# Lockyer Valley Regional Council
# Basic hazard identification for Landslide

## First state interest review version - 2

November 2022

# Table of Contents

# List of Tables



# List of Figures

# Part 1 Introduction

The proposed LVRC planning scheme includes a Steep land overlay code that has been drafted to be consistent with the requirements of the State Planning Policy. The steep land overlay map comprises of LIDAR derived slope maps to identify all land with a slope of 15% greater.

The planning change subject of this report includes:

- the replacement of all the steep land overlay and provisions for steep land hazard in the Gatton Planning Scheme 2007 and the Laidley Shire Planning Scheme 2003 with that contained in the proposed planning scheme.
- changes to equivalent zones in Withcott between the Gatton Planning Scheme 2007 and the proposed planning scheme.

## 1.1 Structure

This report sets out is structured as follows:

- Part 2 outline the objectives, principle and process
- Part 3 of the report comprises of the context for the Lockyer Valley region topography, climate, population, settlement pattern and climate drivers.
- Part 4 of the report provides an overview of how the slope map was created, the map assumptions, limitation and accuracy.
- Part 5 seek to identify those areas of the slope that are likely to create as hazard to the majority of people in the region. This part also seeks to identify what community facilities in the region may be at risk of landslip.
- Part 6 reviews the draft planning scheme and breakdown the elements with respect to slops
- Part 7 summaries the current planning scheme provisions
- Part 8 outlines the proposed planning scheme provisions
- To demonstrate consistency with the State Planning Policy, Part 9 provides an overview and summary of how the proposed planning scheme is consistent.
- Conclusion draws together the conclusions of the assessment.
- Appendix 1 includes a complete list of properties across the region that are affected by slopes 15% and greater.
- Appendix 2 includes a complete list of properties that have had a zone change in relation to slope and includes the context of the change
- Appendix 3 includes the proposed draft Planning Scheme Policy for the Steep slopes and requires development to undertake a site risk assessment to address the planning scheme overlay code.

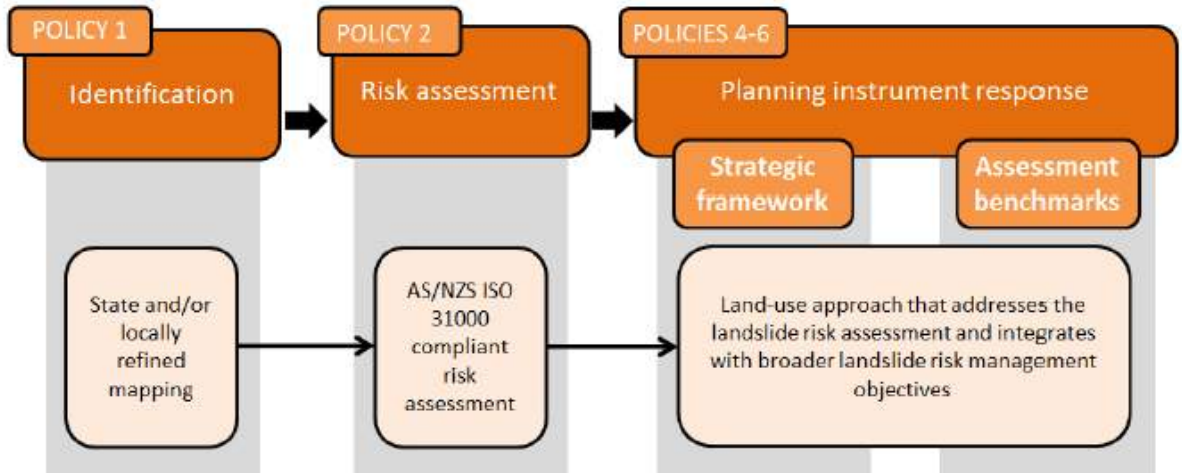
## 1.2 Scope

The purpose of this whole-of-region landslide basic hazard identification is to analyse the nature of potential landslide risk across Lockyer Valley, having regard to existing settlements and identified future growth areas to recommend land use planning controls and provisions to form part of the proposed Lockyer Valley Planning Scheme.

This assessment adopts a risk-based land use planning lens in the critical analysis of the magnitude of potential risk exposure, vulnerability, tolerability, likelihood and consequence, as well as mitigation and treatment opportunities. This process seeks to inform Council decision making in relation to the preparation of the proposed Lockyer Valley Planning Scheme, having regard to the risk profile of the Lockyer Valley region.

This approach seeks to satisfy the current State Planning Policy (SPP) and its guidance materials prepared by the State government, which together articulate the suite of landslide hazard and risk considerations which are required to be appropriately considered as part of strategic planning activities in Queensland.

**Figure 1: Overview of SPP framework (Source: Queensland Government, 2017)**




### 1.2.1 Assumptions and exclusions

The following assumptions and exclusions apply to this basic hazard identification:

- it is assumed the evidence sources utilised to inform this basic hazard identification are accurate and up-to-date, and can be reasonably relied upon for the purposes of its application;
- this basic hazard identification is not a landslide risk management plan;
- this basic hazard identification may offer options or recommendations as part of strategic and statutory land use planning process to ensure Council's obligations under the SPP are met;
- it is assumed a range of other planning-related issues are likely to be considered as part of this basic hazard identification;

- this basic hazard identification seeks to analyse the extent of land with slopes greater than 15%slope and subject to landslide risk with respect to existing conditions and potential future risk, based upon land use allocation. This assessment makes no inference as to the probability of any scenario coming to fruition;
- this assessment does not incorporate any traffic modelling or analysis about landslide emergency evacuation and remains qualitative in this regard only.

# Part 2 Objectives of report

The objectives and priorities of this basic hazard identification are:

1. the delivery of risk-informed land use planning policy, strategy and statutory controls to underpin the proposed Lockyer Valley Planning Scheme; and
2. the quantification of slopes across the Lockyer Valley region to formulate policy; and
3. identify any relevant strategic and statutory planning provisions which may be considered in response to the above matters.

## 2.1 Principles

The principles of this basic hazard identification serve as the foundation which guide the approach and implementation of methodologies. This basic hazard identification is:

- evidence-based;
- locally contextualised;
- fit-for-purpose;
- both quantitative and qualitative in assessment;
- transparent to ensure integrity of process; and
- aligned with the strategic planning requirements of SPP and its guidance materials.

## 2.2 Process

The process taken in this basic hazard identification generally aligns with the SPP and its guidance materials:

- identify hazard areas;
- prepare hazard mapping,
- determine exposure and vulnerability;
- identify options to mitigate risk and minimise exposure to hazard;
- Monitor and review.

# Part 3 LVRC context

## 3.1 Preliminary risk area identification

A Natural Hazard Risk Assessment for LVRC was commissioned by the Local Government Association Queensland. This report was prepared in response to the 2011 flood event to better prepare the Lockyer Valley Regional Council for natural hazards. The Final Report was received by Council in September 2012 and further revised in April 2016. As part of this process ERSA specialists worked with LVRC disaster managers, and their consultants, to identify the natural disaster hazards, consider the Regions exposure and vulnerability to those hazards.

Consistent with the risk management process established in AS/NZS ISO 31000-2009, the ERSA report included:

- identification of the range of natural hazards that have the potential to impact on the Lockyer Valley Region and the analysis of the potential consequences of such impacts;
- analysis of the complex nature of the Lockyer Valley Region built environment and the infrastructures that support the community together with their susceptibility to hazard impacts;
- analysis of the potential exposure of the Lockyer Valley Region population to the range of hazard impacts and their susceptibility to such exposure; and
- analysis of the complex (and at times competing) jurisdictional relationships that exist in the administration of emergency or disaster management in Lockyer Valley Region.

The ESRA study identified the greatest hazard risks in the Lockyer Valley region were (in order of highest to lowest):

1. 500 year ARI flood;
2. 6-day heatwave;
3. 100 year ARI flood;
4. 4-day heatwave;
5. 2-day heatwave;
6. Extreme fire danger;
7. Severe storm;
8. Severe fire danger;
9. 50 year ARI flood;
10. Extended heavy rain landslide;
11. Overland flows;
12. Landslide in heavy rainfall.
13. Very high fire danger.

The ESRA study has thus guided the Lockyer Valley Regional Council to focus its planning for natural hazards from highest to lowest (in order of importance) being:

1. Flood;
2. Bushfire;
3. Landslide.

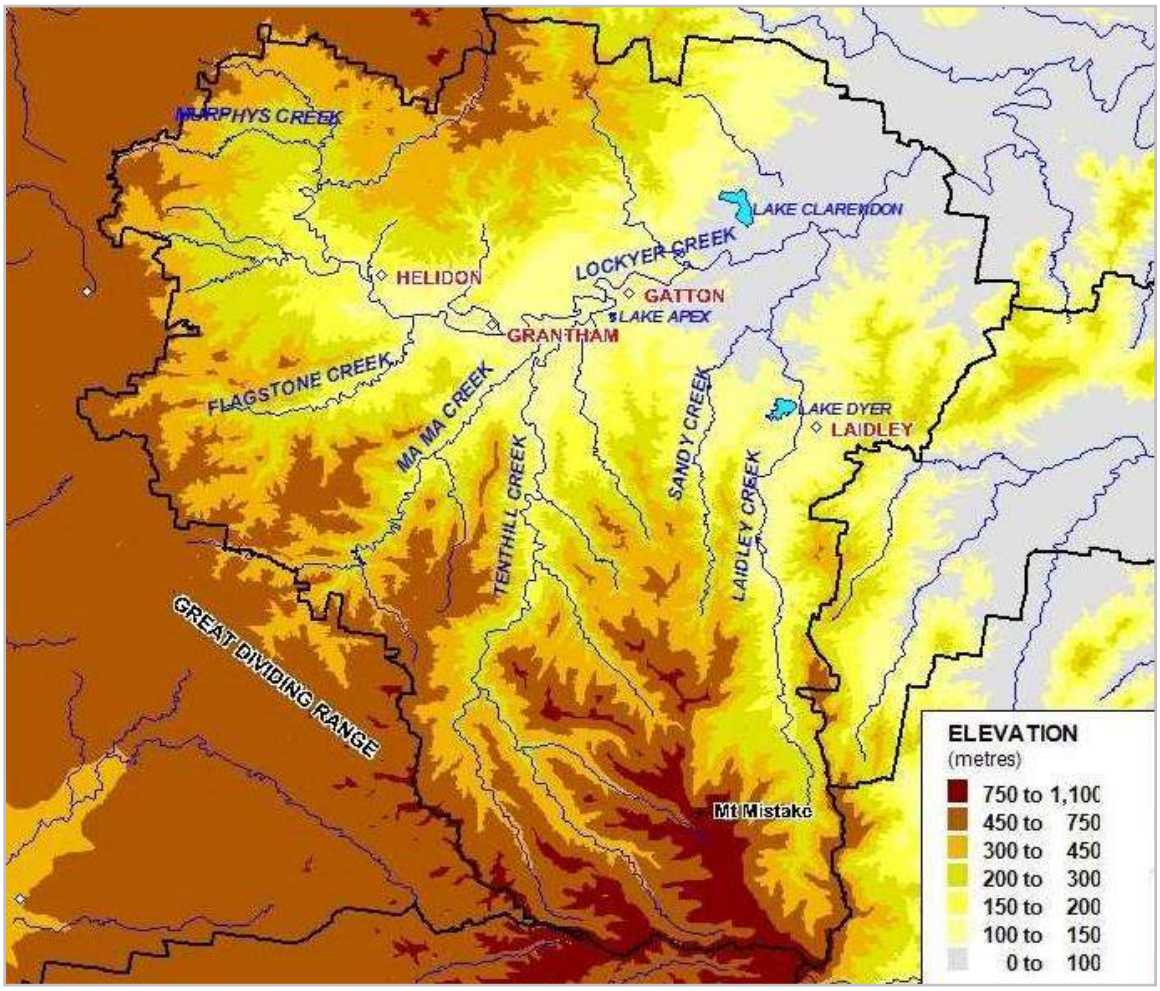
It was determined at this time that a basic landslide risk assessment is to be undertaken based on the above risk profile.

### 3.1.1 Topography and climate

The Lockyer Valley is located to the east of the Great Dividing Range and coincides almost perfectly with the catchment of Lockyer Creek and its tributaries which include Murphy's Creek, Flagstone Creek, Ma Ma Creek, Tenthill Creek, Sandy Creek and Laidley Creek. The western boundary of the Lockyer Valley comprises the escarpment of the Great Dividing Range which rises to over 1000m in the south. Toward the east the foothills of the Great Dividing Range give way to extensive alluvial plains that comprise fertile soils.

The Lockyer Valley experiences a sub-tropical climate with the highest rainfall generally occurring in the summer months. The mean annual rainfall at Gatton based on 117 years of records is 770mm; however, rainfall can be highly variable and has ranged from 354mm (in 1993) and 1,241mm (in 1950). Periods of intense rainfall are not unknown with the highest daily rainfall at Gatton being 199.4mm on 26 January 1974 and the highest monthly rainfall being 452.9mm in January 1974. Sustained periods of dry weather do occur and months with no rainfall can occur in any season. Since 1899 there have been over 80 months where monthly rainfall was 5% or less than average including 36 months where less than 1mm was recorded. The combination of topography and climate make the Lockyer Valley susceptible to landslide.

**Figure 2: Lockyer Valley topography and major creeks (Source: ESRA)**




## 3.1.2 Population

The population of the Lockyer Valley at the time of the census in 2016 was 38,609. Mid-series projections of population growth for the Lockyer Valley indicate significant and sustained growth to 2036 when it is anticipated the population will rise to 56,758 persons.

**Table 1: Population projections for Lockyer Valley Regional Council**

| | 2016 | 2021 | 2026 | 2031 | 2036 |
|---|---|---|---|---|---|
| **Population** | 38,609 | 43,477 | 47,824 | 52,302 | 56,758 |
| **Dwellings** | 14,931 | 16,456 | 18,165 | 19,935 | 21,713 |

As a result, approximately 7,000 additional dwellings are forecast to be required by 2036. Most of this growth will be in appropriately zoned land within the South East Queensland Regional Plan's (SEQRP) Urban Footprint and Rural Living Areas.

### 3.1.3 Land use planning and settlement pattern

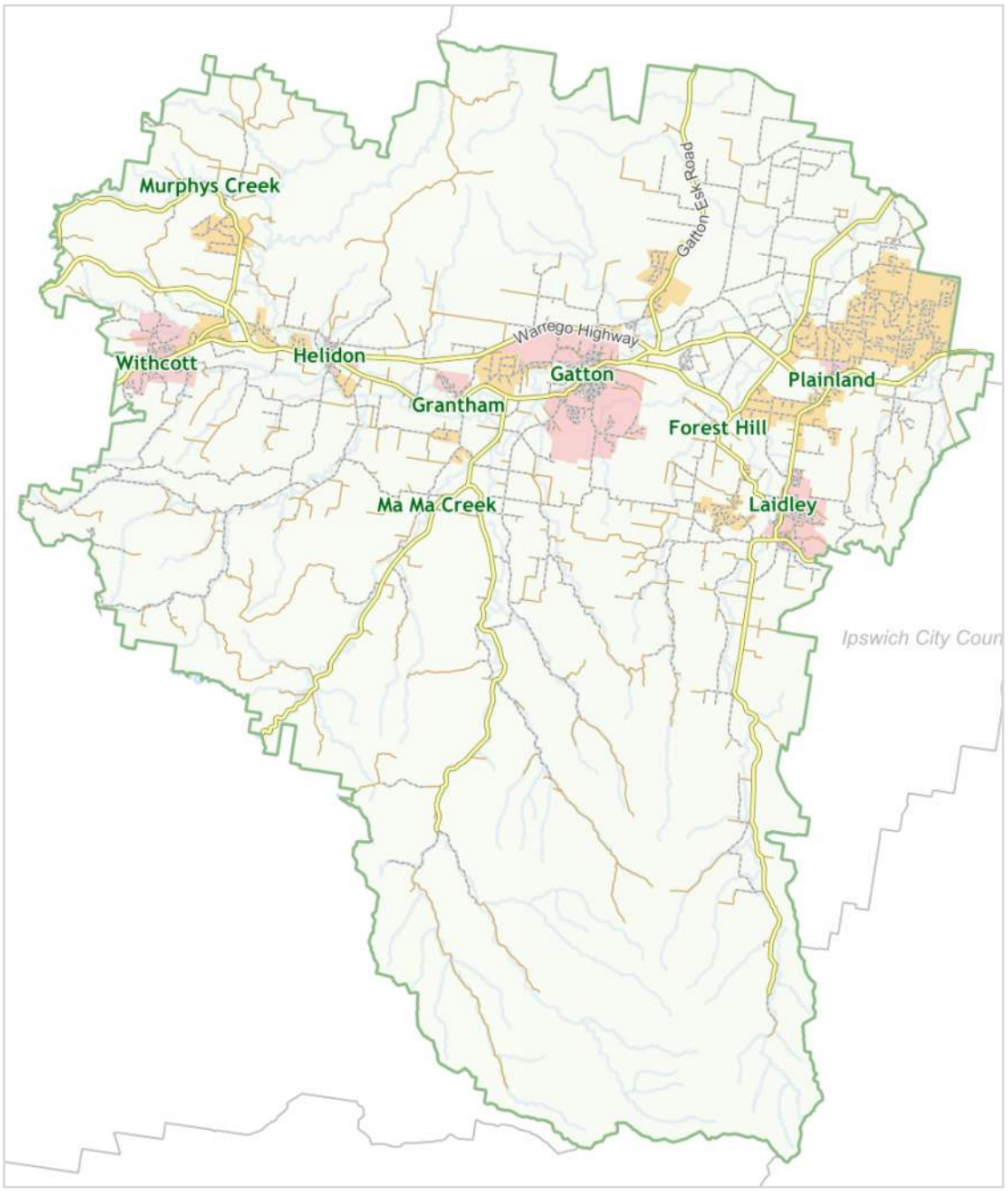
The SEQ Regional Plan identifies most of the Lockyer Valley in the Regional Landscape and Rural Production Area (shown green in Figure 3) land use category (LUC). The townships of Withcott, Gatton and Laidley are within the Urban Footprint (shown pink in Figure 3). Pockets of Rural Living Area (rural residential land use, shown as orange in Figure 3) are located around Murphy's Creek in the North-west, along the Warrego Highway and in the north-east.

