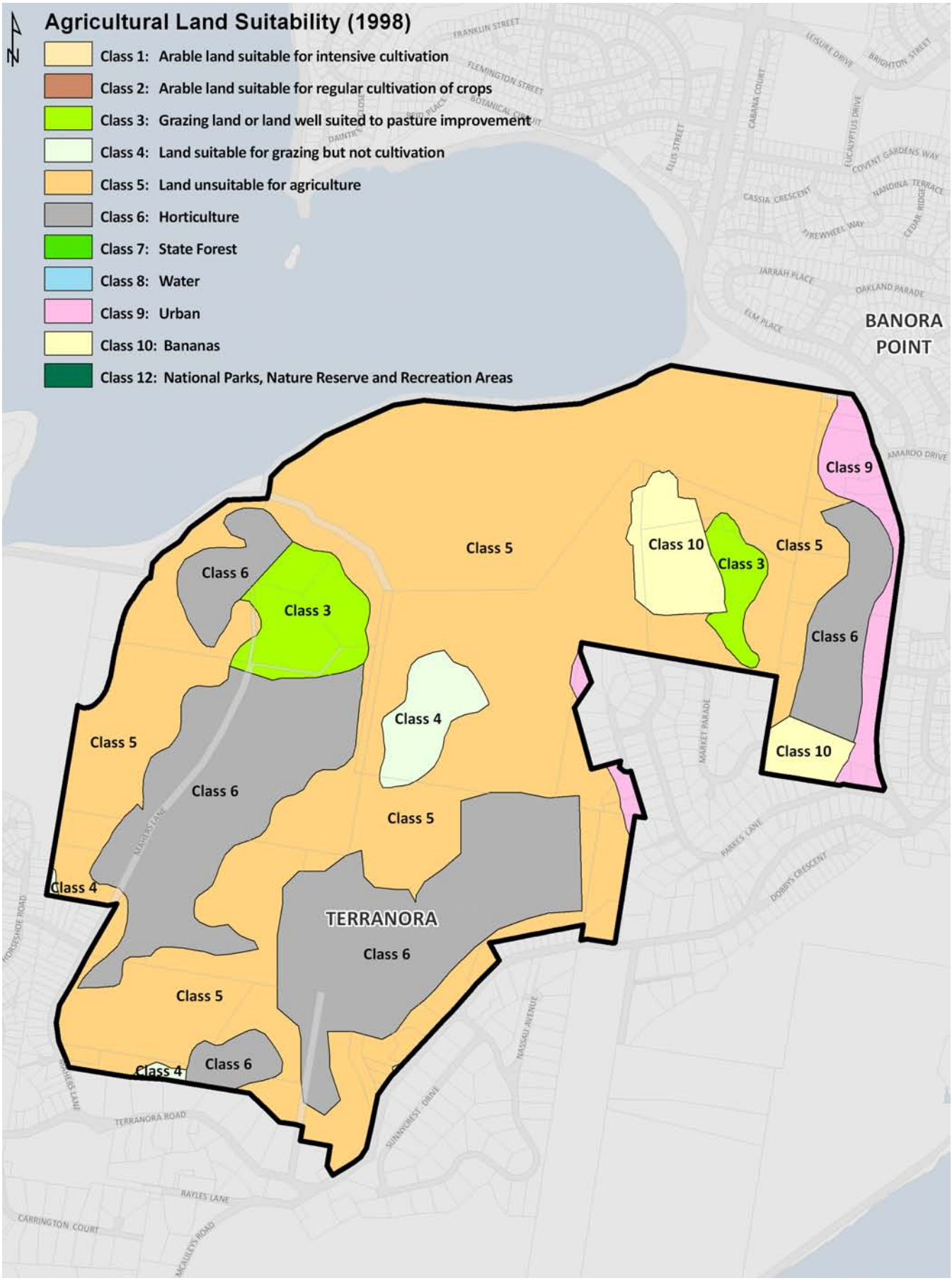


Figure 2.6 - Agricultural Land Suitability

2.4 Soil Types & Quality

The Terranora area has a history of dairying followed by intensive row crops, bananas and passionfruit. Vegetable growing and banana plantations were the dominant use in the mid 1990s together with a field rose operation and a plant nursery. Within the Area E Urban Release Area itself, properties in the north east corner, fronting Fraser Drive have a history of successfully growing bananas, passionfruit, cucurbits, tomatoes and other crops. Intensive row-cropping dominated in earlier times, giving way to grazing as agriculture within the locality evolved.

The Northern Rivers Farmland Protection Project identified the Area E Urban Release Area as containing State Significant Farmland, Regionally Significant Farmland and Significant Non-Contiguous Farmland. The krasnozem (red volcanic) soils of the Tweed Shire are regarded as some of the most productive and unique agricultural lands in NSW (Smith, 1982). Land within Area E falls within classes 3, 4, 5 and specialist class 6.

The LES concluded that a number of threats had undermined the long-term viability of these lands for agricultural production, giving rise to the use of the land for urban purposes. Nonetheless, opportunities are considered present within Area E to maintain the agricultural heritage of the site, for example, through the provision of community gardens, a farmers market or community food stalls.

