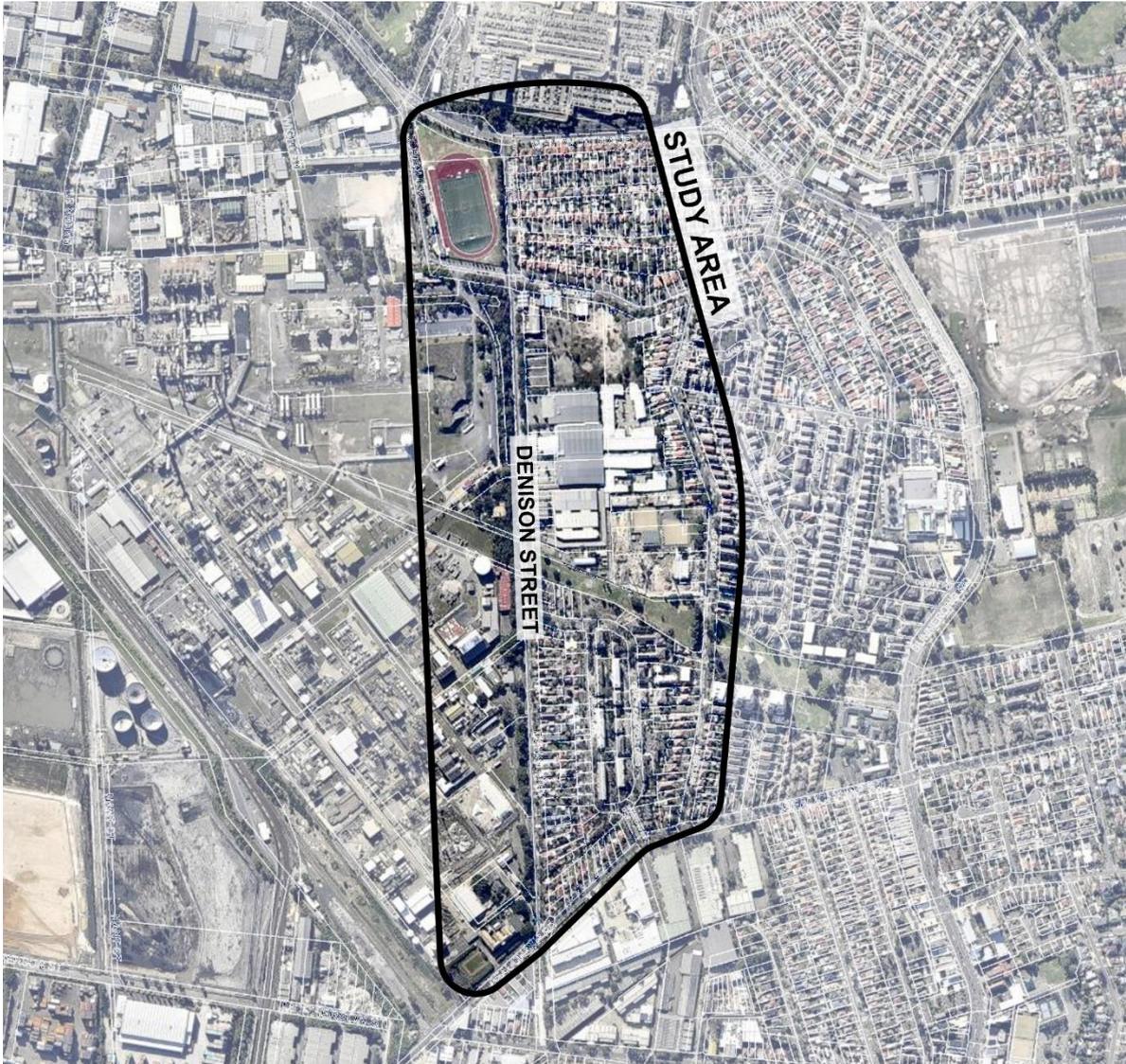


# Review of Planning Controls

## Denison Street, Hillsdale

For Botany Bay City Council

16 August 2016



Doc. No.: J-000166-REP-RPC

Revision: 0

## DISTRIBUTION LIST

Name	Organisation	From (Issue)	To (Issue)
Cathy McMahon	Botany Bay Council	A	Current
Project Master File	Arriscar Pty Ltd	A	Current

## DOCUMENT HISTORY AND AUTHORISATION

Rev	Date	By	Description	Check	Approved
A	13-Apr-16	PS	Consultation draft (Not for circulation).	JL & RR	RR
B	9-May-16	PS	Consultation draft (Not for circulation) incorporating feedback from BBCC	RR	RR
C	29-Jun-16	PS	Draft incorporating feedback from DP&E	JL	PS
0	16-Aug-16	PS	Final report.	RR	RR

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## Summary

The Botany Industrial Park and Port Botany industrial facilities generate significant movements of bulk and packaged dangerous goods (DGs) by road in the local government area of Botany Bay City Council (BBCC). Some packaged goods trucks and bulk liquids road tanker trucks use a 1 km stretch of road at Denison Street, Hillsdale.