**Table 2: Shaping SEQ (Regional Plan LUC's)**

| LAND USE CATEGORY | AREA (HA) | % |
|---|---|---|
| Regional Landscape and Rural Production Area | 211,057 | 93.09 |
| Rural Living Area | 8,717 | 3.84 |
| Urban Footprint | 6,948 | 3.07 |
| **Total:** | **226,722** | **100** |

Based upon the amount land in the regional plan land uses categories, it is expected that the area to be most affected by slope in the Lockyer Valley should be land within the Regional Landscape and Rural Production Area compared to the Rural Living Area and Urban Footprint.

**Figure 3: Shaping SEQ (Regional Plan Land use categories)**



## 3.2 Climate driver and influences

El-Zein (2016) suggests that vulnerability of landslip will continue to occur in the future from:

1. increased urbanisation;
2. increased frequencies, magnitude and duration of droughts, bushfires and floods due to climate change;
3. significant rise in sea levels increasing the risks of erosion of coastal land due to climate change.

This is also supported by Council's region wide Natural Hazard Risk Assessment where:

> *'Rainfall is clearly the most common trigger for landslides and the more widespread the rainfall - as with a tropical cyclone or east coast low - the more widespread will be the occurrence of landslides.' (ESRA 2016)*

In addition, any addition to subsurface moisture on slopes greater than 15% have the potential to increase the risk of landslide. The rainfall intensities that the Lockyer Valley is likely to experience in the future may result in an increase chance of landslide event where ESRA 2016 identifies that rainfall intensities that have an average recurrence interval (ARI) of less than one year are likely to trigger landslide events. Under the Australian Rainfall and Runoff New ARR Probability Terminology this equates to less than 1 exceedance per year or 1EY.

Based on the above the following sections of the basic hazard identification will focus on the potential increased risk in urban and rural residential areas. El-Zein (2016) indicates that issues with increased urbanisation, onsite effluent disposal and rainfall intensity are further likely to increase landslip risk and most imminent in risk.

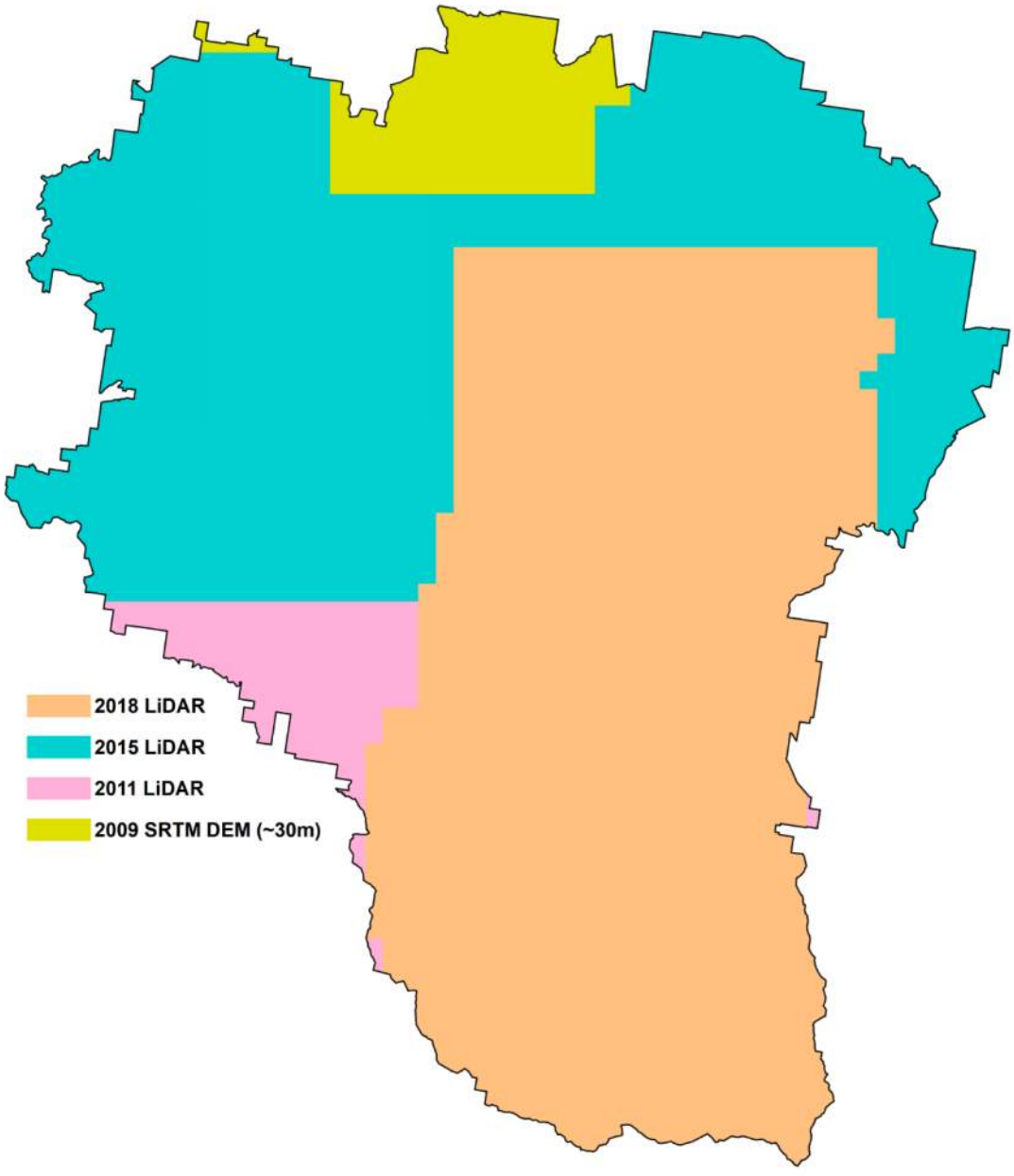
# Part 4 Slope Map generation

Using a basic hazard identification process to develop a hazard identification map involved using pre-existing information including:

- State Shuttle Radar Topographic Mission – 30m (2009);
- State LiDAR based digital elevation model (2011);
- State LiDAR based digital elevation model (2015);
- Council LiDAR based digital elevation model (2018) funded as part of Council's Local Flood Management Plan.

The extent of data sets used to create a complete digital elevation model for the whole region is shown in Figure 5, below.

**Figure 4: Data sets to create LVRC digital elevation model for slope**



The State LiDAR data sets used have a 1m resolution capture for the digital elevation model. Whereas Council's LIDAR has an accuracy of 0.25m and used to generate flood models for the Local Flood Management Plan. The digital elevation model was used to identify slopes of:

- 0-5%;
- 5-10%;
- 10-15%;
- 15-20%;
- Greater than 20%.

The above categories where used for the following reasons:

- slopes greater than 5% can lead to erosion in areas with high risk soils;
- slopes greater than 10%, heavy vehicle struggle to access sites;
- slopes less than 10% are suitable for effluent disposal areas;
- slopes greater than 20%, vehicle and emergency vehicles struggle to access sites;
- slopes greater 35% are subject to potential rapid landslide.

The range of slopes was generated to provide additional administrative information that will be used to inform development assessment. For example, effluent disposal site should not be located on slopes greater than 10% and earthworks in areas with high risk soils greater than 5% are likely to have significant sediment and erosion control issues.

The accuracy of this data is high in areas, to the extent that slopes of waterways, road batters, swale drains, cut and fill slopes for house construction and farm dam walls have been identified. The final mapping that forms the Steep land overlay mapping has been refined to remove any 'noise' and minimise the extent of these features. A GIS script was used as part of this process to ensure there was a consistent approach across the entire region to remove noise and ensure that the administrative layers when combined with the trigger layers provide a slope picture of the region.

It is noted that the mapping is a steep slope extent and not a landslide hazard map. This means Applicants must undertake a risk assessment as part of the development assessment process.

## 4.1 Map data assumptions and limitations

This basic hazard identification was undertaken based on the following data assumptions and limitations:

- data sources are publicly available;
- digital elevation models generated has been combined to form the most current information available at the time of data processing (2021);
- where relevant, the analysis considers zoned land only (i.e. unzoned land, such as road reserve and the like is excluded);
- dwelling exposure is based on building point data made available through QSpatial and may not reflect recent development;

- the location of aged care facilities, schools and childcare centres are determined by geocoding street addresses and are aligned with the underlying cadastral boundaries to form a cadastral assessment.

## 4.2 Slope Vector Creation Process

The following table outlines the process that was followed for the noise reduction on the slope layer. Each layer is created using a tool or process and some parameters. The general purpose of each step is given in the description.

Acronyms outlined in Table1 Detailed Process Method – Noise Reduction include:

- GDAL – Geospatial Data Abstraction Library.
- GRASS – Geographic Resources Analysis Support System.
- QGIS – Quantum GIS – Open Source GIS.

**Table 3: Detailed Process Method – Noise Reduction**

| LAYER NUMBER | SOURCE LAYERS | LAYER | PROCESS OR TOOL (PROVIDER) | PARAMETERS | DESCRIPTION |
|---|---|---|---|---|---|
| 1 | | Digital Elevation Model (raster) | | | Original source elevation data. |
| 2 | 1 | Slope (raster) | Slope (GDAL) | Express in % | Generate slope raster. |
| 3 | 2 | Slope Bins (raster) | r.reclass (GRASS) | Reclass slope rules | Reclassify the slope layer into five categories: 1 = 0-5% slope; 2 = 5-10%; 3 = 10-15%; 4 = 15-20%; 5 = >20% |
| 4 | 3 | Clumped (raster) | r.clump (GRASS) | Clump diagonal | Create a raster where cell values are assigned a unique identifying number by 'clump' cells that have equal slope value and are touching. |
| 5 | 3 | Neighbour Analysis (raster) | r.neighbors (GRASS) | Operation=diversity, Neighbour size=1 | Create a raster where each cell is assigned a value based on the number of different slope categories that are in the surrounding 8 cells. For |

| LAYER NUMBER | SOURCE LAYERS | LAYER | PROCESS OR TOOL (PROVIDER) | PARAMETERS | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | example, a cell in the middle of uniformly sloping will have a diversity value of 1, whereas a cell on the edge of the flat region would have a diversity of 2 or higher depending on how many different other slope classifications it touches. |
| 6 | 4 | Clumped Areas (raster) | r.stats.zonal (GRASS) | Method=count | Create raster where cells contain cell counts for each clumped area. For example, if a region with a slope category of 1 contains 3 cells, each of the 3 cells would have a value of 3. This allows us to compute area because each cell is 25m$^2$. |
| 7 | 4,5,6 | Clump Removal (raster) | Raster calculator (QGIS) | Clumped * (Neighbour Analysis=2 AND Clumped Areas <= x) | Create a raster for the removal of noise from the final raster. It is a refined version of Clumped, but only includes cells which exist in a clump (by slope) of fewer than x cells (e.g., 10,20 or 40), and where, of the surrounding cells, there is only 1 other slope classification (i.e., a diversity value of 2). |
| 8 | 7 | Clump Removal (raster) | Translate (GDAL) | Output: int32 | Translate to integer (GRASS requires integer input) |
| 9 | 8 | Clump Removal Areas (raster) | r.stats.zonal (GRASS) | Method=count | The same raster as Clump Removal except each clumped region now contains a cell count value as per layer 6. The purpose of this layer is to |

| LAYER NUMBER | SOURCE LAYERS | LAYER | PROCESS OR TOOL (PROVIDER) | PARAMETERS | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | compare cell counts with the original Clumped Areas. |
| 10 | 6,9 | Clump Removal Refined (raster) | Raster calculator (QGIS) | Clumped Areas = Clump Removal Areas | The purpose of this raster is to refine the Clumped Removal Areas. Areas picked up as Clump Removal Areas that are part of a larger contiguously categorised slope region (of identical classification) will not be removed as noise. |
| 11 | 3,10 | Slope Bins Refined (raster) | Raster calculator (QGIS) | Slope Bins * ((Clump Removal Refined -1) *-1) | This raster layer is the original Slope Bins Refined layer (categorised slope layer), but the cells defined as noise by the Clump Removal Refined layer are turned to 0. |
| 12 | 11 | Slope Bins Refined (raster) | Raster calculator (QGIS) | (("x">0)*"x") / (("x">0)*1 + ("x"<=0)*0) | This step converts 0 cells to 'nodata' cells. |
| 13 | 12 | Slope Bins Refined (raster) | fill nodata (GDAL) | Search distance = 1 pixel | This step produces the final raster layer. It fills in the removed noise (now no-data regions) with the value of surrounding cells. Because interpolation is not desired, this step must be run 3-4 times at 1-cell infill per run. |
| 14 | 13 | Slope Bins Refined (vector) | Polygonize (raster to vector) | 8-connectedness | Convert the cleaned and categorised slope raster into a vector layer. 8-connectedness ensures that cells with touching |

| LAYER NUMBER | SOURCE LAYERS | LAYER | PROCESS OR TOOL (PROVIDER) | PARAMETERS | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | corners are treated as a single polygon. |

To assist in understanding the GIS process, **Figure 6** below demonstrates how the noise reduction for the slope was undertaken. The blue circles highlight cells determined to be noise, and therefore to be removed. The red circles highlight the cells that are flagged to be removed by the first set of criteria but are then determined to be kept by a later test.

The binned slope raster is shown in **Image A**, where a slope category exists for each cell, depicted by different shades of grey.

**Image B** shows cells of the same colour that exist as connected regions of cells with equal slope categorisation.

**Image C** shows cells by their diversity value. A diversity value of 2 is coloured red, whereas all other diversity values are coloured green (i.e. less than and greater than 2). The diversity value for a cell is equal to the sum of slope categories included in the cell and surrounding 8 cells (9 cells total). A cell diversity of 1 would indicate that all cells surrounding a cell (including the centre cell itself) are of the same slope category (e.g., 10-15% slope). Cell diversities of 2 were chosen as a key removal criterion, as this indicates a cell that is likely to be a part of an isolated sloping region.

**Image D** depicts cells that meet the criteria of having a diversity of 2 and forming part of a clump of equal sloped cells that is less than a nominated number of cells (i.e. less than or equal to a certain area). For example, remove all clumps =< 250m², which equates to 10 or less cells, as they are 5m x 5m in size.

**Image E** depicts cells that are to be removed since they are isolated clumps which meet the two criteria above. The red circled cells were reinstated into the Slope assessment, as they were determined to form part of a larger clump (Image B) that had a diversity value not equal to 2. This process is necessary because it is likely that the cell is a part of a larger sloping terrain feature.

**Image F** then shows the binned slope raster with the noise (blue circled cells) removed, and the adjacent cell values used to fill the gaps.

**Figure 5: Process for determining noise reduction for the slope raster**

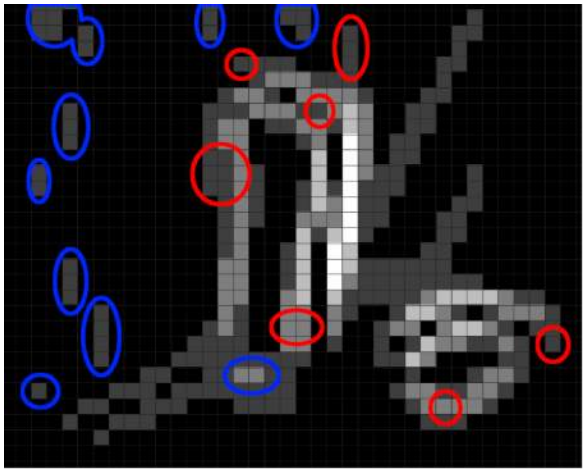


**Image A:** Original slope raster ‘Slope Bins’.

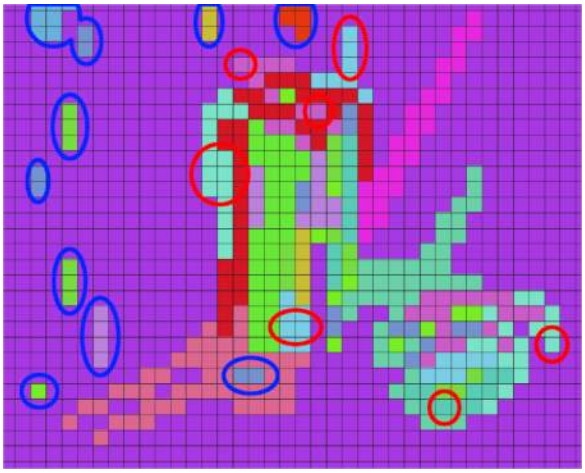


**Image B**: Regions of similar slope ‘Clumped’.

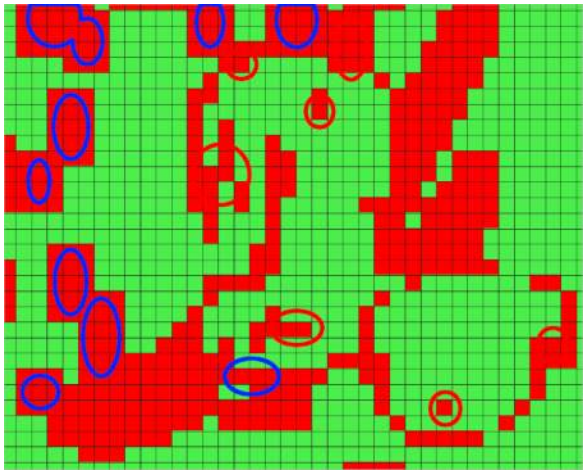


**Image C:** Surrounding cell diversity ‘Neighbour Analysis’.

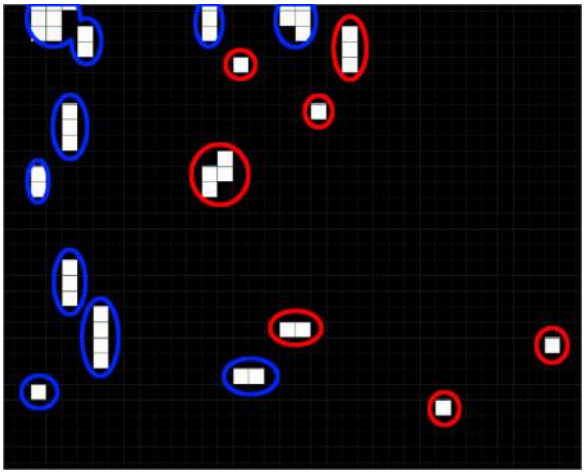


**Image D**: ‘Clump Removal’.

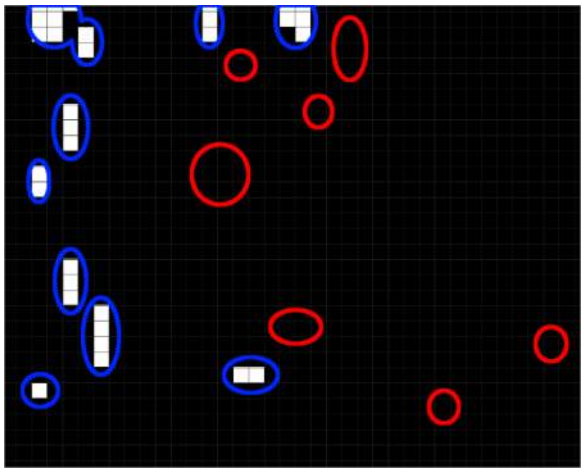


**Image E**: ‘Clump Removal Refined’.

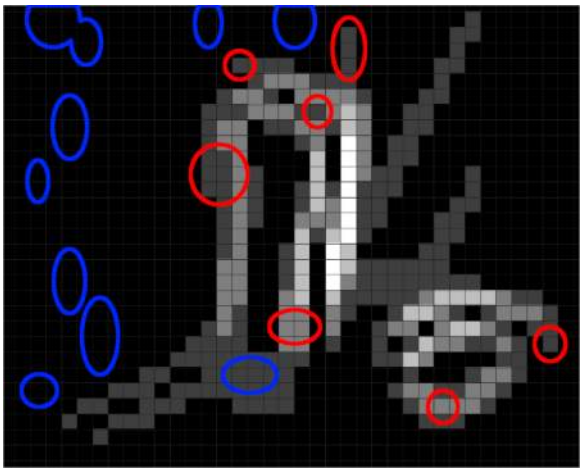


**Image F**: ‘Slope Bins Refined’.

## 4.3 Map accuracy

A comparison of the area mapped as being steeper than 15% in the Gatton and Laidley planning schemes and that for the proposed planning scheme demonstrate an improved map accuracy. At region wide scale, there is a high degree of similarity between the current overlay mapping in the Gatton and Laidley planning schemes and that contained in the proposed LVRC planning scheme as shown in Figure 6 Comparison of Region wide slope mapping.