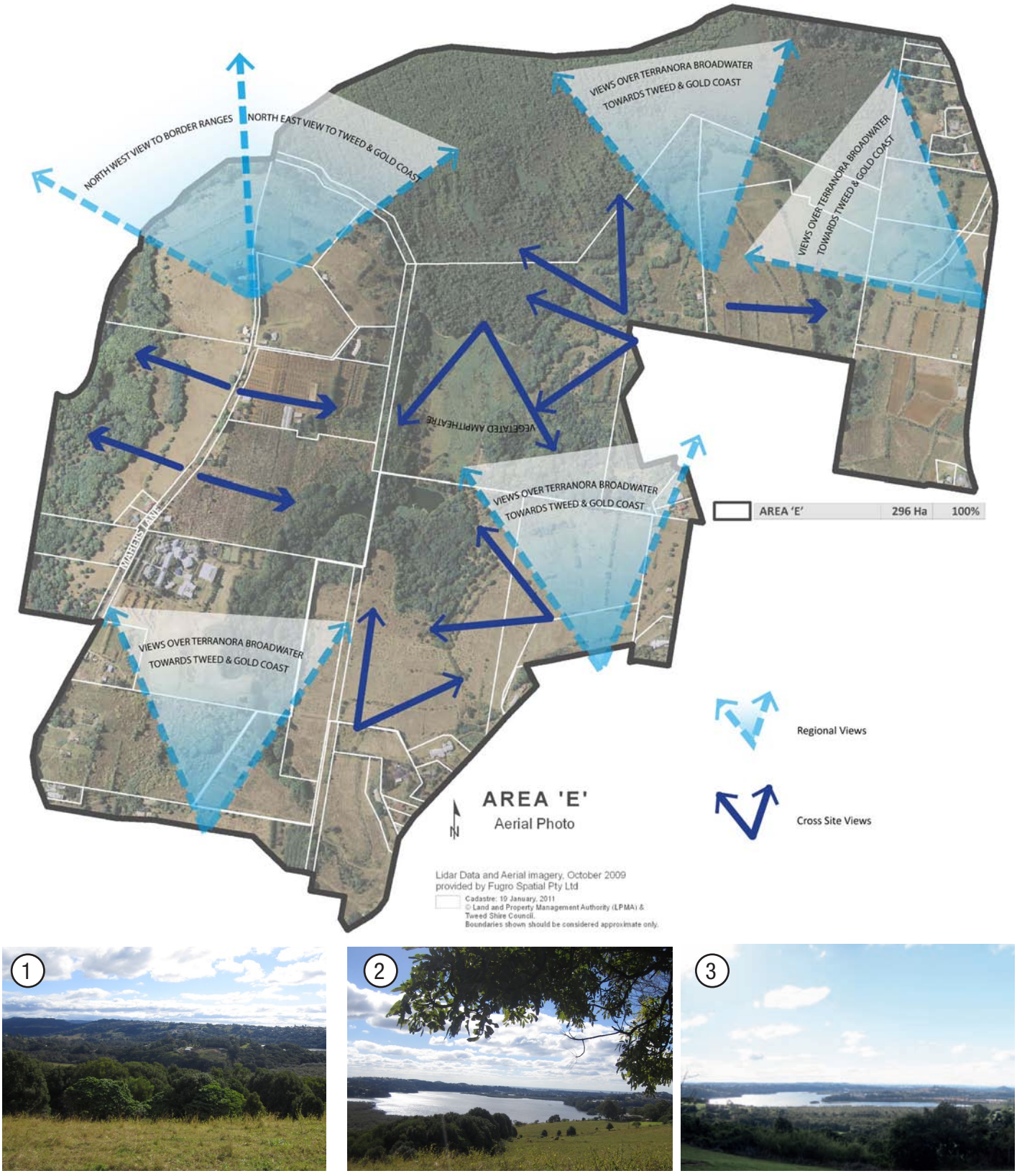


Figure 2.7 - Views out of Area E and Internal Views

2.5 Views & Scenic Protection

The Tweed Shire is valued for its high quality scenic environment. Area E forms an important component of the scenic landscape. The Tweed Shire Scenic Landscape Evaluation (1995), makes the following comments regarding the Shire's landscape identity:

"The landscape with its high diversity of landform and vegetation patterns, predominately natural character and frequent views of water, either of the coast or rivers generally has a high scenic quality.

The natural landscape structure of the Tweed Shire is frequently open to wide views and is highly legible. The volcanic caldera comprising the flat Tweed River Valley with the distinctive, steeply rising Mt Warning in the centre, and the dramatic backdrop of the "scenic rim" World Heritage ranges, the chain of beaches between rocky headlands along the coastline, and the undulating lower coastal ranges are often clearly in view. For this reason, the landscape plays a dominant and important role in the Shire's identity and image."

The site characteristics of Area E reflect the principle landform character of Terranora, and the western portion of Banora Point, being:

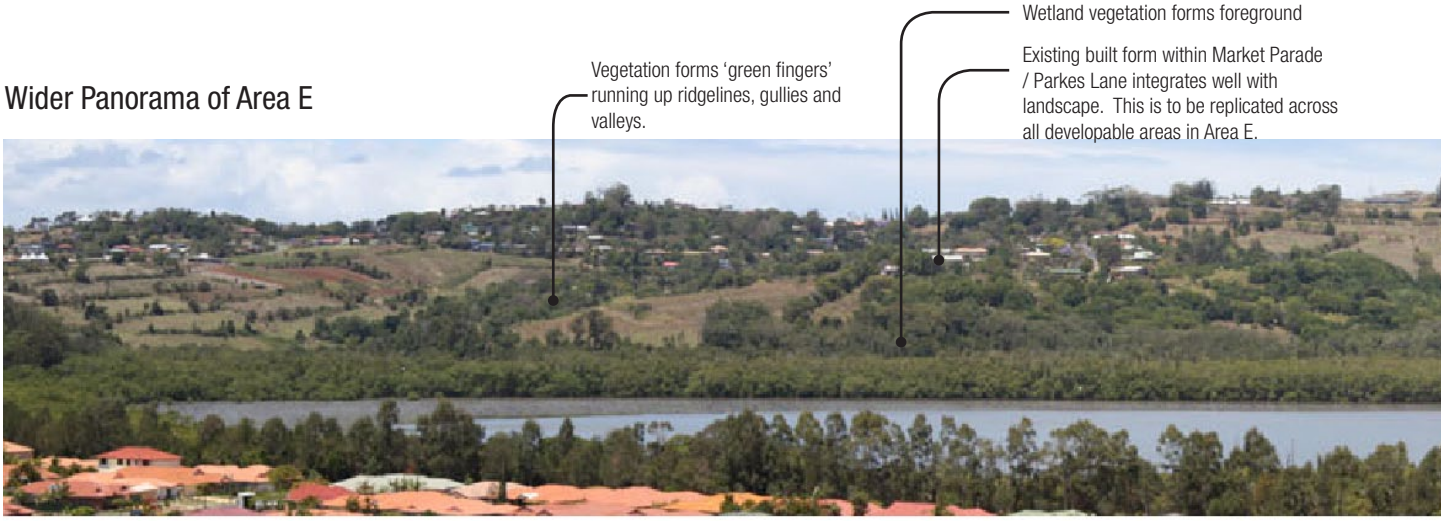
- a significantly undulating landform;
- a distinctive series of ridges;
- a distinctive series of vegetated valleys; and
- steeper land being bush clad.