To inform the Joint Regional Planning Panel (JRPP) on the risks posed by DG transport on a proposed Bunnings Warehouse at 25-49 Smith Street Hillsdale, BBCC in partnership with the Department of Planning and Environment (DP&E) commissioned a Quantitative Risk Assessment (QRA) of Dangerous Goods (DG) movements on Denison Street, Hillsdale ('Transport QRA').

The Transport QRA Report [Ref. 25] recommended that BBCC should":

*"review its planning controls for the area, in light of this study, to ensure new development does not result in a significant exposure to risks from dangerous goods transport incidents. For example, it may be desirable to discourage intensification of residential development within areas with an individual fatality risk in excess of one chance in a million, as indicated in HIPAP 4, Section 2.5.2.1".*

BBCC is undertaking a review of the Botany Bay Development Control Plan (BBDCP2013) and is preparing a new DCP specifically for land covered by the new 'Three Ports' State Environmental Planning Policy (SEPP). To assist in this review, BBCC engaged Arriscar Pty Limited (Arriscar) to undertake a review of land use safety planning controls due to the proximity of the Botany Industrial Park (BIP) and the transport of Dangerous Goods (DGs) along Denison Street.

The Review included consideration of:

- Current and predicted future development in the Study Area.
- Current, and predicted changes to, transport of DGs along Denison Street.
- Available risk assessments for the Study Area, including:
  - *Dangerous Goods Transport QRA, Denison Street Hillsdale* (12 February 2015) [Ref. 25].
  - *Addendum to Dangerous Goods Transport QRA, Denison Street Hillsdale* (19 May 2015) [Ref. 24].
  - *Quantitative Risk Assessment, Summary Report, Botany Industrial Park* [Ref. 27].

The implications of future redevelopment in the Study Area and changes to DG heavy vehicle movements along Denison Street were considered when developing the proposed risk-based planning controls. For example, the forecast population growth could increase the demand for higher density residential development to the east of Rhodes Street. There would also be a corresponding increase in DG truck traffic along Denison Street. Based on information from Ports NSW, a 50% increase in DG heavy vehicle movements along Denison Street would appear to be a reasonable conservative assumption over the next 10 years.

It is important to note that:

- A detailed verification of the currently available quantitative risk assessments (QRAs) was excluded from the scope of the Review (Refer to Section 1.3). The proposed risk-based planning controls are based on the risk results presented in these available QRAs, provided for this Review to Arriscar by BBCC.

- There are no established quantitative risk criteria in NSW for land use safety planning due to the transport of DGs (Refer to Section 6.1). Therefore, the proposed risk-based planning controls are based on the risk criteria for fixed facilities in NSW, which are consistent with criteria that have been adopted in previous QRAs and international practice.

Within the four main precincts in the Study Area, there are 20 areas where the combination of land use zoning and major risk contributor/s warrants specific risk-based planning controls (Refer to Section 7.2). The large number of areas arises because the Study Area includes nine different land use zones (B3, B4, B5, B7, R2, R3, RE1, IN1 and SP1) and the dominant risk contributor (e.g. cumulative location-specific individual fatality risk, cumulative injury / irritation risk and/or cumulative societal risk) varies throughout the Study Area.

A guide for land use safety planning has been provided for each of the 20 specific areas, and this includes recommendations for restrictions on some categories of future development. How these risk-based planning controls are to be implemented needs to be determined by BBCC as some of the proposed controls will only apply to some specific parts the Study Area and should not be applied to all other similarly zoned areas defined within the Local Environmental Plan.

The current zoning, and any potential restrictions on future rezoning (particularly to a more sensitive use category), is identified for each area. Also, the proposed controls for future developments (i.e. potentially hazardous industry and/or other types of development in the vicinity of existing potentially hazardous industry) are included, together with the basis for each of the recommended planning controls.

The proposed risk based planning controls will need to be periodically reviewed as new QRAs become available (e.g. as required by the development consent conditions for the BIP) and/or if the NSW government establishes quantitative risk criteria for the transport of DGs. It will continue to be important to ensure all underlying assumptions and data sources (e.g. truck accident frequency) are thoroughly scrutinised in any future QRAs and it may be appropriate to undertake a sensitivity analysis to test the impact of the data and assumptions.