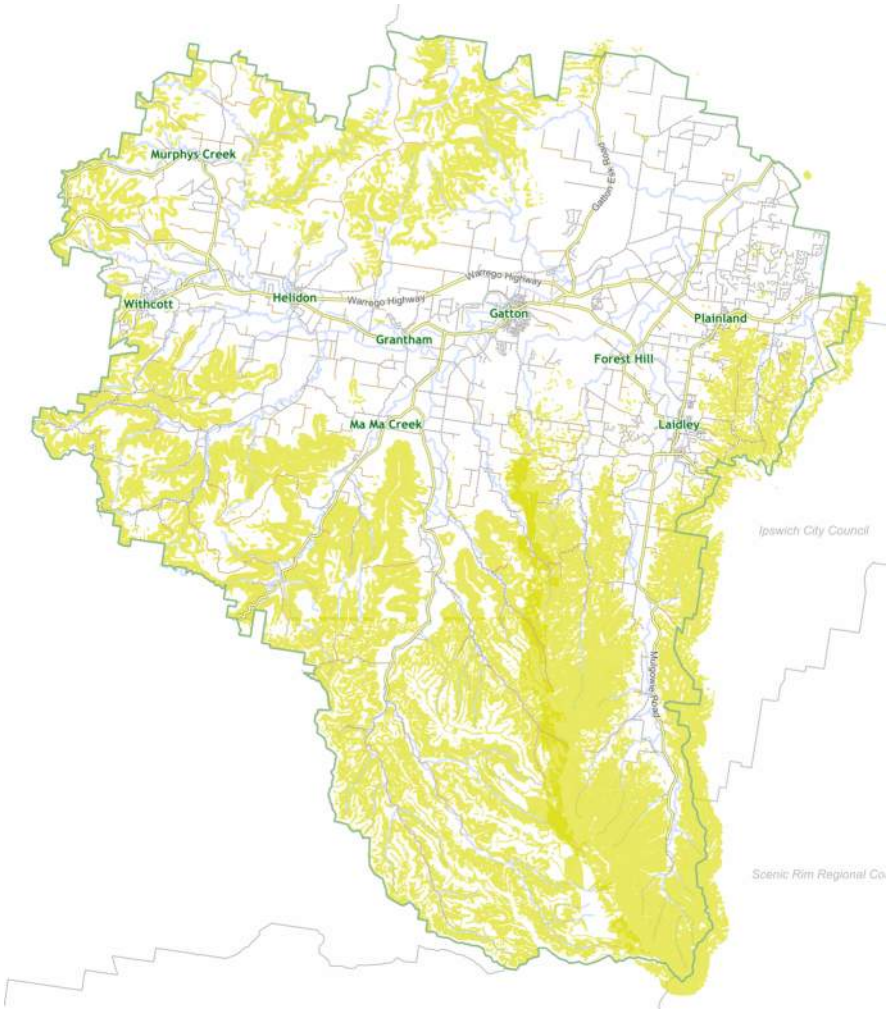
Table 4 Comparison of areas shows that the area of land identified as being slope affected has increase by 33,001ha between the current and proposed planning schemes. The number of lots affected by slope has also increased from 3,467 to 12,145 between the current planning schemes and proposed planning scheme. The increase in extent of slope and number of lots affected can be attributed to the increased accuracy of mapping as illustrated in **Figure 8** below. In addition, because of the map accuracy 85 lots that were previously identified as being slope affected are no longer affected by the overlay (Appendix 1 Slope affected properties) and 1,387 lots have been identified as having less slope than the previously identified under the current slope overlays.

**Table 4: Comparison of areas**

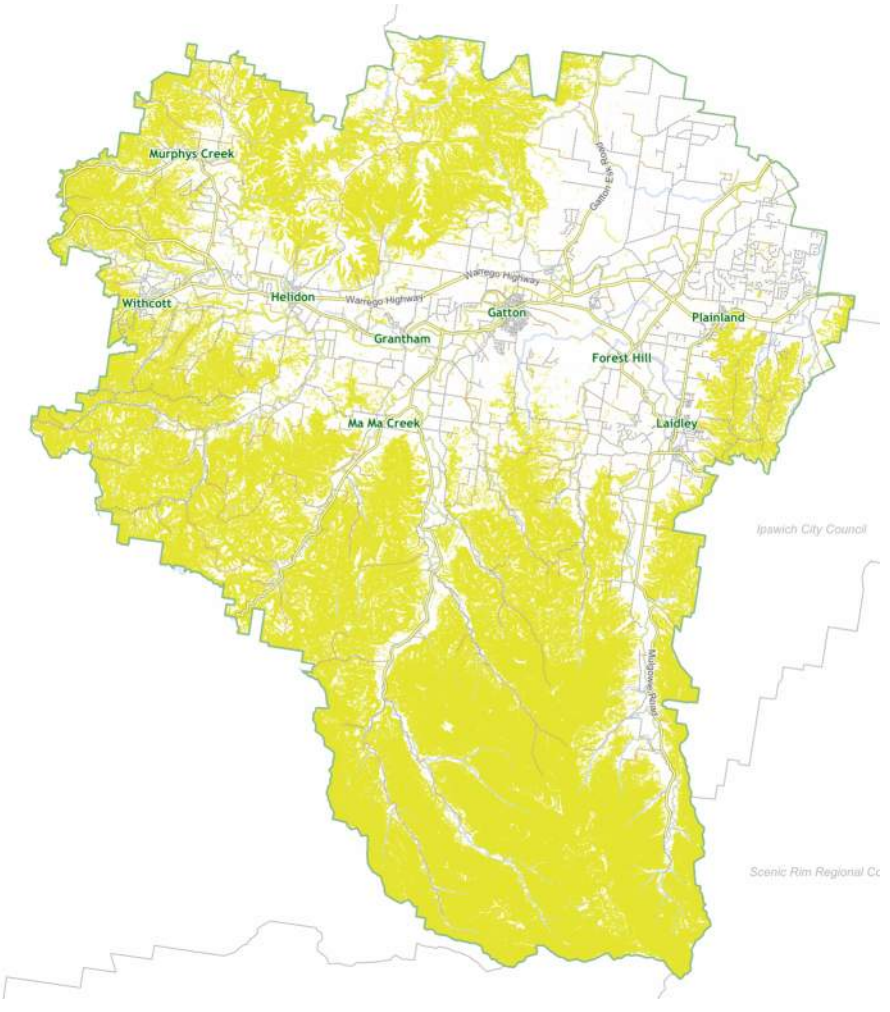
| LAND GREATER THAN 15% SLOPE | NUMBER OF LOTS | AREA (HA) | % OF REGION |
|---|---|---|---|
| Current Planning Schemes | 3,467 | 81,161 | 37.1 |
| Proposed Planning Scheme | 12,145 | 114,162 | 52.2 |
| **Difference:** | **8,678** | **33,001** | |

Figure 8 Map Accuracy shows the locality of Glenore Grove. Three images are shown. **Image A** shows aerial photography to provide context. **Image B** shows the current slope map and **Image C** shows the proposed planning scheme slope map. Three areas have been identified to demonstrate the differences in accuracy between the current and proposed mapping. **Image A** shows slope along the creek bank of Lockyer Creek. It is expected that this natural feature would have some changes to the slope due to erosion over time. **Image B** shows Lockyer Creek as having a discontinuous creek bank pattern of slope with a pixelated extent. **Image C** shows Lockyer Creek as having a continuous pattern of slope following the creek banks showing a truer extent of the slope within the creek banks with a more refined granular extent.

**Figure 6: Comparison of Region wide slope mapping**




**Existing Gatton and Laidley Planning Schemes slope trigger extent for Slope assessment**




**Proposed Planning Scheme slope trigger extent for Slope assessment**

**Figure 7: Map Accuracy Laidley Planning Scheme versus Proposed Planning Scheme**

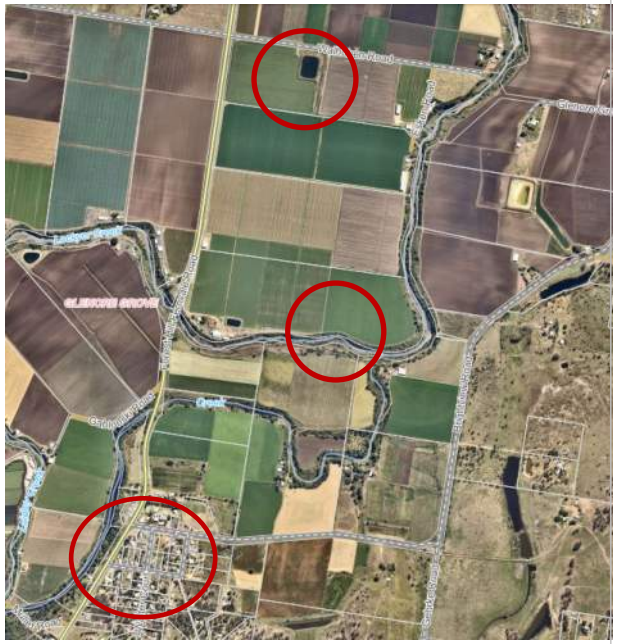


**Image A:** Aerial photo of Glenore Grove

**Image B:** Current Laidley Planning Scheme map

**Image C:** Proposed Planning Scheme map

The mapping has an accuracy that identifies constructed features such as dam walls and road embankments **Image A** shows a constructed dam. **Image B** does not show the dam and **Image C** show the extent of the dam embankments and drainage works. As well as adding areas of slope the proposed mapping removes areas that are errors. The historic township of Glenore Gove is shown on **Image B** as being affected by slopes 15% and greater. However, in Image C this has been corrected and the township is no longer considered a slope risk.

**Figure 8: Map Accuracy Gatton Planning Scheme versus Proposed Planning Scheme**

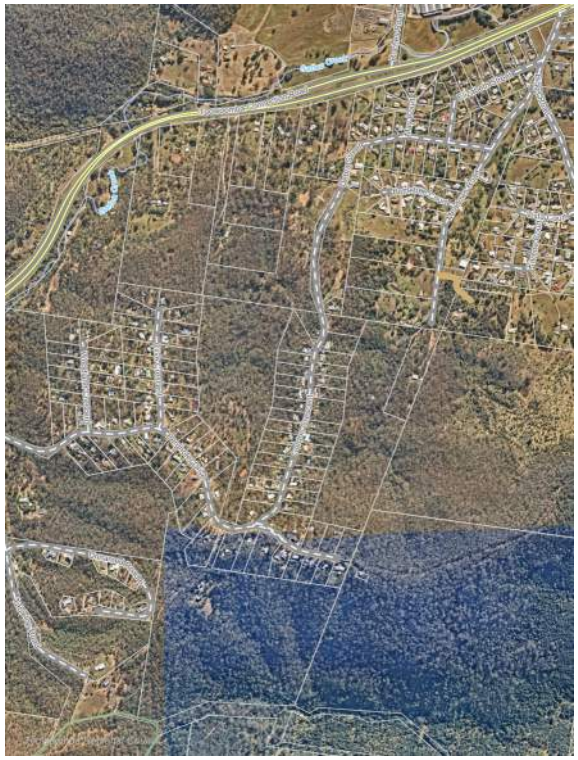


**Image D:** Aerial photo of Withcott

**Image E:** Current Gatton Planning Scheme map

**Image F:** Proposed Planning Scheme map

This comparison again shows constructed and natural features in the proposed mapping (Image F) when compared to the current mapping Image E. While the current Gatton planning scheme map shows broad elements and features the level the granularity of accuracy is low compared to the proposed planning scheme map. It is noted that while the proposed planning map accuracy is high it does not account for changes to the land form that have occurred since the 2018. Such changes include where development has modified the landform and where erosion of creek banks have occurred due to intense rain events.

# Part 5 Hazard identification

This section provides an overview of the key aspects of the spatial analysis. A summary of the data analysis undertaken is included as **Appendix 1** and relevant mapping is provided at **Appendix 2.** Slope extent mapping used region wide to identify dwelling houses and community facilities within slopes greater the 15%.

## 5.1 Zoned land

The Lockyer Valley region covers an area of 2,272 square kilometres. Table 5 shows the total area and percentage of the region to be zoned (at time of analysis).

**Table 5: Total area and percentage of the region by Zone**

| ZONE | TOTAL AREA (HA) | ZONE % OF REGION |
|---|---|---|
| Community Facilities Zone | 3,944.86 | 1.8% |
| Conservation Zone | 32,816.80 | 15.2% |
| Emerging community Zone | 1,229.38 | 0.6% |
| Industry Zone | 363.47 | 0.2% |
| Limited Development Zone | 44.54 | 0.0% |
| Local Centre Zone | 22.17 | 0.0% |
| Low Density Residential Zone | 1,135.77 | 0.5% |
| Low-Medium Density Residential Zone | 90.57 | 0.0% |
| Major Centre Zone | 43.96 | 0.0% |
| Mixed Use Zone | 7.26 | 0.0% |
| Open space zone | 565.28 | 0.3% |
| Principal Centre Zone | 24.65 | 0.0% |
| Rural Residential Zone | 9,001.71 | 4.2% |
| Rural Zone | 165,953.21 | 76.6% |
| Special Industry Zone | 845.30 | 0.4% |
| Sport and Recreation Zone | 387.90 | 0.2% |
| Township Zone | 48.07 | 0.0% |

As can be seen from the above table the zones with the largest amount of the land in the region includes:

1. Rural Zone (76.6%);

2. Conservation Zone (15.2%);
3. Rural Residential Zone (4.2%);

This is to be expected as this is largely consistent with the regional plan land use categories. All other zones are less than 1% of the total regions area. As such it is expected that these three zones would most likely have the highest percentage of steep slope compared to other zones.

Table 6 below, shows that the area and of each zone affected by slope and the percentage of the zone and region

**Table 6: Area and percentage of Land with 15% slope and greater by Zone**

| ZONE | AREA AFFECTED BY SLOPE GREATER THAN 15% (HA) | % OF ZONE AFFECTED BY SLOPE GREATER THAN 15% | % OF REGION AFFECTED BY SLOPE GREATER THAN 15% |
|---|---|---|---|
| Community Facilities Zone | 813.59 | 20.62% | 0.376% |
| Conservation Zone | 26,903.39 | 81.98% | 12.425% |
| Emerging community Zone | 58.44 | 4.75% | 0.027% |
| Industry Zone | 21.07 | 5.80% | 0.010% |
| Limited Development Zone | 1.67 | 3.75% | 0.001% |
| Local Centre Zone | 1.20 | 5.41% | 0.001% |
| Low Density Residential Zone | 112.49 | 9.90% | 0.052% |
| Low-Medium Density Residential Zone | 2.99 | 3.30% | 0.001% |
| Major Centre Zone | 0.41 | 0.93% | 0.000% |
| Mixed Use Zone | 0.10 | 1.38% | 0.000% |
| Open space zone | 26.71 | 4.73% | 0.012% |
| Principal Centre Zone | 0.23 | 0.93% | 0.000% |
| Rural Residential Zone | 777.59 | 8.64% | 0.359% |
| Rural Zone | 85,239.60 | 51.36% | 39.367% |
| Special Industry Zone | 149.25 | 17.66% | 0.069% |
| Sport and Recreation Zone | 48.94 | 12.62% | 0.023% |
| Township Zone | 4.12 | 8.57% | 0.002% |

| ZONE | AREA AFFECTED BY SLOPE GREATER THAN 15% (HA) | % OF ZONE AFFECTED BY SLOPE GREATER THAN 15% | % OF REGION AFFECTED BY SLOPE GREATER THAN 15% |
|---|---|---|---|
| **Total Area:** | **114,161.79** | | **52.7%** |

From Table 6, above the Zones most affected by slope in the region includes the Rural Zone (39.37%) and Conservation Zone (12.43%). The next zone with the highest percentage is Community Facilities Zone (0.38%) closely followed by the Rural Residential Zone (0.36%).

This preliminary review indicates that the Rural Living Areas and Urban Footprint areas under the regional plan are largely unaffected by slope. A visual review of the data also confirms this finding (refer to Figure 9). Figure 9 shows the regional plan land use categories overlaid with the steep slope layer. The areas circled have been identified as follows:

- **Red areas** – Highest risk – Areas known to have slopes greater than 15% slope and/or identified for future growth.
- **Green areas** – Uncertainty - Areas known to have undulating topography but not identified in the overlay mapping and/or anticipated to have low or future growth.
- **Blue areas** – Low risk – Areas are known to have topography that is relatively flat and/or anticipated to have low or no growth in the future.