Located on the northern side of Terranora Road, the site generally has a north downward slope with expansive panoramic views north over the Terranora Broadwater, towards Tweed Heads and the Gold Coast as well as westward to the Border Ranges.

The key visual character components of the site include:

- Strong visual connection with the Terranora Broadwater, Border Ranges and undulating vegetated hinterland;
- The visual connection of site with other surrounding urban settlements including parts of Banora Point to the east and Bilambil to the west;
- Rural/Agricultural land use prominence, providing tree lined accessways, windbreaks, older farm houses and other agriculturally based built forms;
- The dominance of two clear ridge lines;
- Ridgelines separated by two steep, deep vegetated valleys;
- Small watercourses running through each of the valleys;
- Vegetated hillside within the central precinct;
- Sporadic pockets of vegetation on slopes;
- Visual prominance from numerous private and public vantage points; and
- Within the wider visual character of the Terranora/Banora Point area is defined by a

Wider Panorama of Area E



Existing View

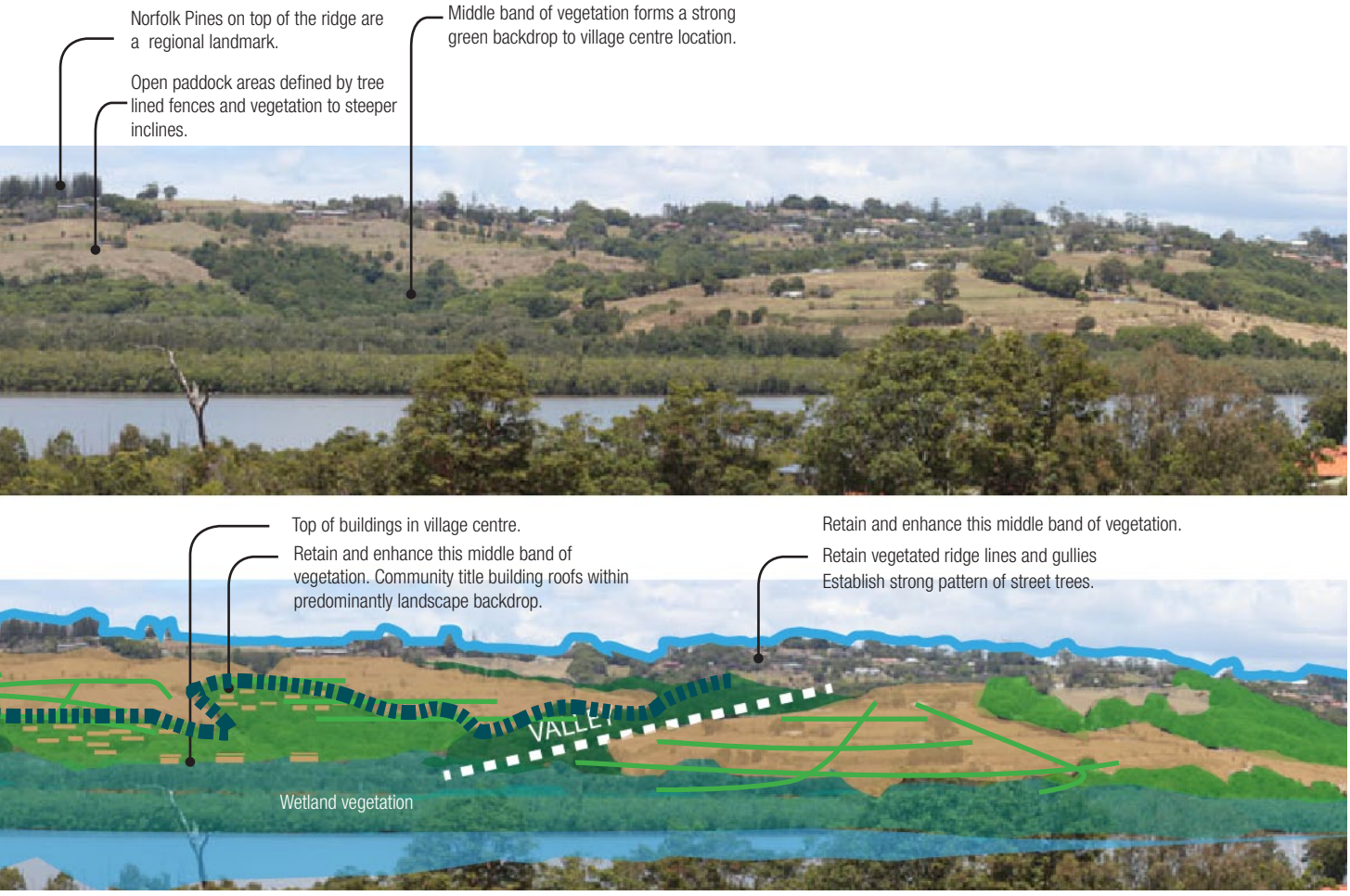
Figure 2.8 - View Analysis

collection of residential precincts within a vegetated undulating hinterland setting.

The site is highly visible from a variety of public and private vantage points.

The future scenic management of Area E should seek to integrate and maintain the key visual character components detailed above. Further, as per the Tweed Shire Scenic Landscape Evaluation (1995), the future visual character is to to provide a strong contrast to adjacent Queensland and form a scenic and environmental gateway to the Tweed Shire.

Some of the site's best views are experienced from the highest points of the site travelling along Terranora Road. It is important that these key vantage points and identified view fields are not obstructed by future development. Whilst elevated areas deliver high quality views, cross-site views should also be acknowledged and embraced. Proponents should consider these positive attributes in subdivision, residential and public domain planning.