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## Notation

Abbreviation	Description
ALARP	As Low As Reasonably Practicable
Arriscar	Arriscar Pty Limited
ARTC	Australian Rail Track Corporation
BBCC	Botany Bay City Council
BBLEP2013	Botany Bay Local Environmental Plan 2013
BBDCP2013	Botany Bay Development Control Plan 2013
BIP	Botany Industrial Park
BLEVE	Boiling Liquid Expanding Vapour Explosion
DCP	Development Control Plan
DG/s	Dangerous Good/s
DP&E	Department of Planning and Environment
FN Curve	Log-log plat of cumulative frequency of fatality versus of number of fatalities
HIPAP	Hazardous Industry Planning Advisory Paper
IMT	Intermodal Terminal. A facility used to transfer freight from one transport mode to another, for example from road to rail.
JRPP	Joint Regional Planning Panel
km	kilometre
kPa	Kilo-Pascals
kW/m <sup>2</sup>	Kilo-Watts per square metre
LEP	Local Environmental Plan
LGA	Local Government Area
LSIFR	Location-Specific Individual Fatality Risk
LUSS	Land Use Safety Study
m	metre
MHF	Major Hazard Facility
NSW	New South Wales
p.a.	Per annum
QRA	Quantitative Risk Assessment
RAC	Risk Assessment Criteria
Ref	Reference
RFB	Residential flat building

Abbreviation	Description
RMS	Roads and Maritime Services
SEPP	State Environmental Planning Policy
SPC	Special Purpose Company
TEU	Twenty-foot equivalent unit. A unit of measurement equal to the space occupied by a standard twenty foot container. One 40 foot container is equal to two TEU.
Three Ports SEPP	State Environmental Planning Policy (Three Ports) 2013

## 1 INTRODUCTION

### 1.1 Background

The Botany Industrial Park and Port Botany industrial facilities generate significant movements of dangerous goods (DGs) by road in the local government area of Botany Bay City Council (BBCC). Some packaged goods trucks and bulk liquids road tanker trucks use Denison Street, Hillsdale.

To inform the Joint Regional Planning Panel (JRPP) on the risks posed by DG transport on a proposed Bunnings Warehouse at 25-49 Smith Street Hillsdale, BBCC in partnership with the Department of Planning and Environment (DP&E) commissioned a Quantitative Risk Assessment (QRA) of Dangerous Goods (DG) movements on Denison Street, Hillsdale ('Transport QRA').

The Transport QRA Report [Ref. 25] recommended that BBCC should":

*"review its planning controls for the area, in light of this study, to ensure new development does not result in a significant exposure to risks from dangerous goods transport incidents. For example, it may be desirable to discourage intensification of residential development within areas with an individual fatality risk in excess of one chance in a million, as indicated in HIPAP 4, Section 2.5.2.1".*

There are some existing risk-based land use safety planning controls within the Botany Bay Local Environmental Plan 2013 (BBLEP2013). For example:

- Part 6.2.8 of the Botany Bay Development Control Plan (BBDCP2013) outlines the recommendations of three previous studies undertaken by the State Government concerning risk in the Banksmeadow / Randwick area and includes planning controls for employment / industrial development.
- Part 8 — Character Precincts (for Hillsdale and Botany) of BBDCP2013 includes planning controls for residential development.

BBCC is undertaking a review of the BBDCP2013 and is preparing a new DCP specifically for land covered by the new 'Three Ports' State Environmental Planning Policy (SEPP). As part of this review, BBCC has engaged Arriscar Pty Limited (Arriscar) to undertake a review of land use safety planning controls due to the proximity of the Botany Industrial Park and the transport of Dangerous Goods (DGs) along Denison Street.

This report provides details of the land use planning controls review conducted by Arriscar for the Denison Street truck transport route.

### 1.2 Objectives

In the Hazardous Industry Planning Advisory Paper (HIPAP) No. 10 – *Land Use Safety Planning* [Ref. 8, Section 4.2.1], it is stated that it is important for local councils to have "policies and follow procedures for ensuring appropriate zoning and development assessment in areas that could be impacted by major accidents".

BBCC's current policies and procedures for land use safety planning in the Study Area are included as risk-based development controls in the BBDCP2013 [Ref. 1].

Therefore, the overall objective was to review the BBCC's existing risk-based planning controls for the Study Area and to propose any amendments that will assist Council to make informed land use safety decisions for existing and future development.

A secondary objective is to address the relevant recommendation from the Transport QRA [Ref. 25] in relation to their applicability to the Study Area.