**Figure 9: Future development locations and risk (Regional Plan LUC with Slope overlays)**

It is therefore anticipated that the urban and rural living location most at risk of landslip includes Withcott and areas of Laidley, Laidley North and Plainland that intersect with the Little Liverpool Range.

Areas of uncertainty include:

- Gatton;
- Grantham;
- Laidley Heights;
- Murphy's Creek;
- Postman's Ridge;

As such it likely that:

- Most existing dwelling houses affected by 15% slope and greater occur in the Rural and Rural Residential with some also within the Low Density Residential zones and Low-Medium Density Residential Zone.
- Community facilities may be affected by landslips where these occur in rural and urban areas.
- Other Zones and uses are marginally affected.

## 5.2 Dwelling and Resident exposure to slopes

As of 2021, an estimated 41,762 persons reside within the region within 12,543 dwellings. Based on an average household size of 2.65 persons per dwelling (.idcommunity, 2022).

The following table outlines the potential exposure of existing residential dwellings and resident population within the Lockyer Valley region.

**Table 7: Dwelling and Resident exposure to potential landslip**

| ZONE | NUMBER OF DWELLINGS ON STEEP LAND | ESTIMATED EXISTING RESIDENT POPULATION EXPOSURE |
|---|---|---|
| Rural Zone | 388 | 1,029 |
| Rural Residential Zone | 124 | 329 |
| Low Density Residential Zone | 69 | 183 |
| **Total:** | **581** | **1,541** |
| **Whole of Region** | **16,164** | **41,762** |

## 5.3 Vulnerable facilities and community infrastructure

As Community facilities zone can occur in urban and rural areas consideration should be given to the effect of steep slopes in this Zone. Essential community infrastructure (such as telecommunications towers and services infrastructure) plays an important role in ensuring essential services are provided to the community which need to remain operational during a landslip to minimise potential loss of life. Whereas vulnerable facilities (such as nursing homes, childcare centres and schools) may be at increased risk to landslip due to the nature of the activity or the facilities occupants.

Other infrastructure that may be affected by steep slopes includes water supply infrastructure such as irrigation channels, pump stations and weirs. This infrastructure is usually located on the embankments of creek beds which are subject to erosion and slumping.

The following table provides an overview of the potential landslip exposure to infrastructure.

**Table 8: Vulnerable use, essential community infrastructure and critical infrastructure exposure to steep slopes**

| USE | TYPE OF INFRASTRUCTURE | NUMBER OF FACILITIES LOCATED ON LOTS IDENTIFIED AS STEEP SLOPES |
|---|---|---|
| Nursing home or respite facilities | Vulnerable use | 0 of 6 in total |
| Childcare facilities | Vulnerable use | 0 of 17 in total |
| Schools | Vulnerable use | 1 of 27 in total |
| Higher education facilities | Vulnerable use | 0 of 3 in total |
| Hospitals | Essential community infrastructure | 0 of 2 in total |
| Electrical substations | Critical infrastructure | 0 of 14 in total |
| Telecommunications towers | Critical infrastructure | 1 of 21 in total |
| Fuel stations | Critical infrastructure | 0 of 18 in total |
| Water pumping stations | Critical infrastructure | 2 of 11 in total |
| Wastewater treatment plants | Critical infrastructure | 0 of 5 in total |
| Prisons | Vulnerable use | 0 of 1 in total |
| Rural Fire Station | Essential community infrastructure | 0 of 19 in total |
| Metro Fire Station | Essential community infrastructure | 0 of 4 in total |
| Police Station | Essential community infrastructure | 0 of 3 in total |

| USE | TYPE OF INFRASTRUCTURE | NUMBER OF FACILITIES LOCATED ON LOTS IDENTIFIED AS STEEP SLOPES |
|---|---|---|
| Ambulance Station | Essential community infrastructure | 0 of 2 in total |
| SES Facility | Essential community infrastructure | 0 of 3 in total |

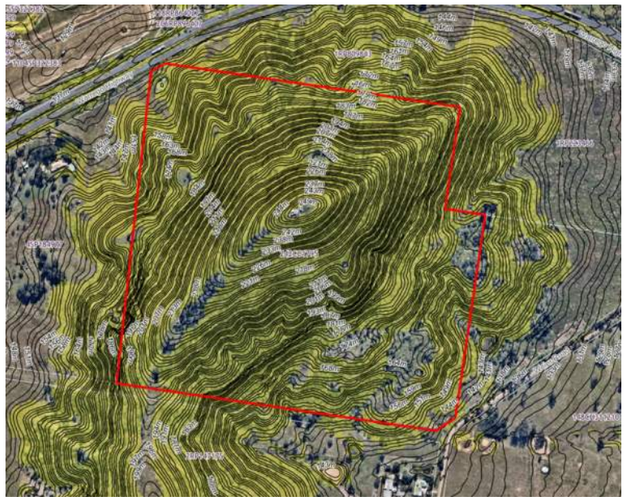
The existing hazard identification process identifies the following vulnerable facility and essential community infrastructure at risk of landslide:

1. Flagstone Creek State School, Flagstone Creek;
2. Water pumping station, Helidon Spa;
3. Water reservoir, Gatton;
4. Telecommunications tower, Plainland.

Of the four facilities identified three are at risk of landslide from erosion or slumping of the existing creek banks. This may be remedied by revegetation of creek banks to minimise erosion that is likely to occur in high intensity rain events and flooding. Catchment management practices demonstrated that stabilisation of creekbanks must occur on both side of the creek to be successful. The extent of facilities overall exposure to slope is shown in the below Table 8: Vulnerable facility and essential community infrastructure at risk of landslide.

**Table 9: Vulnerable facility and essential community infrastructure at risk of landslide**

| REFERENCE | AERIAL IMAGE | LOT PLAN | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 |  | 8 CC 2973 | Freehold | Rural Agricultural | Community facilities | Flagstone Creek State School is considered a vulnerable facility under the proposed Planning Scheme Administrative definitions. The yellow areas show the location of land that has slopes of 15% and greater. The school's oval is within a flood terrace of Flagstone Creek. The creek bed should be checked for slumping of the bank. Stabilisation works to both sides of Flagstone Creek banks within and outside of the school ground should be undertaken to protect the school. To ensure that any proposed stabilisation works of creek banks have the greatest success of survival in a flood event, works should be located on that part of the banks where the flood hazard rating is no greater than H2 in a 0.2% AEP flood event. Stabilisation works along creek banks should seek to achieve 75% tree canopy cover over the creek. |
| 2 |  | 242 CC 1795 | Reserve | Open Space | Community facilities | The water pumping station at Helidon Spa is considered critical infrastructure under the proposed Planning Scheme Administrative definitions. A large proportion of the west bank of Lockyer Creek has been subject to slumping and severe erosion. Stabilisation works should be considered a priority to minimise further erosion of the bank towards the water pump station. This may also require reprofiling the creek bank and approvals from Department of Regional Development, Manufacturing and Water. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|
| **3** |  | 88 CC 2601 | Reserve | Community Facility | Community Facility | The water reservoir at Gatton is considered critical infrastructure under the proposed Planning Scheme Administrative definitions. The banks of Tenthill Creek are very steep and deep. The creek bank in this location appears to be stable. Any further stabilisation works in this location of Tenthill Creek should be located on the high banks and not within the creek bed. |
| **4** |  | 242 CC 1795 | Freehold | Rural Uplands | Rural | The telecommunications tower at Plainland considered critical infrastructure under the proposed Planning Scheme Administrative definitions. Consideration should be given to revegetating previously cleared areas of the site to minimise the risk of landslide in intense rain event. The south-eastern part of Plainland Hill shows signs of past land slip and slumping where clearing has occurred. |

## 5.4 Summary of risk of landslip

Based on the data above, the following observations are relevant to the Lockyer Valley region:

- just over 52% total zoned land is mapped as steep slopes;
- Approximately 51% of the Rural zone is mapped as steep slopes;
- Approximately 82% of the Conservation zone is mapped as steep slopes;
- Approximately 20% of the Community facilities zone is mapped as steep slopes;
- Approximately 22% of residential areas (Rural residential zone and Low density residential zone) is mapped as steep slopes;
- 3.6% and 1,541 of all existing dwelling houses area at risk;
- 1 vulnerable facility is at risk of landslide (i.e. Flagstone Creek State School);
- 3 facilities considered critical infrastructure are at risk of landslide;
- the majority of residences and community infrastructure across the region are located outside of areas mapped as steep slopes.

The state planning policy seeks to prioritise natural hazard investigations in areas where growth and development pressures are greatest. As such a review of the Urban Footprint and Rural Living areas have been the main focus of this report.

A program of mapping works could identify how the necessary level of mapping will be available to enable informed development decisions (e.g. scheduled local area planning).

# Part 6 Proposed planning scheme

## 6.1 State Planning Policy consistency

In 2017 the current SPP came into statutory effect and included a statutory guidance document. In May 2021 State updated the statutory guidance documents. The documents used to guide this risk assessment include:

- State Planning Policy – state interest guidance material Natural hazards, risks and resilience – Landslide (July 20217)
- Integrating state interests into local planning instruments – guidance for local governments (May 2021).

This basic hazard identification considers the SPP and its guidance material to satisfy the State interest for landslide, risk and resilience.

One of the key additions to the current SPP and its guidance material which sets it apart from previous editions is the requirement for fit-for-purpose risk assessments for the natural hazards. This process aims to ensure that all natural hazards relevant to the Local government area is appropriately considered as part of strategic planning activities, having regard to the nature of potential risk rather than mere compliance with statutory measures.

**Table 10: Acceptable risk criteria benchmarks**

| STATE PLANNING POLICY | APPROACH TO MINIMISE RISK |
|---|---|
| **Mapping - Basic hazard identification** | Mapping has used a robust methodology in converting a LIDAR digital terrain map into various categories of slope.<br>A basic hazard identification has informed the plan-making to achieve an acceptable or tolerable level of risk to people and property in areas with slopes of 15% or greater (known as steep slopes). |
| **Avoiding or mitigate to an acceptable or tolerable level in hazard areas.** | The planning scheme takes a risk based approach to development assessment based on the principles of:<br>a. avoidance as ultimate priority in areas that create an intolerable risk.<br>b. mitigation in areas with an acceptable or tolerable risk level. |
| **Accepting residual risk in hazard areas.** | The planning scheme allows acceptable or tolerable land uses without further intensification of development in tolerable areas.<br>The planning scheme restricts new or further development in areas that have an intolerable risk. |
| **Retreating due to risk** | The planning scheme back zones areas where the land cannot be reasonably developed for urban purposes. |
| **Disaster management** | Disaster management capacity and capabilities are maintained to mitigate the risks to people and property to an acceptable and tolerable level. |
| **Land management** | Vegetation clearing is to avoid an increasing landslide exposure or severity. |

| STATE PLANNING POLICY | APPROACH TO MINIMISE RISK |
|---|---|
| | Stormwater management and subsurface drainage are to ensure landslide risks are managed. |
| **Protective functions** | The protective function of vegetation to stabilise steep slopes is maintained. |
| **Vulnerable uses** | Vulnerable uses are not located in areas with steep slopes unless there is an overwhelming community need for the development of a new or expanded service, there is no suitable alternative location and site planning can appropriately mitigate the risk. |
| **Hazardous activities and storage** | Development does not locate buildings or structures used for the storage or manufacture of materials that are hazardous within areas of steep slopes unless there is no suitable alternative location. |
| **Community infrastructure** | Community infrastructure for essential services are not located in in areas of steep slopes unless there is an overwhelming community need for the development of a new or expanded service and there is no suitable alternative location, and further, the infrastructure can be demonstrated to function effectively during and immediately after a landslide. |

## 6.2 Proposed Lockyer Valley Planning Scheme

This section provides a review of the elements contained within the proposed planning scheme, having regard to the full spectrum of planning scheme components from the strategic framework through to the overlay code, with a focus on planning scheme calibration to achieve the State interest for landslide hazard.

### 6.2.1 Strategic Framework

It is recognised the proposed planning scheme largely seeks to amalgamate the existing schemes currently operating across the region, following which a growth management process will be conducted. To this end, the proposed settlement policy and pattern demonstrated by Council's zoning rationale reflects the existing planning instruments operating across the region. It is acknowledged that a series of historical development approvals remain active in the region over various parcels of land zoned for Emerging community.

Steep slopes occur around and within the townships across the Lockyer Valley region. The presence of steep slope does not give rise to risk of landslide, rather it is series of factors which need to be considered, including :

- use (e.g. residential, community infrastructure etc.);
- construction methods, including the extent and volume of cutting and filling the land;
- development with subsoil irrigation;
- development without a stormwater drainage network;
- soil type and geomorphology; and
- rainfall events greater than 1EY.

Having regard to the place-based assessment the following locations are potentially highest at risk and further studies should be considered for these locations in the future:

- Parts of Withcott including the urban area and rural residential area.

While the focus has been on urban and rural residential areas this does not mean landslide will not occur in the Rural areas. Landslip risk has a potential of increase within areas of steep slopes where the risk is likely to increase.

### 6.2.2 Zones and precincts

Zones are consistent with the Planning Regulation 2017 standard zones. Zones from the between the Gatton and Laidley Planning Scheme Grantham Redevelopment Plan have been rationalised and aligned with the Planning Regulation 2017 standard zones.

Precincts have been rationalised in the Low density residential zone to align with the various subdivision precincts under the Gatton Planning Scheme and Grantham Redevelopment Plan precincts.

Precincts have been rationalised in Rural Residential zone also to align various subdivision precincts between the Gatton and Laidley Planning Schemes and also the Grantham Redevelopment Plan. As part of the precinct review, it was determined that some precincts under the Gatton Planning Scheme effectively limited the potential for further subdivision. To provide transparency in the planning scheme, the Rural Residential – No subdivision precinct has been created and applied to those areas that are unable to be subdivided further.

### 6.2.3 Tables of Assessment

The tables of assessment trigger all development where within an areas of:

- Steep slopes (15% to 20%);
- Very steep slopes (20% and greater).

All development within an areas steep slopes or very steep slopes must undertake a geotechnical risk assessment to determine if the risk can be mitigated to an acceptable level.

### 6.2.4 Overlay code

The draft Steep land overlay code contained within the proposed planning scheme is modelled off the SPP example assessment benchmarks, with some level of local contextualisation to integrate it into the draft scheme. Compared to the current planning schemes in force, the code includes the following changes:

- streamlining of provisions and removal of duplicated benchmarks;
- bolstering provisions for vulnerable uses, hazardous facilities, essential community infrastructure and critical infrastructure;
- requirements for stormwater management.
- requirements for on-site effluent disposal areas.

### 6.2.5 Definitions and planning scheme policies

Schedule 1 of the proposed planning scheme incorporates the scheme definitions. It is noted the vulnerable uses identified in the SPP example assessment benchmarks for landslide have been integrated into the vulnerable use definition of the proposed planning scheme, which offers a consistent approach to the consideration of vulnerable uses across multiple hazards.

Council has included a draft of the planning scheme policy for steep slopes (included as Appendix 3). The draft policy outlines detailed instructions to guide the preparation of geotechnical assessment and management plans to determine site specific acceptable and tolerable risk.

# Part 7 The planning change

The planning change subject of this report is the replacement of all the steep land mapping and steep land provisions presently forming part of the 2003 Laidley Shire Planning Scheme, the 2007 Gatton Planning Scheme and the 2011 Grantham Reconstruction Area Development Scheme with the proposed steep land mapping and steep land hazard provisions that will form part of the proposed LVRC planning scheme.

## 7.1 Laidley Shire Council Planning Scheme (2003)

The Laidley Shire Council Planning Scheme came into effect in 2003 and was prepared before the commencement of *State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* and State Planning Policy 2017. The planning scheme does however address the effect of landslip and development on steep slopes as having an adverse impact on the land form but not people or property. Under the Laidley Planning Scheme, Environment Desired Environmental Outcomes require:

> *'b. Places, areas or sites identified as being susceptible to land degradation, including contamination, erosion, salinity and landslip, are protected and further degradation is minimised.'*

The DEO is focussed on protecting the landscape. The DEO does not explicitly address the protection of people and property from landslip.

Under the Residential Areas Code the following outcomes relate to landslip and steep slopes:

> *'Residential development is located in areas where the impact of land degradation, including dry-land salinity, erosion and landslip is not increased;'*
> *…*
> *Specific Outcomes for the Urban Residential Area…*
> *Residential development is not located in areas subject to flood inundation, bushfire risk, or where there are steep slopes, dispersible soils, or the potential to increase land degradation;'*

Again the outcomes are focussed on minimising landslip and minimising the location of development on steep slopes and does not directly address the protection of people or property, as a consequence of landslip. It is noted that there is no additional Specific Outcomes for the Rural Residential area or the Urban Expansion Area.

Under the Rural Upland Area Code the following outcomes relate to landslip:

> *'Development does not cause significant adverse effects (landslip and erosion) on areas characterised by elevated and steep escarpments.'*

Similar to the above the Rural Upland Area identifies landslip as an adverse effect of development and does not address the protection of people and property directly.

The planning scheme includes an overlay showing the extent of slope under the Areas of Natural and Environmental Significance Overlay. The overlay map (Map G) shows a highly pixelated map of slope greater than 15%. How this map has been derived is unknown, but it is expected to be based on contours shown on topographic maps published in 2002-2003. It

is noted that the accuracy of the map is considered low due to the limited GIS due to the lack of granularity and refinement of the map.

Development that occurs within Map G (except for public infrastructure in existing identified and proposed corridors and sites on Overlay Maps I1 and I2, i.e. oil and gas pipelines, electricity transmission lines, railways and major State controlled roads) is to be assessed against the Areas of Natural and Environmental Significance Overlay Environmental Constraints – Wetlands, Dryland Salinity Areas, Land with Slope greater than 15%.

Development that also triggers assessment under other aspects of the planning scheme and 'Other development' includes:

- Operational works for reconfiguring a lot.
- Building works not associated with a material change of use.
- Excavation of filling not associated with a material change of use or reconfiguring a lot is code assessable where the extent of the cut exceeds 100m$^3$ or the extent of fill exceeds 500m$^3$.

Under the Areas of Natural and Environmental Significance Overlay Environmental Constraints – Wetlands, Dryland Salinity Areas, Land with Slope greater than 15% Overlay Code the following outcomes are to be applied:

> *'11. Development does not impact or have the potential to impact on dryland salinity areas, or on land with slope greater than 15%; and*
> *…*
> *14. Development does not compromise visual amenity on land with slope greater than 15%.'*

The overlay code outcomes are consistent with the other aspects of the planning scheme and does not specifically address the protection of people and property from landslip.