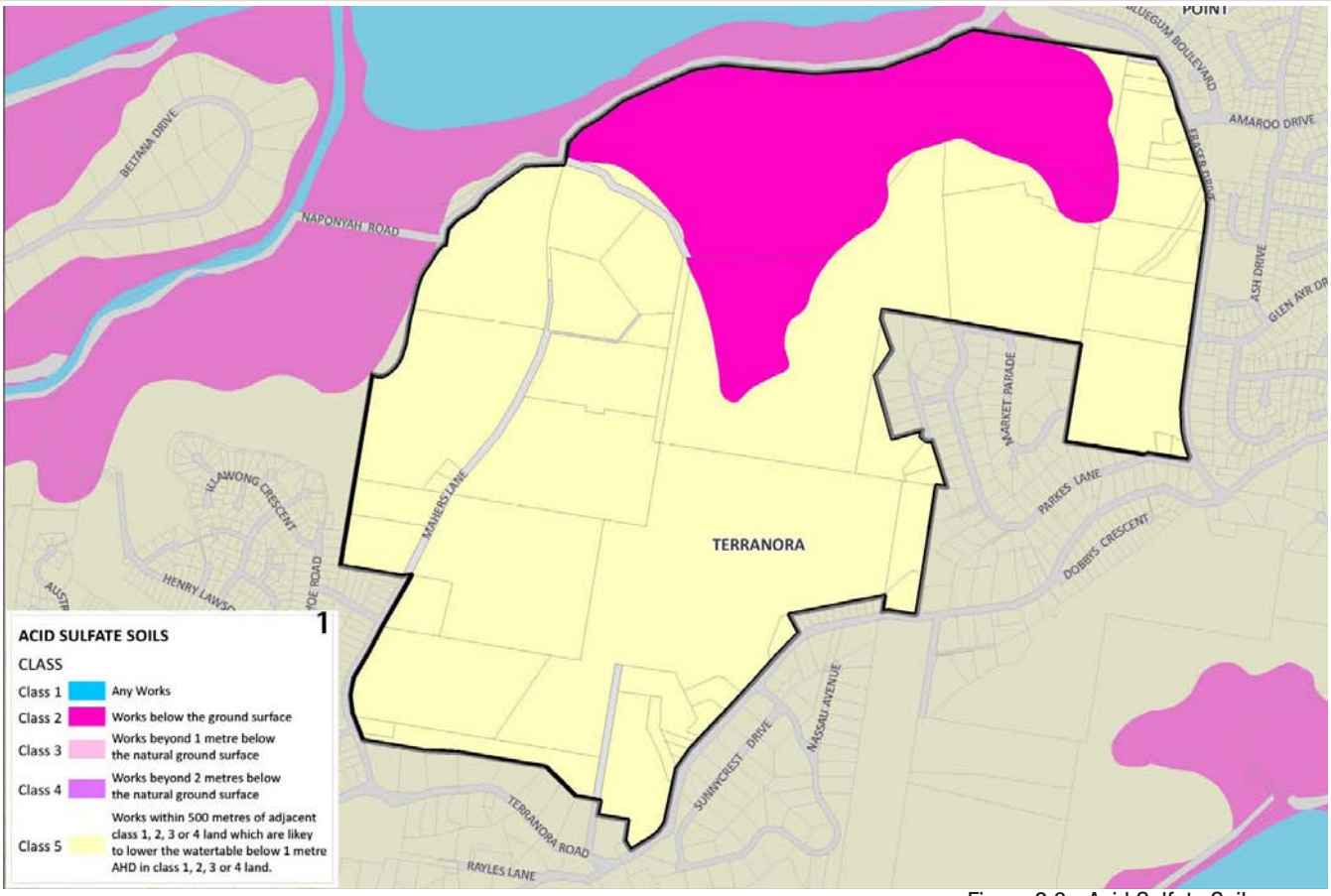


Figure 2.9 - Acid Sulfate Soils

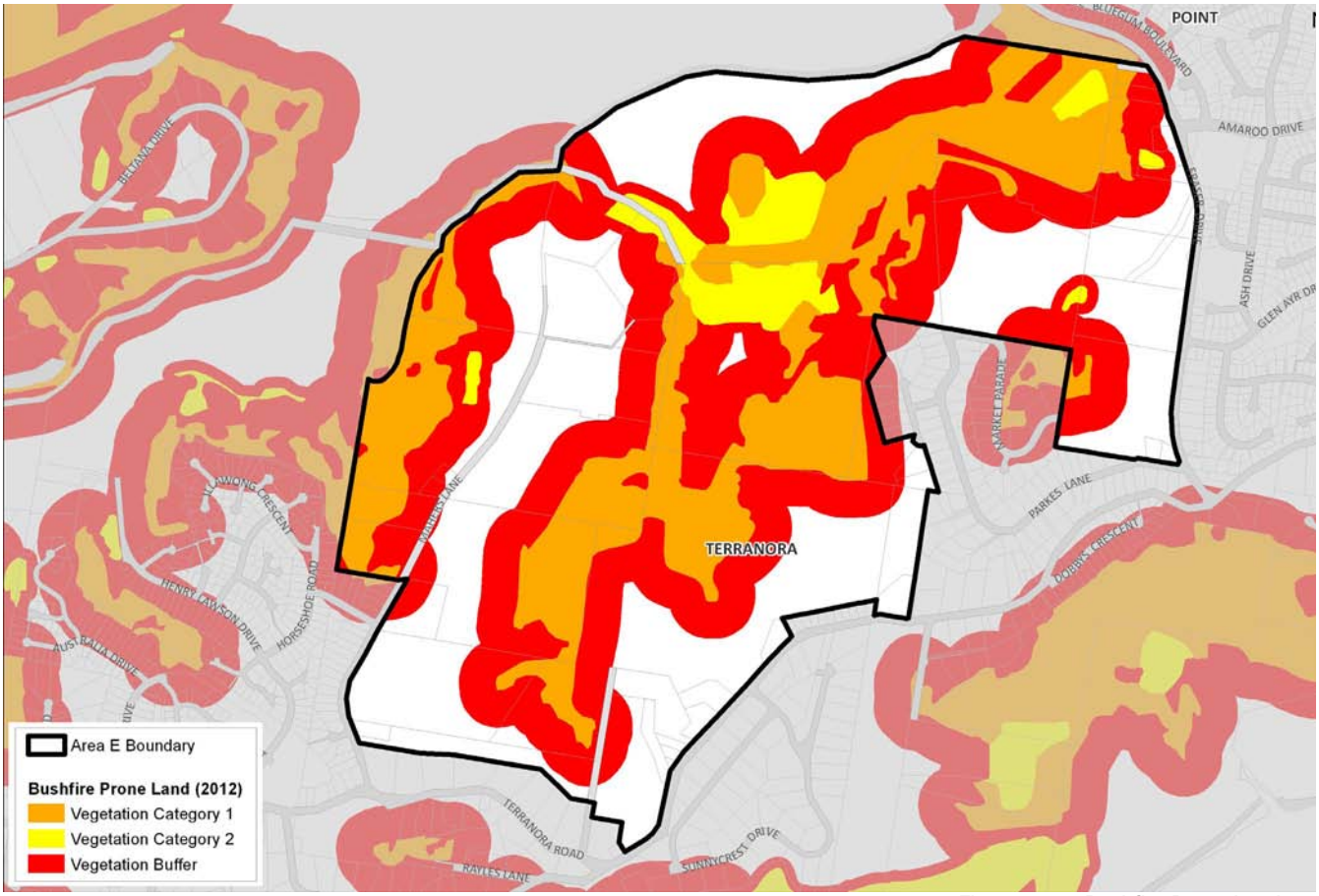


Figure 2.10 -Bushfire Prone Land

2.6 Acid Sulfate Soils

The Area E Release Area is affected by both Class 2 and Class 5 acid sulphate soils. The delineation between the classes is reflective of the landform and flood prone nature of the lower land.