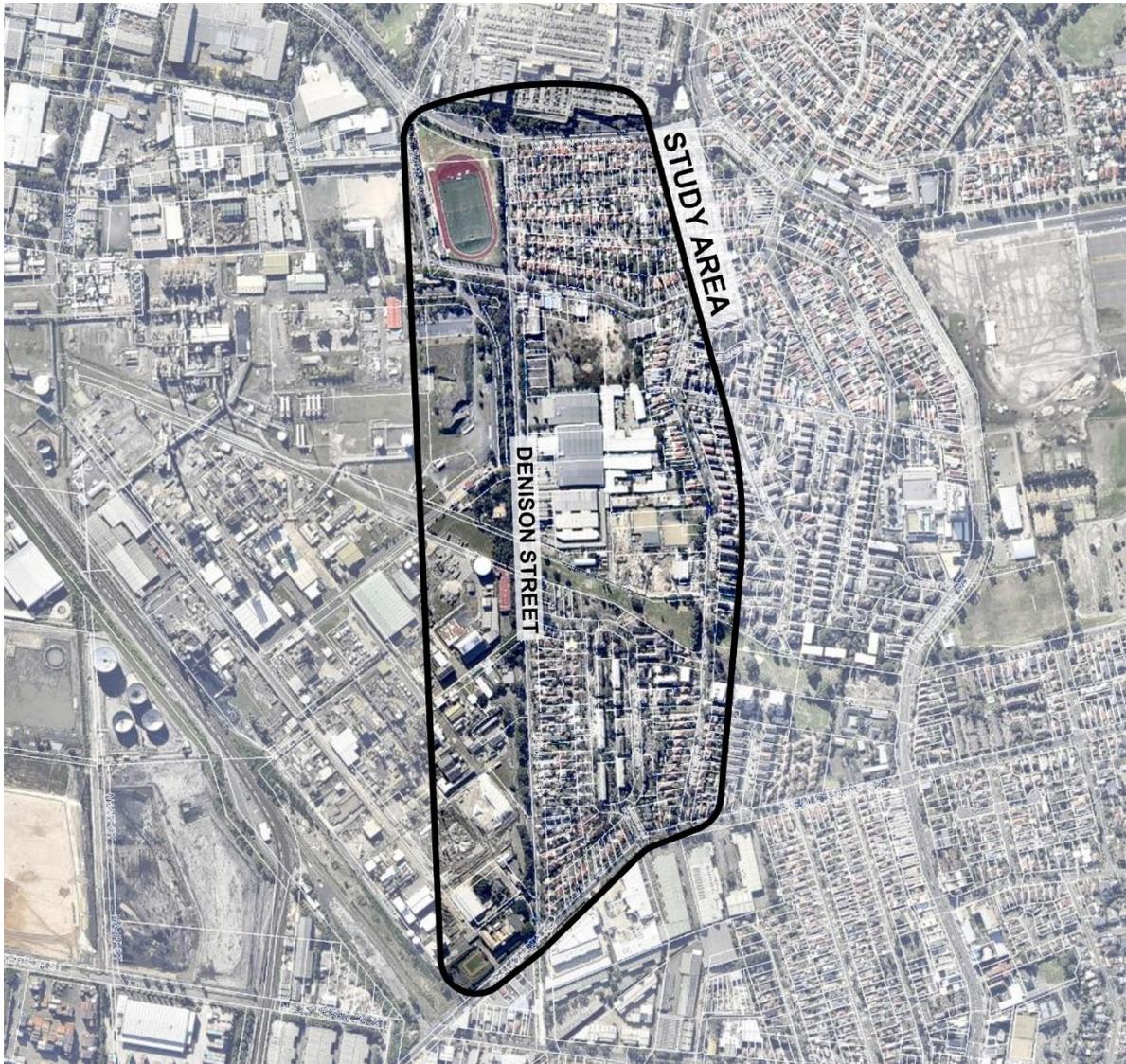
### 1.3 Scope of Work

The scope of work, as reported in BBCC's project brief, includes:

1. A review of the existing:
  - a. land uses and development standards in BBLEP2013; and
  - b. planning controls in the BBDCP2013,as they relate to the Study Area shown in Figure 1 and in the context of the findings and recommendations of the QRA for DG movements on Denison Street.
2. Identification of BCC's existing planning controls and standards that are relevant to the risk within the study area and therefore require review.
3. Reviewing the identified existing planning controls and standards against the results / findings of the key risk studies, in the context of strategic land use safety planning.
4. Recommending any necessary amendments to the relevant existing planning controls and standards.