Overall, this planning instrument does not reflect the State Planning Policy 2017 for Landslide and any policy that is consistent with the SPP may be considered an adverse planning change.

## 7.2 Gatton Planning Scheme (2007)

The Gatton Planning Scheme commenced in 2007 and includes a note which states the Minister for Local Government and Planning has identified *State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* as being appropriately reflected in the planning scheme for landslide matters.

Under the Gatton Planning Scheme, the Desired Environmental Outcomes require:

> *'(d) Places, areas or sites identified as being susceptible to land degradation, including erosion, landslip and contamination are protected and further degradation minimised.*
> *…*
> *(i) Planning and design takes into account the potential adverse effects from natural hazards such as bushfire, landslip or flooding.'*

The DEO is focussed on:

- landslip as an environmental problem to protect the landscape;

- Design of development considering natural hazards such as landslip.

The DEO does not address explicitly require the protection of people and property from landslip.

The planning scheme includes a number of outcomes in zones

> *The overall outcomes sought for the Rural Uplands zone are the following— (a) Land remains largely in a natural state with the visual and landscape quality of the steep slopes, significant topographical features, cultural heritage and significant vegetation and habitat maintained. (b) Closer settlement, particularly urban and rural residential development does not occur.*

The planning scheme includes an overlay being the Steep and Unstable Land Overlay. The overlay mapping (Overlay Map 3) identifies all land within the area of the former Gatton Shire which has a slope of 15% or greater. It is understood that this map was derived from contour identified from aerial photography. It is not known what height the aerial photography was undertaken or how the model for contours was generated. It is noted that the accuracy of the map is considered to be better than that of the Laidley Planning Scheme Overlay map, it still lacks granularity and accuracy.

Development that occurs within Overlay Map 3 triggers assessment against the Steep and Unstable Land Overlay Code. The Assessment Categories for Material Change of Use for land with a slope of greater than 15% increases the level of assessment to code assessable development for:

- Dwelling house;
- Annexed Unit (equivalent to a Secondary dwelling under the Regulation);
- Special purposes (equivalent to a range of community infrastructure including but not limited to Hospital, Emergency services, Cemetery, etc…)

All assessable development and other development on land with a slope of 15% or greater triggers assessment against the overlay code including:

- Assessable material change of use.
- Reconfiguring a lot.
- All building work (except for minor building work) not associated with a material change of use.
- All operational work except where it is for vegetation clearing not associated with a reconfiguring a lot or a material change of use.

The planning scheme addresses landslide hazard through the Steep and Unstable Land Overlay Code which is supported by overlay mapping. The code identifies the purpose as :

> *'is to protect the physical and aesthetic integrity of land with steep slopes, particularly along the escarpment forming the western skyline of the Shire, and to ensure risks to property and people is minimised…'*

The following is a summary of the matters to be satisfied code:

- Development is designed and constructed in a manner which addresses factors affecting land stability, including geotechnical and topographic conditions.

- Buildings, structures and driveways are integrated into the natural landform/s and protect visual amenity of the natural environment.
- Buildings, structures and driveways are designed to maintain natural landforms, minimise earthworks and minimise slope instability and soil erosion.

The overlay code outcomes are consistent with the other aspects of the planning scheme and does not specifically address the protection of people and property from landslip.

Overall, this planning instrument partially reflects the State Planning Policy 2017 for Landslide and any policy that is consistent with the SPP may be considered an adverse planning change.

## 7.3 Grantham Reconstruction Area Development Scheme (2011)

The Grantham Reconstruction Area Development Scheme does not contain provisions that address Landslip and instead defers to the provision of the Gatton Planning Scheme for this matter. Overall, this planning instrument does not reflect the State Planning Policy 2017 for Landslide and is reliant on the Gatton Planning Scheme 2007.

# Part 8 Planning Scheme drafting

The Proposed Lockyer Valley Planning Scheme has been prepared to satisfy the requirements of *State Planning Policy 2017* and *State Planning Policy State Interest Guideline – Natural Hazards, Risk and Resilience.*

## 8.1 Tables of Assessment and Overlay

The proposed planning scheme addresses landslip hazard through the Steep Land Overlay Code which is supported by overlay mapping. The overlay mapping (Map OM10) identifies land that includes:

- Assessment Triggers:
  - (a) Steep slope (15% to 20%)
  - (b) Very steep slope (20% and greater)
- Administrative information:
  - (a) Slope 5% to 10%
  - (b) Slope 10% to 15%

The Level of Assessment Table for All Development and All Overlays indicates that for land identified as being steeper than 15% (i.e. steep slopes and very steep slopes):

- Material change of use for the following uses is accepted development and so is not subject of the Steep Land Overlay Code: Animal husbandry, Aquaculture, Cropping, Outdoor sport and recreation, Outstation, Park, Permanent plantation, Roadside stall.
- All other Material change of uses are made assessable development and subject to the Steep land overlay code.
- All reconfiguring a lot is code assessable development that is subject of the Steep Land Overlay Code.
- Operational work for Vegetation clearing, Earthworks, filling and excavation and Operational work not associated with a material change of use or reconfiguring a lot is accepted subject to requirements.
- Operational work not associated with material change of use or reconfiguring a lot and all other operational work is code assessable development that is subject of the Steep Land Overlay Code.
- Building work for the following is accepted development and so is not subject of the Steep Land Overlay Code: Minor building work, Building work involving total demolition or removal of buildings and structures. All other Building work is accepted development subject to requirements and so is subject of the Steep Land Overlay Code.

For Assessable development, the following is a summary of the matters to be satisfied:

- Safety of people and property from landslides is maintained.
- Mitigation works do not adversely impact on slope stability and environmental values.
- Siting of development minimises impacts on natural landform and landscape character.

- Earthworks do not adversely impact on slope stability, soil erosion or water quality.
- Safe efficient access is provided for vehicles and pedestrians without extensive earthworks.
- Wastewater disposal not to create or increase the likelihood of instability.
- Stormwater runoff does not increase the susceptibility of landslide or create a detriment impact to the natural environment.
- Risks to people and the environment arising from the storage of hazardous and noxious chemicals is avoided.
- Essential community infrastructure can function during and after a landslide event.
- Design of new lots and subdivisions responds to landslide risks by identifying areas on new lots by avoiding or minimising the need for earthworks.

## 8.2 Zoning changes to address steep land hazard

Zone changes have been recommended for a number of properties in Withcott. Properties have been recommended for Zone changes have been included in Appendix 2. The intent of these recommended zone changes is to minimise redevelopment of the land for urban purposes. Minimising redevelopment in these location will assist in minimising the exposure of people and property to potential landslip. In addition these zone changes will also reduce the future need for clearing and earthworks on steep land that may lead to land slumps and slips.

## 8.3 Rural Residential precinct changes to address steep land hazard

The Rural Residential – No subdivision precinct has been created to minimise further subdivision of Rural Residential areas that are affected by a number of overlays and may not be reasonably developed in accordance with the overlays. This precinct is also necessary to respond to flood, bushfire and biodiversity.

## 8.4 Implications of the planning change

Due to the age of the Gatton and Laidley Planning Schemes any change to the slope overlay may be considered a significant planning change.

**Table 11: Summary of implications of planning change**

| PLANNING CHANGE | IMPLICATIONS |
|---|---|
| Inaccurate and coarse mapping of steep land dating back to the late 1990s and early 2000s is replaced with best mapping available in 2021 when the map generation process was formulated. Further map improvements may be possible in the future, if the whole region had LiDAR at the same | Consistent LVRC-wide mapping and risk classifications that is far more accurate and will ensure consideration of landslide risk occurs where there is a likely risk. Reduced level of exposure to landslide hazards for both people and property. Unnecessary applications resulting from inaccurate mapping avoided. |

| PLANNING CHANGE | IMPLICATIONS |
|---|---|
| level of accuracy as opposed to the four different data sets used. | |
| Different tables of assessment that have different responses to the assessment of steep slopes is replaced with consistent triggers that operate based on the standard use definitions in the Planning Regulation 2017. | Consistency in assessment approach across the whole of the region will occur. This will result in an overall improved response to steep slopes and reduced exposure of people and property into the future. |
| Additional matters will need to be addressed in areas of steep land than were previously addressed. | Consistency in assessment approach across the whole of the region will occur. This will ensure all relevant matters outlined in the SPP are addressed as part of the development assessment process. |
| New requirements address matters such as effluent disposal, stormwater impacts and the steepness of driveways. | All relevant matters in areas of potential instability and while an additional application impost will result in:<br>• Improved access arrangements for emergency vehicles;<br>• Improved management of stormwater;<br>• Ensure constrained lots are able to have affordable on-site effluent disposal (where required);<br>• Minimise landslide from poorly constructed retaining walls;<br>• Minimise landslide from extensive cutting and filling;<br>• reduced overall risk to people, property and the environment. |
| New requirements where hazardous or noxious chemicals are stored in areas of steep slopes. | An additional application impost will result for development that have hazardous or noxious chemicals and will result in overall reduced risk to people and the environment. |
| New requirements for vulnerable uses, essential community infrastructure and critical infrastructure. | Ensures consideration is given to various types of infrastructure, in steep slopes and how it should be addressed. Also ensures to that infrastructure is operable during and after a landslide event. |

# Part 9 Consistency with State Planning Policy 2017

The proposed Steep land overlay for the new Lockyer Valley planning scheme is considered to meet the requirements of the State Planning Policy state interest for Steep land by using a basic hazard identification process for landslide. Council has not undertaken detailed studies of the geological and geomorphological conditions due to:

- The majority of the land identified as having slopes 15% and greater occur in the Rural and Conservation zones.
- Less than 0.1% land residential is identified as having slopes 15% and greater.

This suggest a small number of development applications likely to occur.

State interest – natural hazards, risk and resilience identifies requirements for how planning schemes should reflect the state's interest. Generally stated, they are:

1. Natural hazards are identified including steep land.
2. A fit-for-purpose risk assessment is undertaken (basic hazard identification process).
3. Development in areas of steep land:
    - avoids the natural hazard area or, where that is not possible, mitigates the risks to people and property to an acceptable or tolerable level;
    - supports disaster management capabilities;
    - reduces exposure to risks;
    - manages hazardous materials;
    - maintains the protective function of any vegetation;
    - ensures community infrastructure can function during a landslip event;
    - avoids individually or cumulatively worsening the risks.

## Table 12: Summary of compliance of planning change with the SPP

| STATE INTEREST | COUNCIL RESPONSE<br>INTEGRATION INTO DRAFT PLANNING SCHEME |
|---|---|
| **NATURAL HAZARDS, RISK AND RESILIENCE** | |
| **PART D** | |
| The risks associated with natural hazards, including the projected impacts of climate change, are avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards. | The planning scheme manages risks associated with natural hazards, including impacts from climate change, through the Strategic Framework, Zone map and codes and Overlay maps and codes, and Planning Scheme Policies (still in progress). The approach seeks to avoid and mitigated risk to protect people, property and improve the community's resilience to natural hazards. Elements of the Planning Scheme relevant to Landslide hazard include:<br>• Part 3 Strategic Framework as:<br>- Section 3.4, Theme 4 – Sustaining the natural environment;<br>- Section 3.5.7, Element 7 - Safety and natural hazards;<br>• Part 5.10 Tables of Assessment<br>• Part 6 Zones including natural hazards as one of the overall outcomes provided in all zones;<br>• Section 8.11 Steep land overlay code;<br>• OM11 Steep land overlay. |
| **PART E - DETAILED ASSESSMENTS FOR THE LANDSLIDE HAZARD** | |
| (1) Natural hazard areas are identified, including:<br>(a) bushfire prone areas<br>(b) flood hazard areas<br>(c) landslide hazard areas<br>(d) storm tide inundation areas<br>(e) erosion prone areas. | A basic hazard identification has been undertaken where land greater than 15% slope has been identified as steep land across the whole of the Lockyer Valley Region. This mapping has been derived from a number of map sources with differing levels of accuracy.<br>Strategic outcomes acknowledge the steep land and potential landslide areas. Section 3.4, Theme 4 – Sustaining the natural environment, section 3.4.9, Waterways and water quality. Element 3.4.7 does not repeat these provisions but notes:<br>*The planning scheme is responsive to climate change recognising the need to maintain natural corridors and processes and respect increasing urban heat, intensifying storms, more frequent flooding and fire* |

| STATE INTEREST | COUNCIL RESPONSE<br>INTEGRATION INTO DRAFT PLANNING SCHEME |
|---|---|
| | *events among other discrete changes. The scheme enables mitigation methods to achieve acceptable risk levels form natural hazards.*<br><br>Overlay map OM11 Steep land overlay is broken into two trigger categories:<br><br>a. Steep slope (15% to 20%);<br><br>b. Very steep slope (20% and greater).<br><br>Other slope categories on the map are shown to inform development decisions regarding construction works and other matters. |
| (2) A fit-for-purpose risk assessment is undertaken to identify and achieve an acceptable or tolerable level of risk for personal safety and property in natural hazard areas. | The Natural Hazard Risk Assessment for Lockyer Valley Regional Council, Local Government Association Queensland by ERSA (Environmental Risk Science and Audit) 2016.<br><br>Steep land is considered the lowest risk hazard in the Lockyer Valley region as the majority of steep land is located outside of the urban footprint and rural living area designations under the SEQ regional plan.<br><br>This section of the supporting material has undertaken a basic hazard identification focussing on locations most likely to be subject to development. The assessment demonstrates an acceptable or tolerable level of risk for personal safety and property in natural hazard areas for development under the planning scheme. |
| (3) Land in an erosion prone area is not to be used for urban purposes, unless the land is located in:<br><br>(a) an urban area in a planning scheme; or<br><br>(b) an urban footprint identified in a regional plan | Not Applicable. The region does not include any erosion prone areas related to Coastal Hazards.<br><br>Notwithstanding the above, there are areas of the Lockyer Valley that area subject to erosion due to soils being high risk soils. Separate mapping has recognised these locations OM13 High risk soils – information overlay. |
| (4) Development in bushfire, flood, landslide, storm tide inundation or erosion prone natural hazard areas:<br><br>(a) avoids the natural hazard area; or<br><br>(b) where it is not possible to avoid the natural hazard area, development mitigates the risks to people and property to an acceptable or tolerable level | The Strategic Framework has a modified urban area compared to the SEQRP's urban footprint. This is to minimise the exposure of urban development to natural hazards. The Strategic framework urban areas and rural residential areas directly align with the zones in the planning scheme maps. The largest areas of slope in the Lockyer Valley are within the Rural, Conservation and Rural Residential Zones, with less than 1% in urban areas. Areas of the Rural Residential zone have been broken into precincts. Where a location has been deemed to be within steep slopes and unable to be further subdivided it has been included within the 'No Subdivision precinct'. This precinct is also used in locations that have flood hazard, bushfire hazard, scenic amenity, regulated vegetation and waterways. |

| STATE INTEREST | COUNCIL RESPONSE<br>INTEGRATION INTO DRAFT PLANNING SCHEME |
|---|---|
| | Rural Zones will be subject to impact assessable reconfiguration of a lot where consistent with higher order legislation.<br><br>Section 8.11 Steep land overlay code takes a risk-based approach to development by seeking to avoid development subject to very steep slopes and manage development on steep slopes to ensure risks to people and property are mitigated to an acceptable or tolerable level.<br><br>In particular:<br>• avoid measures are included as Overall Outcome (a) & (c), PO1, PO2, PO4, PO6, PO7 & PO11;<br>• mitigate measures to tolerable and acceptable level are included as Overall Outcome (b) & (c), PO3 & PO11;<br>• building controls are included as Overall Outcome (d) & (e), PO4 to PO11;<br>• stormwater management measures are included as Overall Outcome (d) and PO4;<br>• essential community infrastructure measures are included as Overall Outcome (c) & PO7;<br>• hazardous materials are included as Overall outcome (f) & PO8 to PO9.<br><br>Additional avoid measures are required for:<br>• Vulnerable uses (PO6);<br>• Essential community infrastructure (PO6);<br>• Critical infrastructure (PO7);<br>• Hazardous chemical facilities (PO8 & PO9)<br>• Operation Works (P10);<br>• Reconfiguration of a Lot (P11). |
| (5) Development in natural hazard areas:<br><br>(a) supports, and does not hinder disaster management capacity and capabilities | Avoid measures are included in Strategic Framework and Zones.<br><br>Section 8.11 Steep land overlay code requires:<br>a. development to not unduly burden disaster management response (i.e. Overall outcome g); |

| STATE INTEREST | COUNCIL RESPONSE<br>INTEGRATION INTO DRAFT PLANNING SCHEME |
|---|---|
| (b) directly, indirectly and cumulatively avoids an increase in the exposure or severity of the natural hazard and the potential for damage on the site or to other properties<br><br>(c) avoids risks to public safety and the environment from the location of the storage of hazardous materials and the release of these materials as a result of a natural hazard<br><br>(d) maintains or enhances the protective function of landforms and vegetation that can mitigate risks associated with the natural hazard. | b. a geotechnical investigation on steep slopes to avoid increasing the severity of the natural hazard and damage to other properties (i.e. Overall outcome c);<br><br>c. landforms alteration and vegetation removal to be limited so they can continue to mitigate risks associated with the landslide hazard (i.e. Overall outcome d).<br><br>Administrative definitions define the specific use groups for, Vulnerable uses, Essential community infrastructure, and Critical infrastructure. Measures with the code specify address the use groups.<br><br>Measures specific to Hazardous chemical facilities (PO8 & PO9) ensure there is an emergency access and evacuation plans to safely remove hazardous materials to alternative sites in the event of a landslide.<br><br>The code:<br><br>limits vegetation clearing and requires overland flow paths to be rehabilitated to accommodate new stormwater flows. |
| (6) Community infrastructure is located and designed to maintain the required level of functionality during and immediately after a natural hazard event. | Avoid measures are included in Strategic Framework and Zones.<br><br>The planning scheme includes provisions in the 8.11 Steep land overlay code to ensure community infrastructure is located and designed to maintain functionality during and after a natural hazard event (i.e. Overall Outcomes (c), PO7 and PO8.<br><br>All industrial activities including hazardous chemical facilities will trigger assessment in areas of steep slope. Siting and design of essential community infrastructure siting, design, operationality and access is to remain function after a landslide event. |
| (7) Coastal protection work in an erosion prone area is undertaken only as a last resort where coastal erosion or inundation presents an imminent threat to public safety or existing buildings and structures, and all of the following apply:<br><br>(a) The building or structure cannot reasonably be relocated or abandoned. | Not Applicable. The region does not include any coastal areas or coastal erosion areas. |

| STATE INTEREST | COUNCIL RESPONSE<br>INTEGRATION INTO DRAFT PLANNING SCHEME |
|---|---|
| (b) Any erosion control structure is located as far landward as practicable and, on the lot, containing the property to the maximum extent reasonable.<br><br>(c) Any increase in coastal hazard risk for adjacent areas from the coastal protection work is mitigated. | |
| Erosion prone areas within a coastal management district<br><br>(8) Development does not occur unless the development cannot feasibly be located elsewhere and is:<br><br>(a) coastal-dependent development; or<br><br>(b) temporary, readily relocatable or able to be abandoned development; or<br><br>(c) essential community infrastructure; or<br><br>(d) minor redevelopment of an existing permanent building or structure that cannot be relocated or abandoned. | |
| (9) Development permitted in policy 8 above, mitigates the risks to people and property to an acceptable or tolerable level | |

# Part 10 Conclusion

The proposed planning scheme, in replacing the existing local planning instruments, results in a broad range of planning changes including:

- Strategic Framework to be reviewed with Flood Hazard Expert Planner Basic hazard identification to be finalised, to ensure that there is alignment at a Strategic level between all three hazards that affect the Lockyer Valley.
- improved accuracy of maps with improved technology and GIS, that is consistent with contemporary expectations;
- changes to mapping of the natural hazards by the replacing the existing overlay maps with a revised and updated overlay map in the proposed planning scheme;
- changes to the level of assessment for land subject to natural hazards by the replacement of the current tables of assessment with a new set of assessment tables for overlays in the proposed planning scheme;
- changes to the Overlay code with a new code for landslide hazard more in line with the outcomes of the State Planning Policy 2017;and
- Addition of Planning Scheme Policy to be used with the overlay code to ensure that development assessment of application has a consistent approach.
- Zone change to a limited number of properties as a result of the existence of hazards that cannot, as a result of changes to code requirements, be able to be developed in accordance with the current zone expectations.