ASS planning mapping for the site identifies significant areas of Class 2 land, however most if not all of this land is below the design flood level of 2.65m AHD. In addition the majority of this land is contained with the wetland complex and as such will not be subject to development.

While the design flood level for Area E is 2.65m AHD the site rises sharply from the edge of the flood plain and as such there is very little land between 2.65m AHD and 5m AHD. Development likely to occur below 5m AHD includes the following:

- Broadwater Parkway
- Open space (formal and informal);
- Utilities;
- Artificial wetlands and drainage structures; and
- Wetland rehabilitation.

The construction of the Broadwater Parkway potentially poses the greatest issues with regard to ASS management as it is likely that earthworks will be required to provide adequate foundation conditions and to elevate the roadway above the design flood level. This has the potential to expose potential acid sulfate soils to air through excavation and lowering the watertable.

The future rehabilitation of the wetlands area is intended to restore freshwater wetland values in this area and would result in the raising of the watertable. Over the long term this would be desirable as it would prevent further ASS events occurring.

2.7 Bushfire Prone Land

A review of the Bushfire Prone Land Map, prepared by the NSW Rural Fire Service identifies the presence of predominately low to moderate fire hazard ratings for remnant vegetation and limited high fire hazard ratings to the north of the site.

Whilst bushfire hazard will need to be considered in the provision of infrastructure, subdivision layout and built form design, previous studies emphasised that bushfire hazards within Area E are generally not a significant development constraint.

Both subdivision and building design will require appropriate site planning to reduce risk to life and property by utilising suitable buffers and locating dwellings away from the hazard and to identify appropriate asset protection zones.