The scope of the review did not include verification of the data and results included in any of the currently available QRAs for the Study Area. This includes, *inter alia*, the: *Dangerous Goods Transport QRA, Denison Street Hillsdale* (12 February 2015) [Ref. 25]; *Addendum to Dangerous Goods Transport QRA, Denison Street Hillsdale* (19 May 2015) [Ref. 24]; and *Quantitative Risk Assessment, Summary Report, Botany Industrial Park* [Ref. 27].

**Figure 1 Study Area**



## 2 APPROACH

The review involved the following key activities:

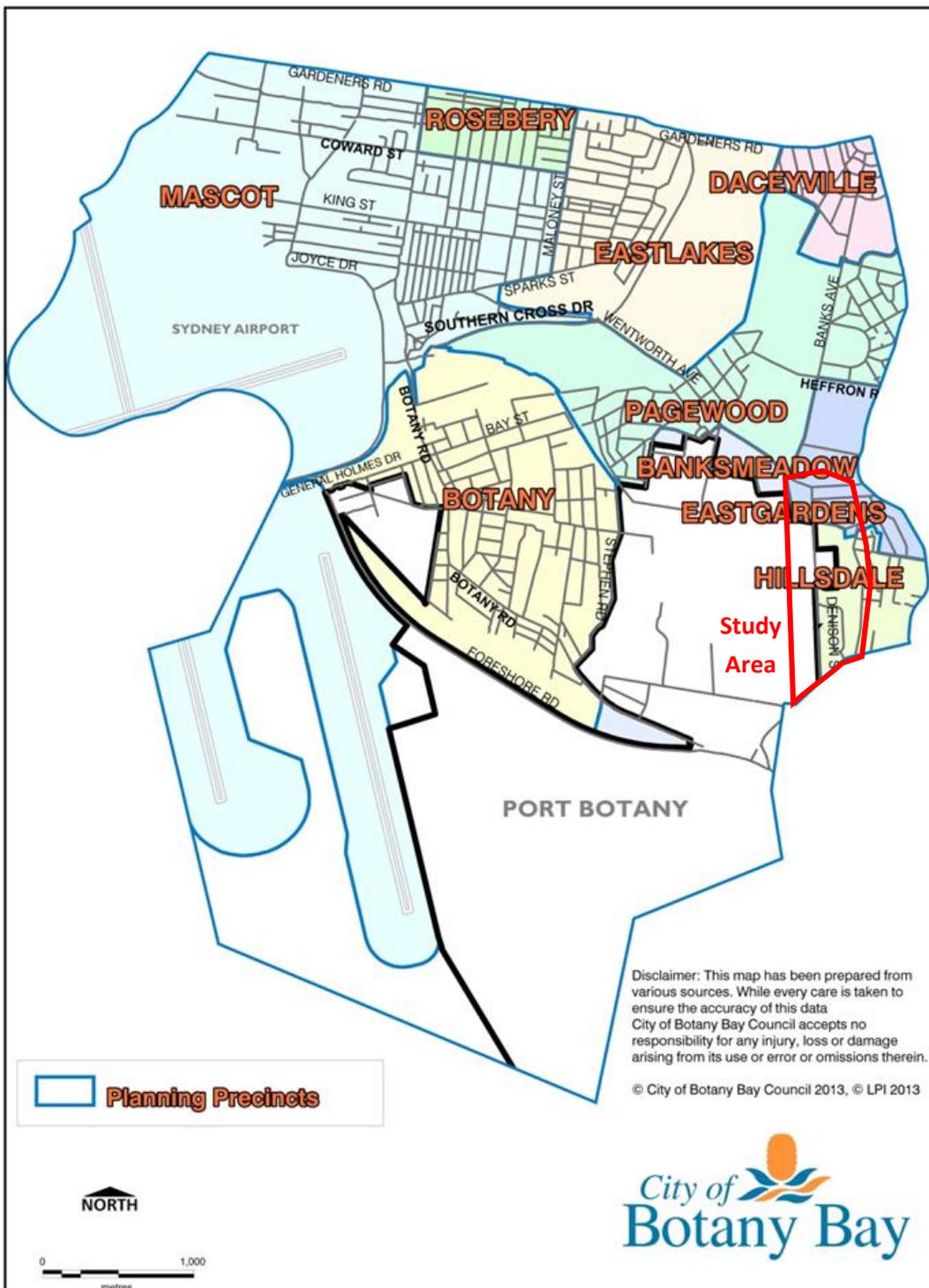
- Inception (kick-off) meeting with BBCC and visit to the Study Area.
- Briefings with representatives from BBCC, DP&E, NSW Ports, Transport NSW, Roads and Maritime Services (RMS) and Australian Rail Track Corporation (ARTC).
- Development of the proposed (draft) amendments to the existing planning controls and standards, based on a review of:
  - Existing planning control documents relating to the Study Area, including:
    - *Botany Bay Development Control Plan 2013* [Ref. 1].
    - *Botany Bay Local Environmental Plan 2013* [Ref. 14].
    - *State Environmental Planning Policy (Three Ports) 2013* (Three Ports SEPP) [Ref. 15].
    - *Botany / Randwick Industrial Area Land Use Safety Study* (2001) [Ref. 9].
  - Current and predicted future development in the Study Area.
  - Current, and predicted changes to, transport of DGs along Denison Street.
  - Available risk assessments for the Study Area, including:
    - *Dangerous Goods Transport QRA, Denison Street Hillsdale* (12 February 2015) [Ref. 25].
    - *Addendum to Dangerous Goods Transport QRA, Denison Street Hillsdale* (19 May 2015) [Ref. 24].
    - *Quantitative Risk Assessment, Summary Report, Botany Industrial Park* [Ref. 27].
  - Consideration of the relevant risk criteria for land use safety planning in the Study Area, including from the transport of DGs. This included a review of the risk criteria from HIPAP No. 4, *Risk Criteria for Land Use Safety Planning* (2011) [Ref. 7] and HIPAP No. 10, *Land Use Safety Planning* (2011) [Ref. 8].
- Finalisation of the proposed amendments to the existing planning controls and reporting.