The planning changes that arise from the proposed planning scheme are not considered to constitute an adverse planning change as they have been made to address the existence of natural hazards and there is no feasible alternative to the proposed planning changes.

# Part 11 References

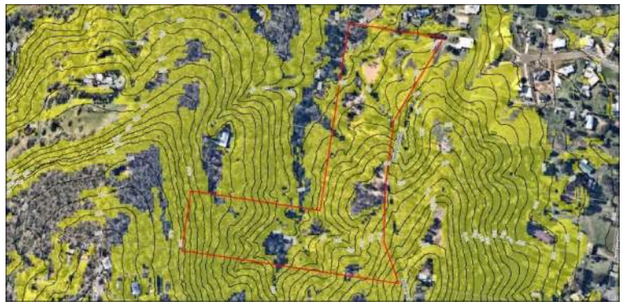
Abbas El-Zein (2016) *Resilience and Vulnerability to Climate Change: Challenges of Temporal and Geographical Scales for Geotechnical Engineering,* Australian Geomechanics Journal, Volume 51, Number 2, June 2016, Pages 65-76

Environmental Risk Science and Audit (2016) *Lockyer Valley Regional Council - Natural Hazard Risk Assessment Update,* ERSA, St Leonards

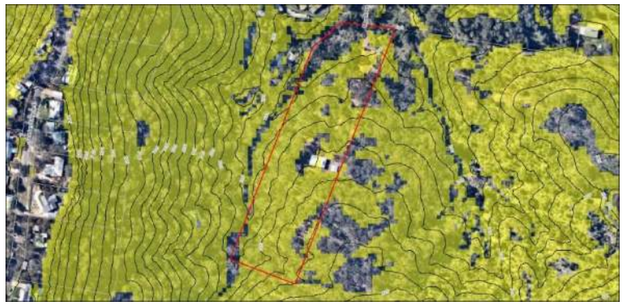
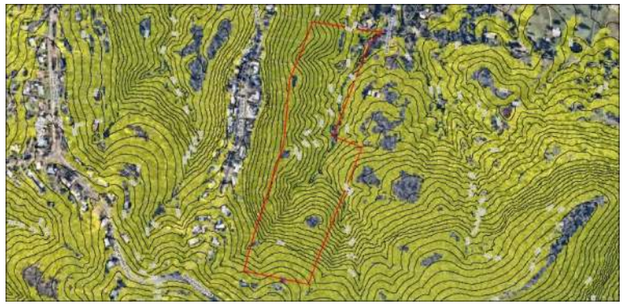
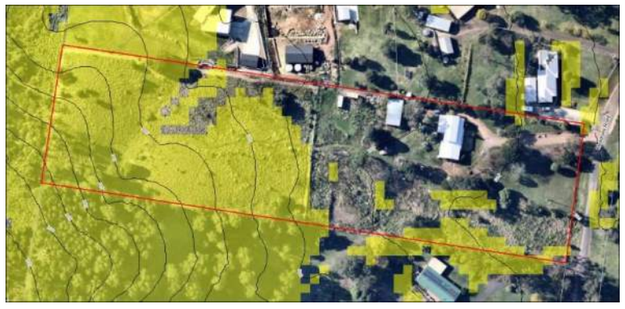
Xi Sun, Jie Li and Annan Zhou (2017) *Assessment of the impact of climate change on expansive soil movements and site classification*, Australian Geomechanics Journal, Volume 52, Number 3, September 2017

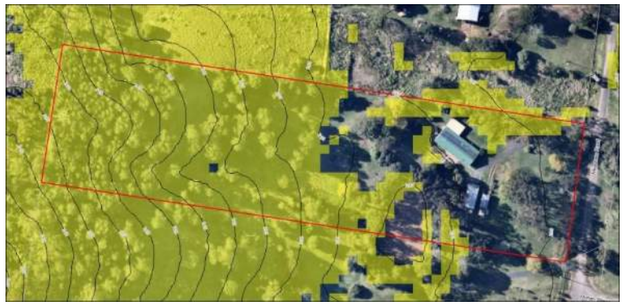
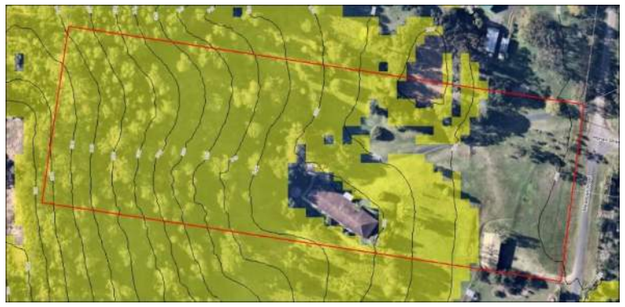
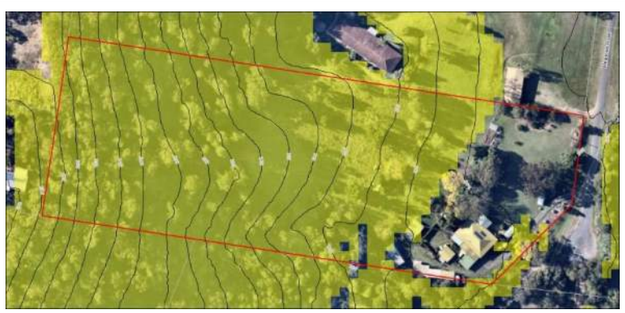
# Appendix 1 Slope affected properties