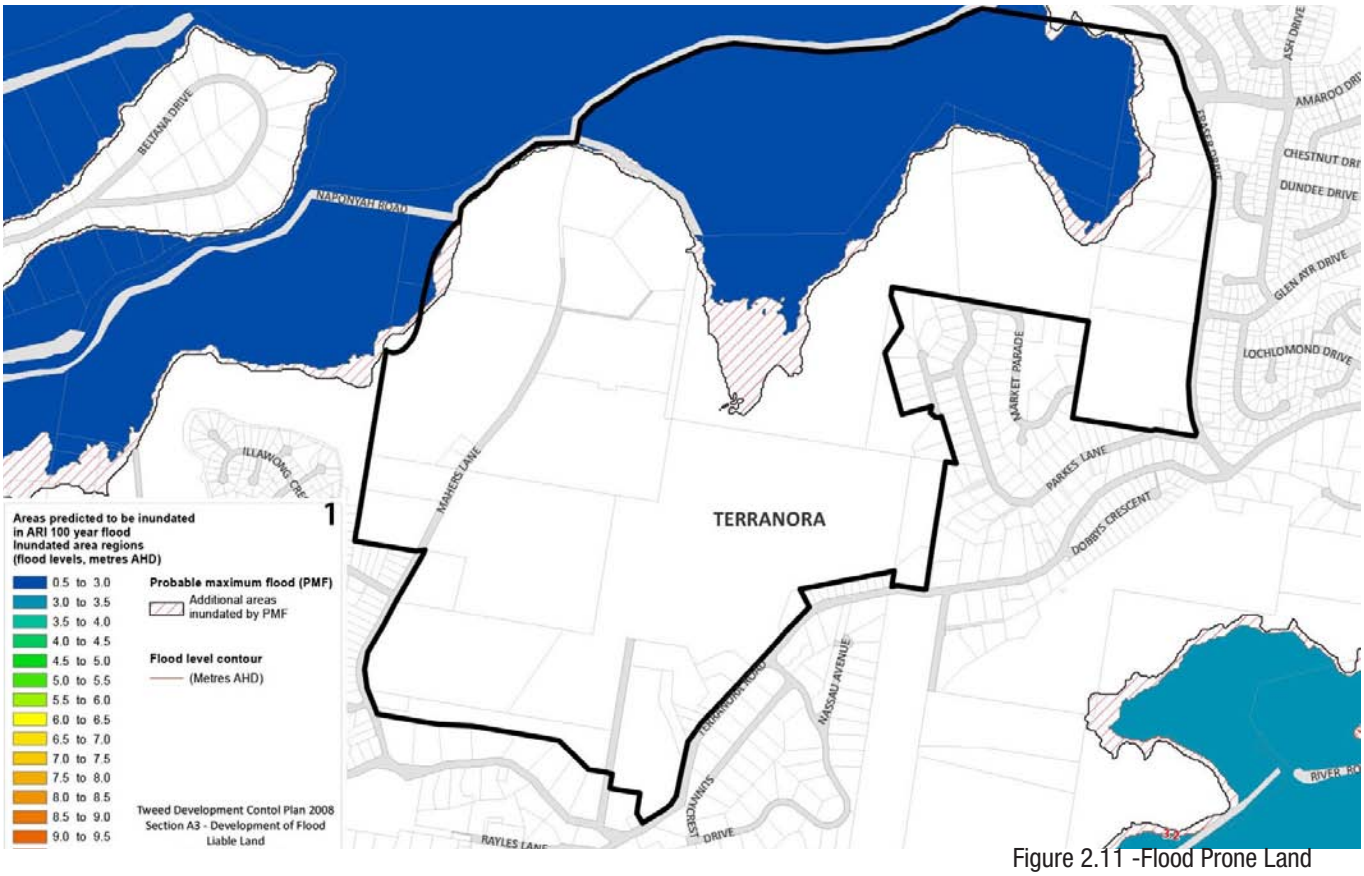


Figure 2.11 -Flood Prone Land

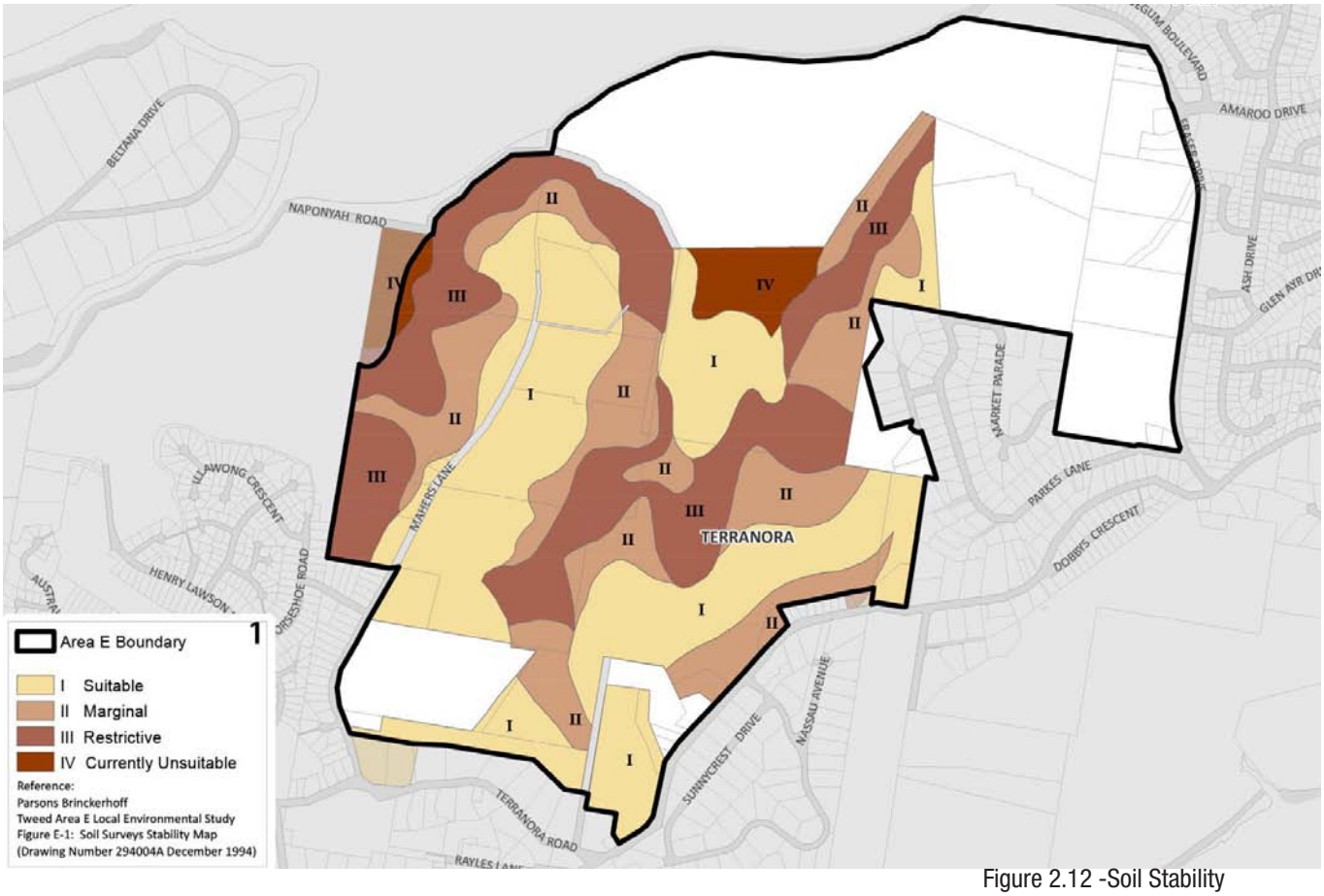


Figure 2.12 -Soil Stability

2.8 Flood Prone Land

The northern parameters of the Area E Urban Release Area are identified as flood prone, as displayed in Figure 2.11. The vast majority of land affected by a 1:100 year flood event is contained within land already zoned for environmental protection, and as such will not be subject to development. The Probable Maximum Flood (PMF) does encroach into land zoned for urban expansion, within this area proposed land uses and built form design will need to take into account this constraint.

The catchment sizes of Area E, and the landform within those catchments, stormwater and flooding treatments will need to be extensively analysed. Engineering based solutions will need to be balanced with consideration for the following:

- changing the existing quality of the landscape and visual setting of Area E,
- adverse impacts on significant ecological systems and species,
- obstruction of stormwater and flood flow paths, and
- cumulative impacts across different land ownerships.

2.9 Soil Stability

Previous soil stability studies into Area E have identified four stability zones for development within Area E, being 'suitable', 'marginal', 'restrictive' and 'currently unsuitable'. Figure 2.12 demonstrates that there are two major tracts of 'currently unsuitable' land in the northern section of Area E. Marginal and restrictive categories of land are able to be developed however will require greater care with respect to construction methods, design and hydrology.

Further, whilst Lot 227 on DP 755740, was excluded from previous stability assessment, as this land has been identified as containing acid sulfate soils, is flood prone and is included in SEPP 14, development of this area is not contemplated. Soil stability testing for a number of other sites within the Area E Urban Release Area have not been undertaken.

It is understood that with restoration and appropriate engineering design of construction and drainage soil stability may become less of an issue. Area E has similar underlying geology, soils and topography (including gradients) as much of the previously urbanised areas of Banora Point. These areas have been developed over the last 25 to 30 years with little or no significant issues relating to land instability, except where significant cut and fill has occurred.