### 3 DESCRIPTION OF STUDY AREA

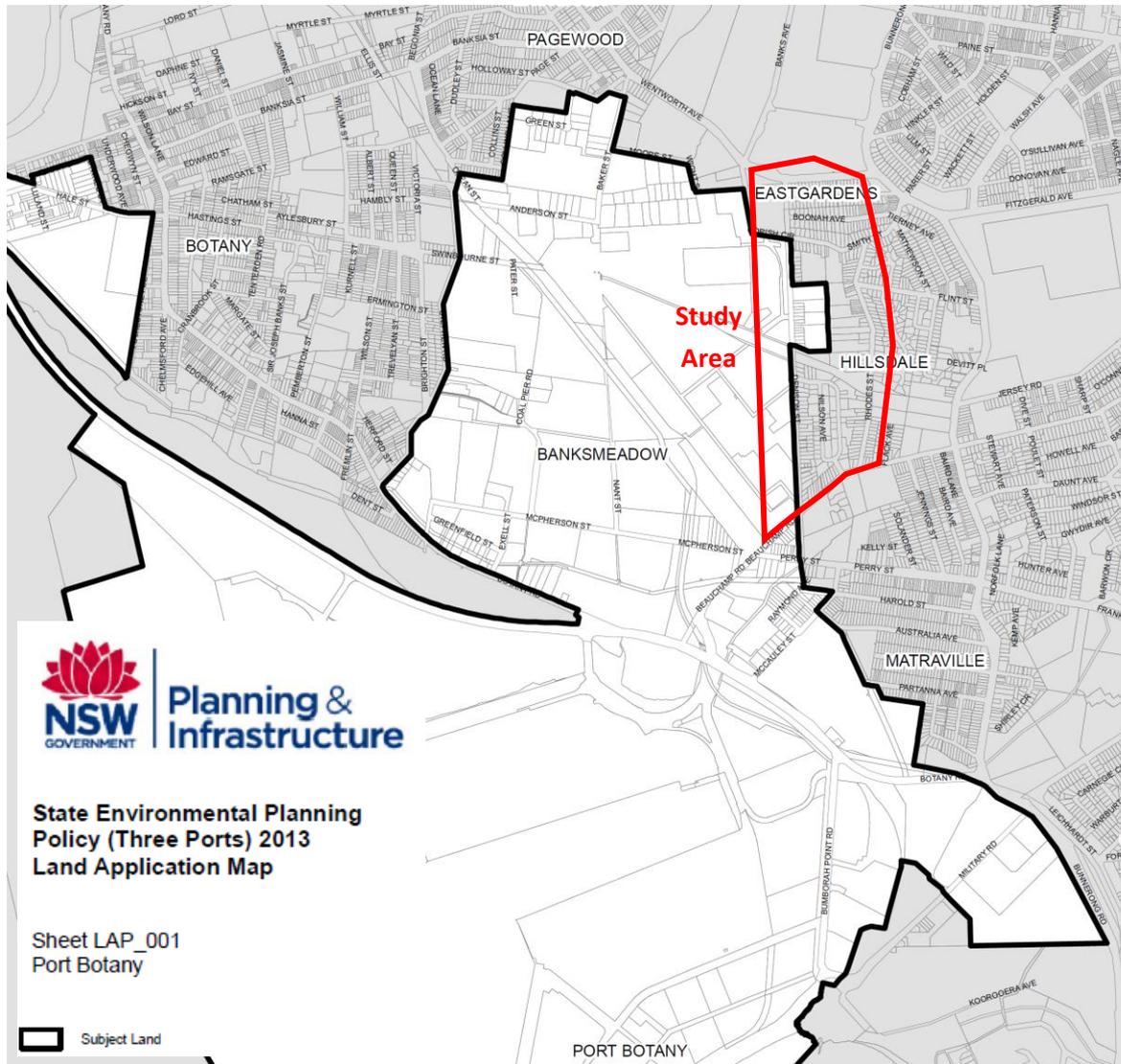
#### 3.1 Introduction

The Study Area partly overlaps two of BBCC’s planning precincts: Hillsdale and Eastgardens (Refer to Figure 2). It also partly overlaps land that falls under the Three Ports SEPP, which is principally the Botany Industrial Park (BIP) to the west of Denison Street (Refer to Figure 3), and includes part of the Banksmeadow Industrial Precinct (Refer to Section 3.1.2).

**Figure 2 BBCC Planning Precincts [Ref. 1]**



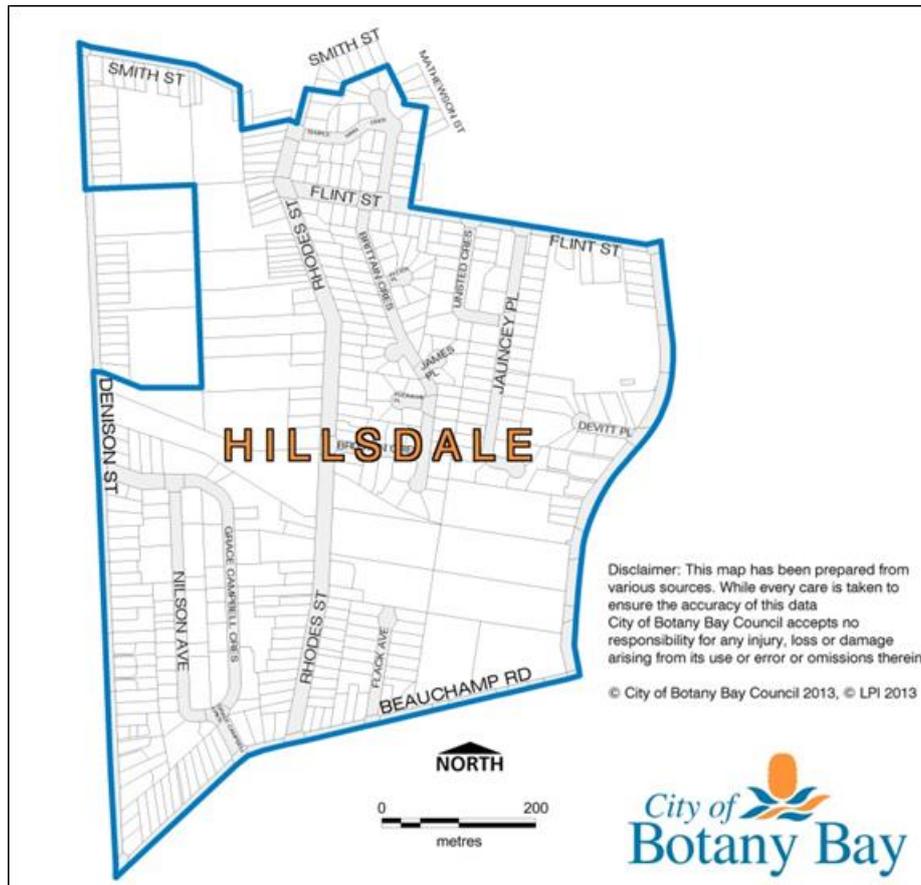
**Figure 3 Land Application Map for Three Ports SEPP [Ref. 4]**



### 3.1.1 Hillsdale Precinct

The Hillsdale Precinct is generally bounded by Smith Street, Bunnerong Road, Beauchamp Road and Denison Street (Refer to Figure 4). Rhodes Street Reserve bisects Hillsdale (between Denison Street and Rhodes Street).

**Figure 4 Hillsdale Precinct [Ref. 1]**



Two and three storey Residential Flat Buildings (RFB) are the dominant multi-unit residential style building type to the east of Rhodes Street. These sites were traditionally detached dwelling sites redeveloped for flat buildings in the 1960s-1970s. More recently, some RFBs have been approved (under construction) to the east and west of Rhodes Street near the Bowling Club.

Villa and townhouse developments occupy the western side of Nilson Avenue and are in the vicinity of Flint Street, Unsted Crescent and Jauncey Place. Dwelling Houses are scattered throughout the Precinct, with the majority located on Rhodes Street (south of the Rhodes Street Reserve) and along Beauchamp Road/Denison Street.