# Appendix 2 Proposed zone changes

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W1** |  | 5 RP 891685 | 216 Blanchview Road | BLANCHVIEW | Freehold | Existing Rural Residential Urban Residential | Rural Residential | The proposed change seeks to remove the split zone from the land. The property has slopes across most of its extent that are well more than 15%. A large proportion of the land affected by slope is heavily treed and subject to koala habitat protections. It contains a single detached residence which can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. The extent of the slope and koala habitat restricts the development potential of the site for subdivision. As Withcott is unsewered, land with 10% slope and less will need to be used for on-site effluent disposal and will constrain further residential development on the land. |
| **W2** |  | 5 RP 231655 | 38 Berghofer Drive | WITHCOTT | Freehold | Rural Uplands Urban Residential | Rural Residential | The proposed change seeks to remove the split zone from the land. The property has slopes across most of its extent that are well more than 15%. A large proportion of the land affected by slope is heavily treed and subject to koala habitat protections. The extent of the slope and the koala habitat restricts the development potential of the site for subdivision. It contains a single detached residence which can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, land with 10% slope and less will need to be used for on-site effluent disposal and will constrain further residential development on the land. |
| **W3** |  | 99 SP 226292 | Debra Street | WITHCOTT | Freehold | Urban Residential | Rural Residential | The property has slopes across most of its extent that are more than 15%. A large proportion of the land affected by slope is heavily treed and subject to koala habitat protections. The extent of the slope and koala habitat restricts the development potential of the site for subdivision. The land is vacant. Under the Rural Residential Zone, a dwelling house may be located on the land. As Withcott is unsewered, land with 10% slope and less will need to be used for on-site effluent disposal and will constrain the location of any dwelling house. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W4** |  | 2 SP 189218 | 20 Dolleys Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The property has slopes across most of its extent that are well more than 15%. The land forms part of the ridge that encircles Withcott township. The land also has an existing overland flow path that feeds into a regulated waterway. At the confluence of the waterway and overland flow path is a dam. The flow path segments the property and would make development of the land west of the flow path difficult to develop due to the unsewered nature of Withcott. The site contains a single detached residence which can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, land with 10% slope and less will need to be used for on-site effluent disposal. |
| **W5** |  | 3 SP 180976 | 28 Dolleys Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The property has slopes across most of its extent that are well more than 15%. The land forms part of the ridge that encircles Withcott township. The land is surround by Lot 2 SP 189218, as such the land is exposed to potential landslip risk from Lot 2. The site contains a single detached residence which can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. The land has been significantly modified to accommodate the dwelling house and on-site effluent disposal system. |
| **W6** |  | 10 SP 166780 | 35 Gordon Crescent | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The property has slopes of 15% and greater along the property boundary. The land is undersized for the location and access appears to be via an unformed access across the Lot 1 RP229163. It is noted that there is no formal access easement. The land is part of a ridge. The site contains a single detached residence which can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. The land has been significantly modified to accommodate the dwelling house and on-site effluent disposal system. The house may be subject to future landslip from land to the east and due to proximity to slopes along the boundary. The size of the lot and the location of the slope restricts the development potential of the site for subdivision. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W7** |  | 107 RP 162648 | 34 Meadows Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the split zone from the land. The property has slopes across most of its extent that are well more than 15%. A large proportion of the land affected by slope is heavily treed and subject to koala habitat protections. The extent of the slope restricts the development potential of the site for subdivision. It contains a single detached residence which can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, land with 10% slope and less will need to be used for on-site effluent disposal and will constrain further residential development on the land. |
| **W8** |  | 106 RP 162648 | 39 Meadows Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the split zone from the land. The property has slopes across most of its extent that are well more than 15%. A large proportion of the land affected by slope is heavily treed and subject to koala habitat protections. The extent of the slope restricts the development potential of the site for subdivision. It contains a single detached residence which can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, land with 10% slope and less will need to be used for on-site effluent disposal and will constrain further residential development on the land. |
| **W9** |  | 1 RP 157934 | 21-23 Meadows Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The property has slopes more than 15% across approximately 50% of the site. The land has an existing overland flow path that feeds into the dam on-site. A second flow path segments the western slopes on the property. The land one of a five lots along Meadows Road that have similar slope constraints. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to land with similar constraints. The site contains a single detached residence which can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, land with 10% slope and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W10** |  | 2 RP 157934 | 25-27 Meadows Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The property has slopes more than 15% across approximately 65% of the site. The land has two existing overland flow paths. One feeds the dam on Lot 1 RP157934. The second path feeds into the dam that straddles the southern boundary. The western slopes are heavily treed with vegetation identified as koala habitat. The land one of five lots along Meadows Road that have similar constraints. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all five lots. The location and extent of the slope restricts the development potential of the site for subdivision. The site contains a single detached residence which can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, land with 10% slope and less will need to be continued to be used for on-site effluent disposal. |
| **W11** |  | 1 RP 163694 | 29-31 Meadows Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The property has slopes greater than 15%, across approximately 70% of the site. The land has an existing overland flow path that feeds into the dam that straddles the northern boundary and Lot 2 RP157934. The western slopes are heavily treed with vegetation identified as koala habitat. The land one of five lots along Meadows Road that have similar constraints. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all five lots. The ground level of the site has been modified to site a single detached residence close to the vegetation and within the area identified as having slope. The location of dwelling house means that it is also exposed to bushfire hazard risks. The extent and location of the slope restricts the development potential of the site for subdivision. The dwelling house can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, land with 10% slope and less will need to be continued to be used for on-site effluent disposal. |
| **W12** |  | 2 RP 163694 | 33-35 Meadows Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The property has slopes more than 15%, across approximately 78% of the site. The land has an existing overland flow path that feeds into the dam on the land. The western slopes are heavily treed with vegetation identified as koala habitat. The land is one of five lots along Meadows Road that have similar constraints. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all five lots. The extent and location of the slope restricts the development potential of the site for subdivision. The site contains dwelling house that can continue to be used in accordance with existing use rights and rights under the Rural |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Residential Zone. The area immediately adjoining the house has been significantly modified and has retaining wall. As Withcott is unsewered, land with 10% slope and less will need to be continued to be used for on-site effluent disposal. |
| **W13** |  | 500 SP 283635 | 27 O'Neils Road | WITHCOTT | Freehold | Urban Residential | Community facilities | The site has slopes of more than 15% over 67% of the land. Lot 500 is a stormwater detention basin that services the residential estate known as Horizons Estate. |
| **W14** |  | 42 SP 283635 | 29 O'Neils Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 34%% of the site. The area of the slope is upslope of the dwelling house and retaining walls. Significant earthworks have been undertaken on the site to allow for a slab on ground house. Within the slope it appears earthwork have occurred to form a dam. Erosion is evident in the aerial photographs on the upslope near the house. The dwelling is likely at risk of upslope landslip due to the modification of the land. The location of the of the slope restricts the development potential of the site for subdivision. The dwelling house can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W15** |  | 43 SP 283635 | 31 O'Neils Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 34%% of the site. The area of the slope is upslope of the dwelling house and retaining walls. Significant earthworks have been undertaken on the site to allow for a slab on ground house, the pool, shed and benched garden areas. The location of the slope at the rear of the property restricts the development potential of the site for subdivision. The dwelling house can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W16** |  | 44 SP 283635 | 33 O'Neils Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 12% of the site. The area of the slope is upslope of the dwelling house and retaining walls. Earthworks have been undertaken on the site to allow for a slab on ground house, and benched garden area. The dwelling house can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W17** |  | 45 SP 283635 | 35 O'Neils Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 39% of the site. The area of the slope is upslope of the dwelling house, shed and retaining walls. The irregular shape of the land is due to an overland flow paths feed into Lot 501 (detention basin) The overland flow path is under a drainage easement and the slope is indicative of the banks of overland flow path. The dwelling house can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W18** |  | 501 SP 283635 | 37 O'Neils Road | WITHCOTT | Freehold | Urban Residential | Community facilities | The site has slopes of more than 15% over 67% of the land. Lot 501 is a stormwater detention basin that services the residential estate known as Horizons Estate. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
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| **W19** |  | 46 SP 283635 | 39 O'Neils Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 52% of the site. The land is currently vacant. The irregular shape of the land is due to an overland flow paths feed into Lot 501 (detention basin) The overland flow path is under a drainage easement and the slope along the front of the property is indicative of the banks of overland flow path. An application for dwelling house will need to address access over the overland flow path and through the easement. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W20** |  | 47 SP 283635 | 41 O'Neils Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 87% of the site. The irregular shape of the land is due to an overland flow paths feed into Lot 501 (detention basin). The overland flow path is under a drainage easement and divides the lot approximately along though the middle. The site has an unconstructed driveway and small dwelling house. Earthworks have been undertaken to create a flat area for the dwelling house and car parking area. Erosion is evident from the aerial photographs where earthworks have occurred near the house. The extent of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W21** |  | 48 SP 283635 | 43 O'Neils Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 94% of the site. The overland flow path protected by a drainage easement. The irregular shaped is due to the steep slopes and overland flow path that traverses the rear of the land. Earthworks appear to have been undertaken to create a flat area for a slab on ground dwelling house and effluent disposal area. The dwelling house (as constructed) appears to have a front setback less than 6m from the front boundary. The driveway and private turnaround appears to have been constructed in the unconstructed part of O'Neils Road and does not appear to have |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
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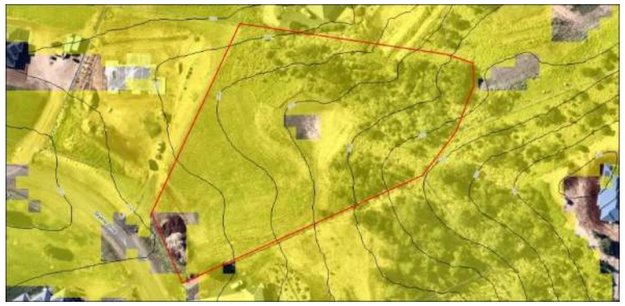
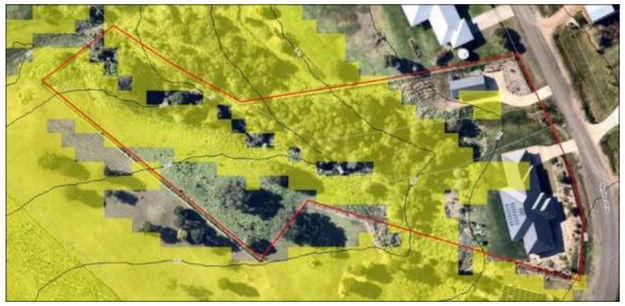
| | | | | | | | | an operational works approval. The dwelling house can continue to be used in accordance with existing use rights and rights under the Rural Residential Zone. The extent of the slope restricts the development potential of the site for subdivision. The dwelling house may be at risk of landslip if slumping and erosion occurs in the overland flow path. |
| **W22** |  | 10 SP 283635 | 3 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 63% of the site. The irregular shape of the land is due to topography and the detention basin. The extent of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W23** |  | 41 SP 283635 | 4 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 55% of the site. The extent of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W24** |  | 11 SP 283635 | 5 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 70% of the site. Significant earthworks appear to have been undertaken to create a flat area for a slab on ground dwelling house, effluent disposal area and driveway access. The extent of the slope restricts the development potential of the site for subdivision. The irregular shape of the land is due to topography and the subdivision design. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W25** |  | 40 SP 283635 | 6 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 5% of the site. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W26** |  | 12 SP 283635 | 7 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 92% of the site. Significant earthworks appear to have been undertaken to create a flat area for a slab on ground dwelling house, effluent disposal area and driveway access. The extent of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W27** |  | 39 SP 283635 | 8 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 50% of the site. The irregular shape of the land is due to the overland flow path that is covered by stormwater drainage easement. The existing dwelling house, effluent disposal area and driveway access have been constructed outside of the 15% slope. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W28** |  | 13 SP 283635 | 9 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 94% of the site. Clearing of vegetation and significant earthworks appear to have been undertaken to create a flat area in the middle of the site. It is anticipated that these earthworks have occur to create a flat area for on-site effluent disposal area to support a dwelling house. The irregular shape of the land is due to subdivision design. The irregular shape of the lot and extent of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W29** |  | 38 SP 283635 | 10 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 47% of the site. The irregular shape of the land is due to the overland flow paths traversing the adjoining lots. The existing dwelling house, effluent disposal area and driveway access have been constructed outside of the 15% slope. The irregular shape of the lot and the location of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W30** |  | 14 SP 283635 | 11 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 89% of the site. Significant earthworks appear to have been undertaken to create a flat area for a slab on ground dwelling house, effluent disposal area and driveway access. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W31** |  | 37 SP 283635 | 12 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 54% of the site. The irregular shape of the land is due to the overland flow path that is covered by stormwater drainage easement. The location of the dwelling house, domestic outbuilding, effluent disposal area and driveway access have been constructed largely outside of the 15% slope. The irregular shape of the lot and the restriction of the stormwater drainage restrict the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W32** |  | 15 SP 283635 | 13 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 52% of the site. The location of the dwelling house, domestic outbuilding, effluent disposal area and driveway access have been constructed largely outside of the 15% slope. The extent and location of the slope to the rear of the land restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W33** |  | 36 SP 283635 | 14 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 77% of the site. Clearing of earthworks appear to have been undertaken to create a flat area for the dwelling house The extent and location of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W34** |  | 16 SP 283635 | 15 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 76% of the site. The location of the dwelling house, domestic outbuilding, effluent disposal area and driveway access have been constructed largely outside of the 15% slope. The extent and location of the slope to the rear of the land restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W35** |  | 35 SP 283635 | 16 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 54% of the site. The location of the dwelling house, domestic outbuilding, effluent disposal area and driveway access have been constructed largely outside of the 15% slope. The extent and location of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W36** |  | 17 SP 283635 | 17 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 70% of the site. The location of the dwelling house, domestic outbuilding, effluent disposal area and driveway access have been constructed largely outside of the 15% slope. The extent and location of the slope to the rear of the land restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
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| **W37** |  | 34 SP 283635 | 18 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 40% of the site. While vacant a dwelling house and effluent disposal area can be sited outside of the 15% slope and not trigger a planning application to Council. The location of the slope to the rear of the property restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W38** |  | 18 SP 283635 | 19 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 45% of the site. The location of the dwelling house, domestic outbuilding, effluent disposal area and driveway access have been constructed largely outside of the 15% slope. The extent and location of the slope to the rear of the land restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W39** |  | 33 SP 283635 | 20 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 68% of the site. The location of the dwelling house, effluent disposal area and driveway access have been constructed largely outside of the 15% slope. The extent and location of the slope to the rear of the land restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W40** |  | 19 SP 283635 | 21 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 80% of the site. Significant earthworks appear to have been undertaken to create a driveable access and flat area at the highest point on the ridge. It is anticipated that these earthworks have occur to create a flat area for the dwelling house and on-site effluent disposal area. The driveway is long and traverses area indicated as having slope 15% and greater. The extent and location of the slope as well as the irregular shape of the lot restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W41** |  | 32 SP 283635 | 22 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 96% of the site. Dwelling house and access Clearing of vegetation and significant earthworks appear to have been undertaken to create a flat area a flat area for the Dwelling house and driveway access. It is anticipated that these earthworks have occurred to create a flat area for on-site effluent disposal area to support a dwelling house. An overland flow path forms part of the western boundary and is covered by an easement. The overland flow path accounts for the lots irregular shape. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W42** |  | 20 SP 283635 | 23 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 1% of the site. The size of the lot and unsewered nature of the estate restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
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| **W43** |  | 31 SP 283635 | 24 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 88% of the site. Earthworks appear to have been undertaken to create a flat area for dwelling house, and on-site effluent disposal area and driveway access. The existing dwelling house and driveway have been located partly with the 15% slope. An overland flow path forms part of the eastern boundary and is covered by an easement. The overland flow path accounts for the lots irregular shape. The extent of the slope as well as the irregular shape of the lot restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W44** |  | 21 SP 283635 | 25 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. While this property has no slope above 15%, it forms part of the greater estate known as Horizons Estate. The size of the lot and unsewered nature of the estate restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W45** |  | 30 SP 283635 | 26 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 16% of the site. The dwelling house, domestic outbuildings and effluent disposal area have been sited outside of the 15% slope. The driveways access is from the unconstructed part of Skyline Drive. The size of the lot and slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
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| **W46** |  | 22 SP 283635 | 27 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 36% of the site. The dwelling house and effluent disposal area have been sited outside of the 15% slope. The extent and location of the slope to the rear of the property restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W47** |  | 23 SP 283635 | 29 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 58% of the site. The dwelling house and effluent disposal area have been sited outside of the 15% slope. The extent and location of the slope to the rear of the property restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W48** |  | 24 SP 283635 | 31 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 67% of the site. The dwelling house and effluent disposal area have been sited outside of the 15% slope. The extent and location of the slope to the rear of the property restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W49** |  | 25 SP 283635 | 33 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 66% of the site. The dwelling house and effluent disposal area have been sited outside of the 15% slope. The extent and location of the slope to the rear of the property restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W50** |  | 26 SP 283635 | 35 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 58% of the site. The dwelling house and effluent disposal area have been sited outside of the 15% slope. The extent and location of the slope to the rear of the property restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W51** |  | 27 SP 283635 | 37 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 54% of the site. The dwelling house, domestic outbuildings and effluent disposal area appear to have been sited outside of the 15% slope. The driveway access is within the 15% slope. An overland flow path forms part of the western boundary but is not covered by an easement. The extent and location of the slope to the front, rear and west of the property restricts the development potential of the site for subdivision. The irregular shape of the lot is largely due to the subdivision design. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W52** |  | 28 SP 283635 | 39 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 55% of the site. The dwelling house, domestic outbuildings and effluent disposal area appear to have been sited outside of the 15% slope.<br><br>Significant earthworks appear to have been undertaken to create a driveable access from Skyline Drive. for dwelling house, domestic outbuilding and on-site effluent disposal area and driveway access. The existing access is unsealed. The land appears to be cut along the rear boundary and rills have formed within the batter. The dwelling house and effluent disposal area have been sited mostly outside of the 15% slope. The extent and location of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W53** |  | 29 SP 283635 | 41 Skyline Drive | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 24% of the site. Domestic outbuilding and effluent disposal area have been sited outside of the 15% slope. The existing dwelling house appears to be within the area identified as 15% slope The properties size with the extent and location of the slope to the rear of the property restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W54** |  | 9 SP 171004 | 8 Taylors Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 68% of the site. Some slopes greater than 15% have been previously cleared. The dwelling house domestic outbuildings, on-site effluent disposal area are mostly sited outside of the 15% slope. A large proportion of the land is heavily treed and subject to koala habitat protections. Overland flow paths divide the property and existing dam is centre over the boundary of the land near the access. The overland flow paths, the slope and vegetation restrict the site the development |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | potential for subdivision. The extent of the koala habitat with the overland flow path and slopes restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W55** |  | 10 RP 215723 | 10 Taylors Road | WITHCOTT | Freehold | Urban Residential | Low Density Residential Rural Residential | The proposed change seeks to partial remove the Urban residential zone from the land. The site will have two zones. Low density residential that aligns with the existing Urban residential zone under the Gatton Planning Scheme 2007 and Rural residential zone. The Rural residential zone has been applied over that part of the land that land affected by slope is also heavily treed and subject to koala habitat protections. Some slopes greater than 15% have been previously cleared. The property has slopes more than 15%, across approximately 38% of the site. The lot has a number of overland flow paths and dams. The overland flow path feed into the greater waterway network in Withcott. The lot has a number of paddocks divided by fences that may be redeveloped for urban purposes. The dwelling house domestic outbuildings, on-site effluent disposal area are mostly sited outside of the 15% slope. Rights for subdivision will be retained on that part of the land under the Low density residential zone. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W56** |  | 4 RP 138612 | 735 Toowoomba Connection Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 46% of the site. Some slopes greater than 15% have been previously cleared. The dwelling house domestic outbuildings, on-site effluent disposal area are sited outside of the 15% slope. A couple of overland flow paths divide the site and restricts the development potential of the site for subdivision. Small property dams site on the overland flow paths. The extent of the overland flow paths, flood hazard and slopes restricts the development potential of the site for subdivision. The dwelling house domestic outbuildings, on-site effluent disposal area are mostly sited outside of the 15% slope. The vehicle access to the site is from the Warrego Highway and suggest to high flood hazard. Alternative vehicle access from Debra Street is subject to steep slopes. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W57** |  | 3 RP 138612 | 745 Toowoomba Connection Road | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 30% of the site. The dwelling house domestic outbuildings, on-site effluent disposal area are sited outside of the 15% slope. An overland flow path divides the site length-wise and restricts the development potential of the site for subdivision. The dwelling house domestic outbuildings, on-site effluent disposal area are mostly sited outside of the 15% slope. The vehicle access to the site is from the Warrego Highway and suggest to high flood hazard. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W58** |  | 1 SP 283635 | 1 Twilight Court | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. While this property has no slope above 15%, it forms part of the greater estate known as Horizons Estate. The size of the lot and unsewered nature of the estate restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W59** |  | 9 SP 283635 | 2 Twilight Court | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 92% of the site. Significant earthworks appear to have been undertaken to create a flat area for dwelling house, domestic outbuilding and on-site effluent disposal area and driveway access. The extent of the slope as well as the irregular shape of the lot restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W60** |  | 2 SP 283635 | 3 Twilight Court | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. While this property has no slope above 15%, it forms part of the greater estate known as Horizons Estate. The size of the lot and unsewered nature of the estate restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W61** |  | 8 SP 283635 | 4 Twilight Court | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 80% of the site. Significant earthworks appear to have been undertaken to create a flat area for dwelling house, domestic outbuilding and on-site effluent disposal area. The extent and location of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W62** |  | 3 SP 283635 | 5 Twilight Court | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 7% of the site. The size of the lot and unsewered nature of the estate restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W63** |  | 7 SP 283635 | 6 Twilight Court | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 66% of the site. The dwelling house, domestic outbuilding and driveway access appears to have been largely constructed outside of the 15% slope. Significant earthworks appear to have been undertaken to create a flat area for on-site effluent disposal area to support the dwelling house. The extent and location of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W64** |  | 4 SP 283635 | 7 Twilight Court | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 74% of the site. Earthworks appear to have been undertaken to create a flat area for the Dwelling house and driveway access. The existing area outside of the 15% slope has been used for on-site effluent disposal to support a dwelling house. The extent and location of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W65** |  | 6 SP 283635 | 8 Twilight Court | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 99% of the site. Clearing of vegetation and significant earthworks appear to have been undertaken to create a flat area in the middle of the site for the dwelling house, on-site effluent disposal area and driveway access. The extent and location of the slope restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. |

| REFERENCE | AERIAL IMAGE | LOT PLAN | STREET ADDRESS | LOCALITY | TENURE | EXISTING ZONE | PROPOSED ZONE | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| **W66** |  | 5 SP 283635 | 9 Twilight Court | WITHCOTT | Freehold | Urban Residential | Rural Residential | The proposed change seeks to remove the Urban residential zone from the land. The land is one of a number of lots that form Horizons Estate. A precinct approach has been undertaken in this location to ensure a consistent approach has been applied to all lots. The property has slopes more than 15%, across approximately 83% of the site. Clearing of vegetation and significant earthworks appear to have been undertaken to create a flat area for a dwelling house and driveway. It is anticipated that these earthworks have occurred to create a flat area also for the on-site effluent disposal area to support a dwelling house. The extent of the slope as well as the irregular shape of the lot restricts the development potential of the site for subdivision. Rights for a dwelling house will be retained under the Rural Residential Zone. As Withcott is unsewered, land within 10% slopes and less will need to be continued to be used for on-site effluent disposal. |
| **W67** |  | 5 SP 295715 | Roches Road | WITHCOTT | Freehold | Industrial | Industry and Rural | The property has slopes across western and northern extent that are more than 15% and in some instances exceed 30%. The land with slopes greater than 15% covers approximately 61% of the site. The whole of the land was previously zoned for Industry purposes however the slopes generally over 10% are difficult for large vehicles and trucks to access. A large proportion of the land affected by slope is also heavily treed and subject to koala habitat protections. Some slopes greater than 15% have been previously cleared. The land has been previous subdivided and has capacity for further industry activities. The proposed rural zone generally follows the area of land with 15% slope and greater with Industry zone being retained on that part of the land with slopes less than 15%. As Withcott is unsewered, land with 10% slopes and less will need to be used for on-site effluent disposal and will constrain the Industrial capacity. |

# Appendix 3 Draft PSP5 Geotechnical assessments

## SC1.1 Planning Scheme Policy 5 Geotechnical assessment and management plan

### SC1.1.1 Application

(1) This planning scheme policy applies to development where an applicable code identifies Planning Scheme Policy 4 Geotechnical assessment and management plan as supporting an outcome of the Steep land overlay code.

(2) The Steep land overlay mapping used in the planning scheme has been compiled from a LiDAR derived digital elevation model.

### SC1.1.2 Relationship to the Planning Scheme

(1) This planning scheme policy is to be read in conjunction with the assessment provisions specified in the Planning Scheme and applies when development is proposed in an area identified on OM11 Steep land overlay map. This Policy specifically relates to the assessment of 8.11 Steep land overlay code and ensuring development is consistent with the overall outcomes and performance outcomes specified in the code.

### SC1.1.3 Purpose

(1) The purpose of this planning scheme policy is to:

- (a) identify the qualifications required to be held by the author of a geotechnical assessment and management plan;
- (b) identify requirements for site assessments and management plans;
- (c) provide supporting technical information, where relevant;
- (d) provide supporting information on who should be consulted regarding adjoining landowners;
- (e) identify other relevant guidelines, standards, and information sources, where relevant.

(2) This planning scheme policy aims to:

- (a) ensure that development in any area of steep or potential landslip has proper regard to factors affecting land stability.
- (b) provide guidance on the preparation and assessment of geotechnical assessments.

### SC1.1.4 Qualifications

(1) The landslide risk assessment for the proposed development site should be conducted by a Registered Professional Engineer of Queensland (RPEQ) specialising in

geotechnical engineering, with a minimum 5 years experienced in landslide risk assessment and management.

## SC1.1.5 Technical standards

(1) The following references are relevant when preparing a landslide risk assessment and management plan.
(2) A reference in the policy to a specific resource, guideline, standard or document means the latest version of the resource, guideline, standard or document.

### SC1.1.5.1 Guidelines

(1) The following guidelines are relevant when preparing a slope and stable land assessment:

(a) Australian Geomechanics Society (2007) A National Landslide Risk Management Framework for Australia AGS 2007c, Journal of the Australian Geomechanics Society, Vol. 42, No. 1, March 2007
(b) Australian Geomechanics Society (2007) Practice Note Guideline for Landslide Risk Management 2007, Journal of the Australian Geomechanics Society, Vol. 42, No. 1, March 2007
(c) Australian Geomechanics Society (2007) The Australian GeoGuides for Slope Management and Maintenance. Journal of the Australian Geomechanics Society, Vol. 42, No. 1, March 2007

### SC1.1.5.2 Standards

(1) The following standards are relevant when preparing a slope and stable land assessment:

(a) AS.1170.4-2007 Structural design actions Part 4: Earthquake actions in Australia
(b) AS.3700:2001 Masonry structures
(c) AS.3798 Guidelines for Earthworks for Commercial and Residential Developments
(d) AS.4678 Earth Retaining Structures
(e) AS/NZS.1170:2002 Structural design actions.
(f) Australian Building Codes Board (2015) The Australian Building Codes Board (ABCB) Handbook: Landslide Hazards
(g) Australian Standards Laboratory testing is required to be undertaken by a NATA certificated laboratory

### SC1.1.5.3 Studies

(1) The following studies are relevant to the Lockyer Valley:

(a) Willmott W.F. (1984) *Slope stability and its constraints on closer settlement in the foothills of the Toowoomba range*, Gatton Valley Geological Survey of Queensland Record Series 1984/44.

### SC1.1.5.4 Information sources

(1) The following information sources relevant to landslip:

(a) Water monitoring information portal https://water-monitoring.information.qld.gov.au/

## SC1.1.6 Consultation

The Council may seek third party advice or comment about an application where the development may conflict with a code or technical advice is required to assess the development. Where technical advice is outsourced to an independent consultant an additional fee will apply.

## SC1.1.7 Landslide management plan parts

(1) When undertaking development for a Material change of use, Reconfiguration of a Lot, and Operational works where changing the ground level or undertaking infrastructure works the following parts of the landslide management plan must be completed:

(a) Landslide risk assessment;
(b) Geotechnical stability assessment;
(c) Management and mitigation measures;
(d) Geotechnical Certification.

## SC1.1.8 Landslide risk assessment

(1) For any proposed development on land within Steep land areas, as identified on the Steep land overlay map, there is a risk of landslide that must be assessed by a qualified expert and submitted to Council for assessment.

(2) The level of landslide risk depends on several factors including, but not limited to the following:
(a) ground slope angle and shape;
(b) characteristic geology;
(c) strength of geomaterials and its distribution within the subsurface;
(d) landslide history;
(e) presence of existing or recent past instability i.e. slips, slumps, hummocky ground etc;
(f) emergent seepages and depth of groundwater table;
(g) potential for surface runoff concentration, orientation of rock mass defects etc.

(3) The applicant needs to assess the risk of landslide which may adversely affect the subject site, adjoining premises and the proposed development.

### SC1.1.8.1 Requirements for Landslide risk assessment

(1) The landslide risk assessment should be carried out using the following:

(a) site-specific geotechnical information;
(b) site slope gradient and shape;

(c) surface features;
(d) historical landslide information, where available;
(e) emergent seepages and groundwater table;
(f) drainage conditions; and
(g) any other relevant information of the site.