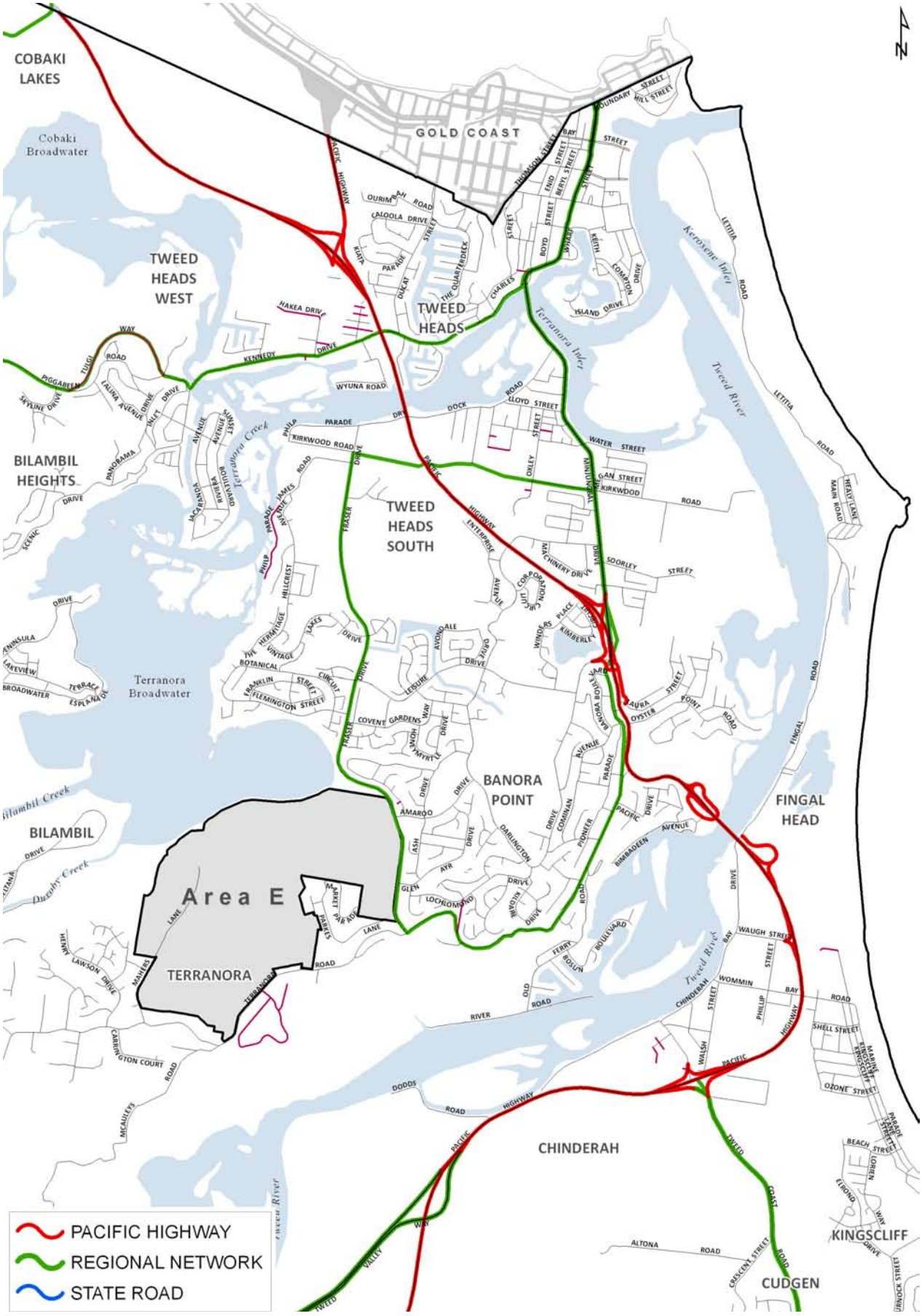


Figure 2.13 - Regional Road Network

2.10 Traffic and Transport

Most vehicle trips generated by the future residential development of the site are anticipated to have destinations towards the northeast to Banora Point, Tweed Heads South, Tweed Heads, Coolangatta, the Gold Coast and Brisbane.

Modelling of these vehicle trips display a predominant use of the Pacific Highway, which is the main arterial link providing access between Area E and key destinations in the northeast. Therefore, suitable distributor links between Area E and the Pacific Highway are essential.

Currently there are four key routes linking Area E with key destinations to the northeast (assuming a future extension of Mahers Lane to Fraser Drive), as depicted in Figure 2.13

- Terranora Road - 2 lane, 2 way road providing access to northbound and southbound Pacific Highway via a signalised intersection;
- Fraser Drive, Leisure Drive and Darlington Drive - 2 lane, 2 way road providing access to northbound and southbound Pacific Highway via on-ramps;
- Fraser Drive, Leisure Drive, Greenway Drive and Minjungbal Drive- 2 lane, 2 way road providing access to southbound Pacific Highway via on-ramp, and access to Tweed Heads South and Tweed Heads/Coolangatta via Minjungbal Drive; and
- Fraser Drive, Dry Dock Road – 2 lane, 2 way road providing the most direct access from Area E to Tweed Heads/Coolangatta.

Area E is currently accessed by two roads being Mahers Land in the west and Parkes Lane in the east. Terranora Road and Fraser Drive bound the southern and eastern boundaries of the site respectively however there are no public access points from these roads into the site.

Mahers Lane is a two lane urban collector road with an intersection to Terranora Road. It serves the residential estate of Terranora Village, Lindisfarne Secondary School and a number of rural holdings within and adjoining Area E.

Parkes Lane currently serves a number of rural residential lots and a small number of rural holdings.

There is no existing road newtork within Area E and development of the site for residential purposes will require the planning for a new internal road networks and new intersections integrating with the surrounding road network.

The main internal transport link that will provide access from within Area E to the external road network is an extension of the existing Mahers Lane traversing the Area E site and connecting to Fraser Drive to the east. This road is referred to as Broadwater Parkway and was identified through the Tweed Road Development Strategy. Broadwater Parkway is displayed in Figures 2.14(A) and (B).

All routes connecting the proposed Area E and the Pacific Highway are currently operating within capacity and are of sufficient standard for the existing traffic volumes.