(2) The landslide risk assessment results should be included in the geotechnical stability assessment report.

(3) For any proposed development or redevelopment on any site or lot mapped on the Landslide hazard overlay map, a 'landslide relative susceptibility' analysis should be carried out first using the Figure 1: Landslide Susceptibility Analysis Form.

## Table 13: SMEC Landslide susceptibility analysis form

**LANDSLIDE SUSCEPTIBILITY ANALYSIS** Analysis No. ____

**Location:** **Site No.** **Site Name:**

**1 Natural Surface Slope**

| Site | | Level | Factor |
|---|---|---|---|
| | Less than 5 degrees | L | 0.1 |
| | Between 5 and 15 degrees | M | 0.5 |
| | Between 15 and 30 degrees | M | 0.8 |
| | Between 30 and 45 degrees | H | 1.2 |
| | More than 45 degrees | M | 0.8 |

**2 Slope Shape**

| Site | | Level | Factor |
|---|---|---|---|
| | Crest or ridge | L | 0.7 |
| | Planar / Convex | M | 0.9 |
| | Rough / Irregular | H | 1.2 |
| | Concave | H | 1.5 |

**3 Site geology**

| Site | | Level | Factor |
|---|---|---|---|
| | Volcanic Extrusive rock | H | 1.1 |
| | Sedimentary rock | M | 1 |
| | Low grade metamorphic rock | M | 1 |
| | High grade metamorphic rock | L | 0.9 |
| | Volcanic Intrusive rock | M | 1 |

**4 Soils**

| Site | | Level | Factor |
|---|---|---|---|
| | Rock at surface | VL | 0.1 |
| | Residual soil < 1m deep | L | 0.5 |
| | Residual soil 1-3m deep | M | 0.9 |
| | Residual soil > 3m deep | H | 1.5 |
| | Colluvial soil < 1m deep | H | 1.5 |
| | Colluvial soil 1-3m deep | VH | 2 |
| | Colluvial soil > 3m deep | VH | 4 |

**5 Fill height**

| Site | | Level | Factor |
|---|---|---|---|
| | None | L | 1.0 |
| | Less than 1m | M | 1.1 |
| | Between 1 and 3m | M | 1.3 |
| | Between 3 and 6m | H | 1.7 |
| | More than 6m | VH | 2.5 |

**6 Evidence of groundwater**

| Site | | Level | Factor |
|---|---|---|---|
| | None apparent | L | 0.7 |
| | Minor moistness | M | 0.9 |
| | Generally wet | H | 1.5 |
| | Surface springs | VH | 3 |

**7 Cut height**

| Site | | Level | Factor |
|---|---|---|---|
| | None (Go to section 11) | L | 1.0. |
| | Less than 1m | M | 1.1 |
| | Between 1 and 3m | M | 1.3 |
| | Between 3 and 6m | H | 1.7 |
| | More than 6m | VH | 2.5 |

**8 Slope of cut face**

| Site | | Level | Factor |
|---|---|---|---|
| | Less than 30 degrees | L | 0.5 |
| | Between 30 and 45 degrees | M | 1 |
| | Between 45 and 60 degrees | H | 1.5 |
| | More than 60 degrees | VH | 3 |

**9 Material in cutting**

| Site | | Level | Factor |
|---|---|---|---|
| | High strength rock | L | 0.5 |
| | Medium strength rock | L | 1 |
| | Low strength rock | M | 1.2 |
| | Very low strength rock and soil | H | 1.5 |
| | Soil | VH | 2 |

**10 Cut slope support**

| Site | | Level | Factor |
|---|---|---|---|
| | Concrete wall | L | 0.5 |
| | Crib wall | M | 0.9 |
| | Gabion wall | M | 1 |
| | Rock wall | H | 1.5 |
| | Unsupported | H | 2 |

**11 Concentration of surface water**

| Site | | Level | Factor |
|---|---|---|---|
| | Ridge | L | 0.7 |
| | Crest | M | 0.8 |
| | Upper slope | M | 0.9 |
| | Mid slope | H | 1.2 |
| | Lower slope | H | 1.5 |

**12 Wastewater Disposal**

| Site | | Level | Factor |
|---|---|---|---|
| | Fully Sewered | M | 1 |
| | Onsite disposal – Surface | M | 1.2 |
| | Onsite disposal – Soak Pit/Trenches | H | 1.5 |

**13 Stormwater Disposal**

| Site | | Level | Factor |
|---|---|---|---|
| | All stormwater piped into road drainage | L | 0.7 |
| | Rain water tank with overflows | M | 1 |
| | Stormwater discharge on site | H | 1.5 |

**14 Evidence of instability**

| Site | | Level | Factor |
|---|---|---|---|
| | No sign of instability | L | 0.8 |
| | Soil Creep | H | 1.2 |
| | Minor irregularity | VH | 2 |
| | Major irregularity | VH | 5 |
| | Active instability | VH | 10 |

**Summary**

| | | | Factor |
|---|---|---|---|
| 1 | Natural Surface Slope | | |
| 2 | Slope Shape | | |
| 3 | Site Geology | | |
| 4 | Soils | | |
| 5 | Fill Height | | |
| 6 | Evidence of Groundwater | | |
| 7 | Cut height | | |
| 8 | Slope of Cut Face | | |
| 9 | Material in Cutting | | |
| 10 | Cut Slope Support | | |
| 11 | Concentration of Surface Water | | |
| 12 | Wastewater Disposal | | |
| 13 | Stormwater Disposal | | |
| 14 | Evidence of Instability | | |
| Relative Susceptibility (1x2x3x4x5x6x7x8x9x10x11x12x13x14) | | | |

(4) The calculated relative susceptibility should then be correlated to susceptibility rating using Table ##: Correlation between relative susceptibility and susceptibility rating

**Table 14: Correlation between relative susceptibility and susceptibility rating**

| RELATIVE SUSCEPTIBILITY | SUSCEPTIBILITY RATING |
|---|---|
| Less than 0.2 | Very low |
| 0.2-0.6 | Low |
| 0.6-0.2 | Moderate |
| 2.0-6.0 | High |
| Greater than 6.0 | Very High |

### SC1.1.8.1.1 Landslide susceptibility rating analysis is 'low' or 'very low'

(1) If the result of the landslide susceptibility rating analysis is 'low' or 'very low', then the following is required:

- (a) undertake a further risk assessment of the proposed development impacting any adjoining buildings or properties; and
- (b) certification from a RPEQ specialising in geotechnical engineering. This certification needs to confirm:
  - (i) the proposed development site or lot has been assessed with a landslide risk rating of 'low' or 'very low'; and
  - (ii) the proposed development will not cause any adverse impact on any adjoining buildings, properties, and infrastructure.

### SC1.1.8.1.2 Landslide susceptibility rating analysis is 'moderate', 'high' or 'very high'

(1) If the result of the landslide susceptibility rating analysis is 'moderate', 'high' or 'very high', a detailed landslide risk assessment following the Australian Geomechanics Society (AGS) 'Landslide Risk Management Guideline 2007' should be carried out to determine whether the risk to life and property is acceptable.

(2) In this regard a 'low' or 'very low' risk to property and life is acceptable to Council. If the result of the landslide risk assessment following the AGS 2007 method is still 'moderate', 'high' or 'very high', then the following is required to be included in the report:

- (a) detailed risk mitigation measures and engineering recommendations to reduce the landslide risk to 'low' or 'very low'; and
- (b) certification from a RPEQ specialising in geotechnical engineering. This certification needs to confirm:
  - (i) the proposed development site or lots will achieve a landslide risk rating of 'low' or 'very low'; and
  - (ii) will not cause any adverse impact on any adjoining buildings, properties, and infrastructure, providing the risk mitigation measures and engineering recommendations (if any) of the report are followed.

### SC1.1.8.2 On-site effluent disposal (if applicable)

(1) The report should examine feasibility and suitability of the proposed development about landslide risk issues for the site. If the proposed development involves on-site effluent disposal system, the risk assessment should consider potential saturation and softening of the soils within the effluent disposal areas and their impacts on the long-term stability of the site.

### SC1.1.8.3 Details a landslide risk assessment must address

(1) The details of landslide risk assessment must address include:

**(a) Assess the risk of landslide:**

(i) on the subject site for material change of use. This may be limited to a proposed development envelope area where on a large site; or
(ii) for each proposed lot in a subdivision. This may be limited to a proposed development envelope area on benched site/s; or
(iii) from any proposed bulk earthworks, retaining walls and proposed finished levels to achieve and maintain acceptable risk of landslide in the long-term conditions; and
(iv) on any upslope and downslope external properties which may impact the proposed development; and
(v) on driveway or road access to the development, whether internal or external to the development site.

**(b) Identify any risk mitigation measure including:**

(i) any exclusion area/s (i.e. locations on the development site) that are considered unsuitable for new development (i.e. reconfiguration or material change of use) due to an unacceptable risk to life and/or property.
(ii) any buffers to protect the proposed development (i.e. reconfiguration or material change of use) from an exclusion area/s.
(iii) proposed bulk earthworks and finished level/s.

**(c) Confirm the risk of landslide is 'low' or 'very low':**

(i) on the subject site for material change of use. This may be limited to a proposed development envelope area where on a large site; or
(ii) for each proposed lot in a subdivision. This may be limited to a proposed development envelope area on individual proposed lot/s; or
(iii) after completion of any operation works, bulk earthworks and retaining walls and will not cause any adverse impact on any adjoining premise/s or structure/s.

## SC1.1.9 Geotechnical stability assessment

(1) Where the proposed development requires significant bulk earthworks including cut or fill batters and/or retaining structures to achieve the desired finished levels, a geotechnical stability assessment is required to assess potential sliding, rotational and slip circle failure. The stability assessment of the proposed cut or fill batters and/or

retaining structures should be included with the geotechnical stability assessment report.

(2) This section provides guidance on the Councils requirements for stability assessment of cut or fill batters and retaining structures associated with any proposed development.

## SC1.1.9.1 Stability assessment of batters

(1) The stability assessment of all proposed cut or fill batters should be carried out following a conventional slip circle failure analysis method. In this type of analysis, several potential slip circles are assumed, and the factor of safety for each of the assumed slip circles is calculated. The minimum factor of safety amongst those assumed slip circles is the factor of safety for that designed batter. The accuracy of the stability assessment depends on the number of slip circles analysed and the calculation method followed.

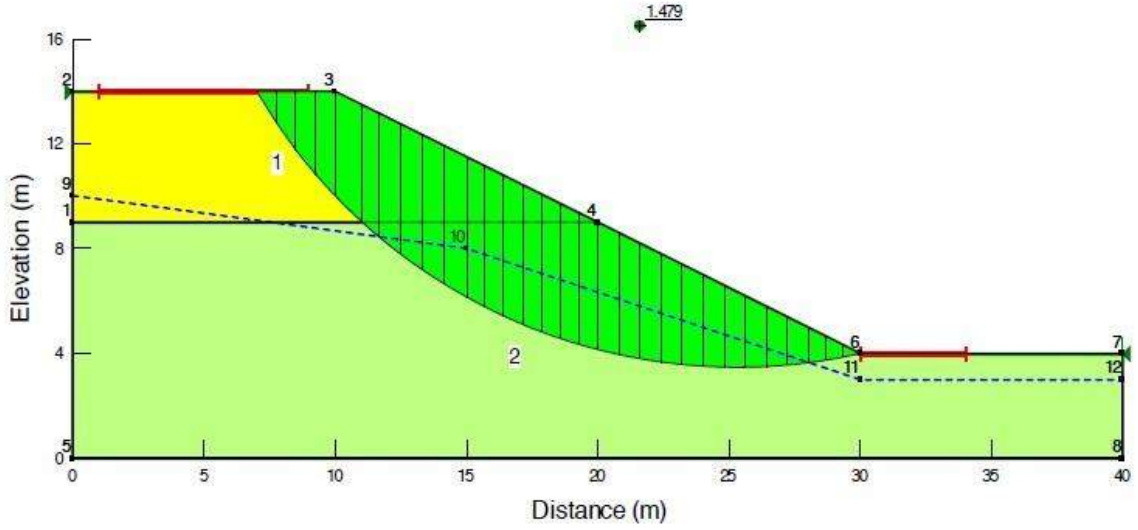
(2) One particularly important issue in the stability assessment of batters is the estimation of representative shear strengths for the constituting soil layers. In stability analysis of batters, the worst credible shear strengths of the soil layers expected during the design life of the batters should be used, rather than using the existing shear strengths of the soil layers. If there is a prolonged and heavy rainfall, the highest estimated water table and drainage conditions should be used. Another potential worst case scenario for the stability assessment of batters adjacent to any water body is sudden drawdown of the water table. In this instance, the factor of safety for the sudden drawdown case should be calculated, rather than for the temporary or short term high water level condition.

(3) The stability assessment of the cut or fill batters should achieve a long term factor of safety of at least 1.5 against geotechnical instability. For rapid drawdown temporary conditions, the stability assessment of the cut or fill batters should achieve a short term factor of safety of at least 1.3 against geotechnical instability.

(4) The stability analysis of batters may be carried out manually, however, the use of professional software, such as *SLOPE/W by Geoslope* (**www.geo-slope.com**) would be cost effective with much less computational efforts and time. Figure 1: Typical slope stability analysis using SLOPE/W shows an example of slope stability analysis using *SLOPE/W.*

**Table 15: Figure 1: Typical slope stability analysis using SLOPE/W**

| | | | | |
|---|---|---|---|---|
| Material number 1: | Unit weight: 15 | C: 5 | Phi: 20 | Model: MohrCoulomb |
| Material number 2: | Unit weight: 18 | C: 10 | Phi: 25 | Model: MohrCoulomb |

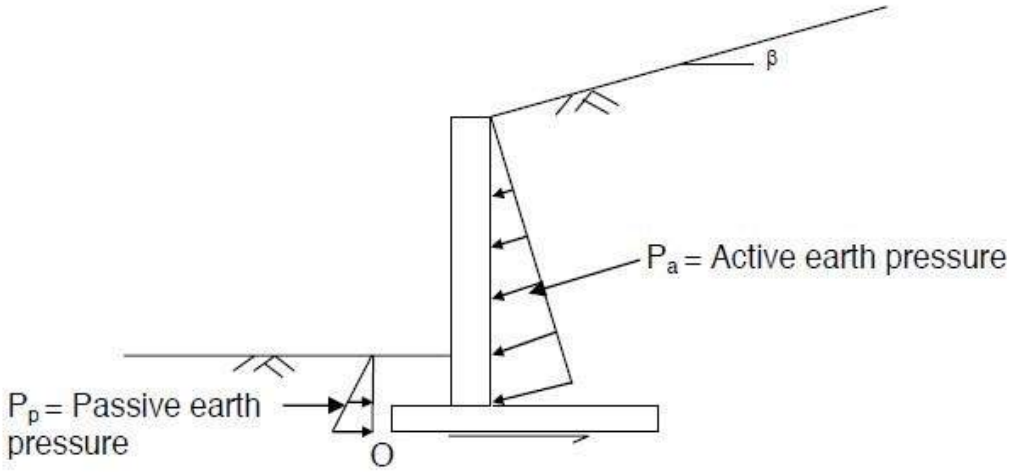



## SC1.1.9.2 Stability assessment of retaining structures

(1) Geotechnical stability of all proposed retaining structures should be carried out against sliding, overturning and global slope instability through the geomaterials. The proposed retaining structures should also be checked against bearing capacity failure or excessive base settlements. Furthermore, the retaining structure itself must be designed against any potential structural failure such as flexural failure or shear failure.

(2) Figure 2 shows a typical retaining structure including lateral earth pressure distributions. The retained soil behind the retaining structure will exert active lateral earth pressure if the retaining structure allows lateral movement. Otherwise, lateral earth pressure at rest 'Ko condition' should be used during the design and stability assessments. The soil in front of the wall will provide passive earth pressure (resistance).

**Figure 10: Figure 2: Typical retaining structure and lateral earth pressure distributions**




(5) For the proposed retaining structures, the applicant should assess the factor of safety against the following:

(a) sliding caused by the active earth pressure and resistance by passive earth pressure and frictional force at the base of the retaining structure;
(b) overturning about the toe (point 'O' in Figure 2) as a result of the driving moment caused by the active earth pressure and resisting moment caused by the passive earth pressure, the self-weight of the retaining structure and weight of the retained soils behind the structure; and

(6) global slope instability considering several large slip circles passing below the base of the retaining structure and the retained soils.

(7) The stability assessment should ensure all retaining structures will achieve a factor of safety (FOS) greater than or equal to 1.5 against sliding, overturning and global slope instability. Alternatively, the sliding and overturning stability and global stability assessments for retaining structures can be carried out using Limit State Methods as described in *AS.4678 – Earth Retaining Structures.*

(8) The global stability analysis of retaining walls may be carried out manually, however, the use of professional software, such as *SLOPE/W by Geoslope:* (**www.geo-slope.com**) would be cost effective with much less computational efforts and time.

## SC1.1.10 Geotechnical certifications

(1) In addition to undertaking a landslide risk assessment, the applicant should provide a geotechnical certification from a RPEQ specialising in geotechnical engineering for any proposed development within landslide hazard areas.

(2) If the landslide risk assessment determines the site OR lot OR development envelope area with a landslide risk rating of 'low' or 'very low' certification is from a RPEQ specialising in geotechnical engineering confirming the proposed development is appropriate for:
(a) the sloping nature of the site,
(b) the risk of landslide on the subject site or lot (or each of the proposed lots for reconfiguring a lot development applications) adversely affecting the proposed development and adjoining properties or structures and
(c) the risk of landslide on any upslope and downslope external properties impacting the proposed development is 'low' or 'very low'.

(3) If the landslide risk assessment determines the site OR lot OR development envelope area with a landslide risk rating of 'moderate', 'high' or 'very high' certification from a RPEQ specialising in geotechnical engineering confirming the proposed development is appropriate for:
(a) the sloping nature of the site,
(b) the risk of landslide on the subject site or lot (or each of the proposed lots for reconfiguring a lot development applications) adversely affecting the proposed development and adjoining properties or structures and
(c) the risk of landslide on any upslope and downslope external properties impacting the proposed development will be reduced to 'low' or 'very low', providing the risk mitigation measures and engineering recommendations of the report are followed.

(4) These certifications will provide assurance of geotechnical stability for the proposed development site and a summary of the complex landslide risk assessment process. These certifications should be prepared using the Councils standard engineering certification form and should be included with the geotechnical stability assessment report.