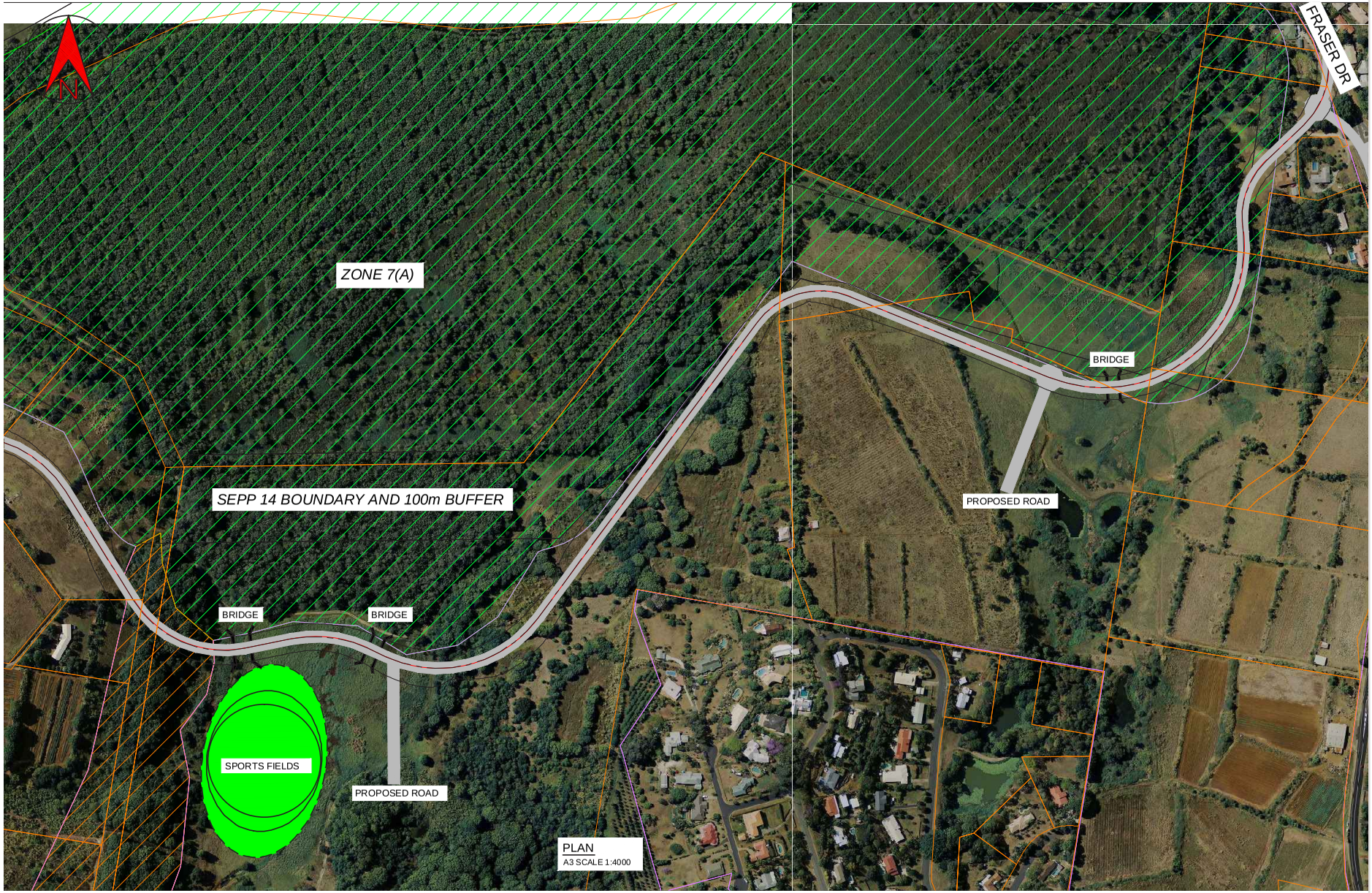


Figure 2.14(A) - Broadwater Parkway (East)

Currently Surfside Buslines serves current residents in estates to the west and east of the proposed development and provides access northeast to Tweed City Shopping Centre and Coolangatta, and south to Murwillumbah. All bus routes run through residential collector streets before connecting with the Pacific Highway. The Surfside bus routes currently in service include:

- Route 602 which serves Tweed Heads, Greenbank, Tweed City, Tweed Heights via Leisure Drive, Darlington Drive, Glen Ayr Drive and Minjungbal Drive. Stops at the eastern side of Area E.
- Route 604 which serves Tweed Heads, Tweed City, Dry Dock Road, Hillcrest via Minjungbal Drive, Dry Dock Road, Fraser Drive, Vintage Lakes Drive.
- Route 605 which serves Tweed Heads, Banora Gardens, Terranora, Murwillumbah via Minjungbal Drive, Greenway Drive, Fraser Dive, Terranora Road and Mahers Lane. Services residents on the south and southwest side of Area E.

The above bus routes are subject to change from time to time by the bus operator.

Negotiations with the bus operator are encouraged, during the master planning stage, to plan for extension of the bus routes through Area E. Ideally, any changes to the bus network should be undertaken in the early stages of residential development to capture residents trips associated with the development before the residents become accustomed to being reliant solely on their car for transportation.

The roads surrounding the proposed Area E development do not have allocated cycle or pedestrian facilities. A cycleway and pedestrian walkway are provided to the north east servicing St. Josephs College and St. James Primary School. A shared user path (cycles and pedestrians) is also provided along Terranora Creek, which partly runs along Dry Dock Road.

The Tweed Shire Council has planned to have either an on-road cycleway or a shared user path on Fraser Drive (between Terranora Road and Leisure Drive) and a proposed shared user path along the proposed Mahers Lane to Fraser Drive extension. These proposed paths will provide good pedestrian and cycle access for residents of Area E, connecting to activity centres to the northeast.

The Tweed Road Development Strategy – 2007 acknowledges the need for improving road infrastructure in the lower Tweed area to cater for anticipated growth. This includes works to Fraser Drive, Leisure Drive, Kirkwood Road and the need for a transport link from Fraser Drive to Mahers Lane to provide access to Area E. Traffic modelling results show that the majority of traffic volumes generated by new development would require access via Fraser Drive.

The traffic generated from the full development of Area E is estimated to be greater than 10,000 additional daily trips and would occur via two main access points:

- Mahers Lane (existing); and
- Fraser Drive (proposed).

Figure 2.14(B) - Broadwater Parkway (West)

These intersections will be major influences on the overall road hierarchy of the area given that their locations are largely fixed by topography, existing urban development and environmental constraints. The number of connections to the surrounding area and their location provides sufficient scope for the road network to cater for the residential development and traffic volumes anticipated.

The size and dimensions of Area E provide significant opportunity to develop a pedestrian/ cycleway network which integrates with the surrounding area and promotes the use of alternative modes of transport.

In addition to this larger network an internal network of cycle and pedestrian ways is required. This network should be designed to link community focal points such as existing or proposed schools, shops, parks, community centres and where possible, involve circuits that seek limited elevation change. The network should also be integrated with the wider network proposed above.