The Hillsdale Local Centre, which is not located within the Study Area, includes major supermarkets and specialty stores.

### **3.1.2 Eastgardens Precinct**

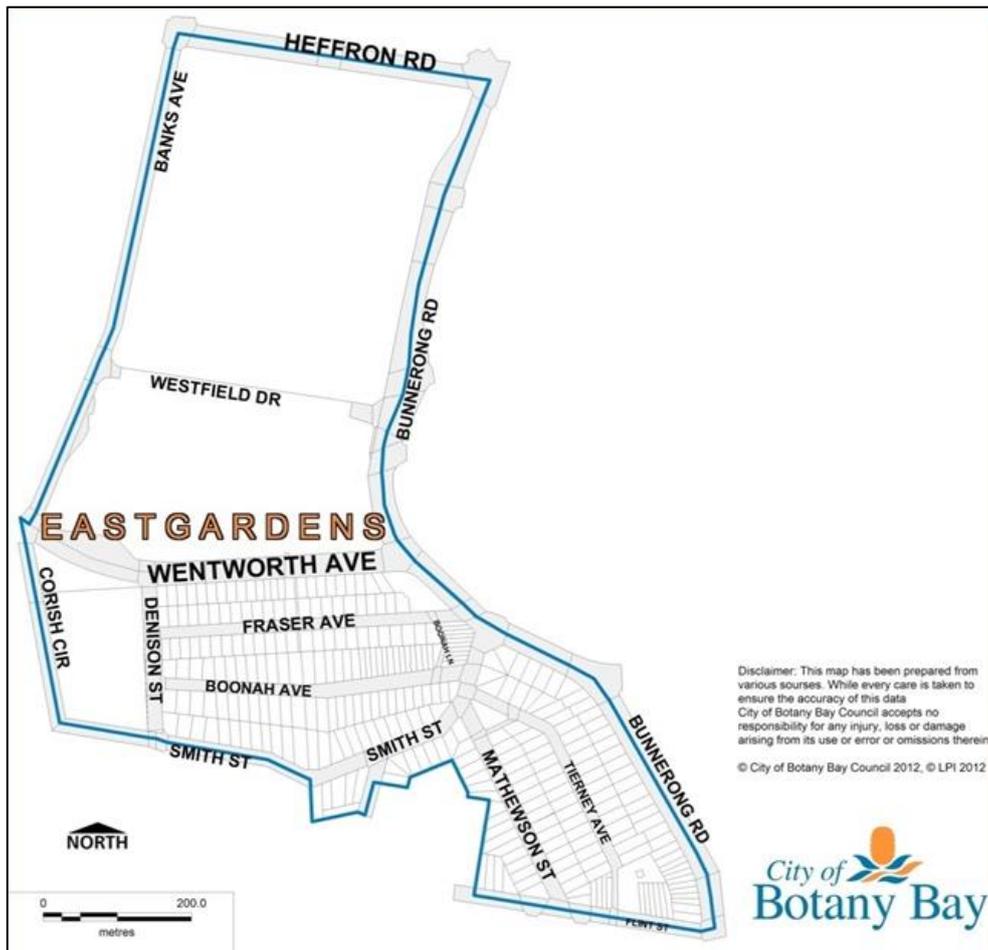
The Eastgardens Precinct (Refer to Figure 5) includes: the Westfield Eastgardens shopping centre (North of Wentworth Avenue); low density detached dwelling houses (South of Wentworth Avenue in Fraser Avenue, Boonah Avenue, Bunnerong Road, Tierney Avenue, Matheson Street and Smith Street); and the Hensley Athletic Field (Bounded by Wentworth Avenue, Denison Street, Smith Street and Corish Circle).

Westfield Eastgardens is a major shopping centre in the area and includes a major bus interchange facility with bus routes connecting Eastgardens with the City, Bondi Junction, Burwood, Rockdale, Little Bay, Port Botany and La Perouse. The shopping centre is bounded by an approved masterplan comprising 2205 dwellings to the north, and a golf course to the west.

Hensley Athletic Field is the only major open space area within this Precinct. It includes: a running track and field events area for athletics; an infield area for field sports such as soccer, rugby league and cricket practice nets.

There are two small pocket parks in the Precinct: (i) Tierney Avenue Reserve at the corner of Flint Street and Tierney Avenue; and (ii) Muller Reserve at the corner of Tierney Avenue and Mathewson Street.

**Figure 5 Eastgardens Precinct [Ref. 1]**



### 3.1.3 Banksmeadow Industrial Precinct

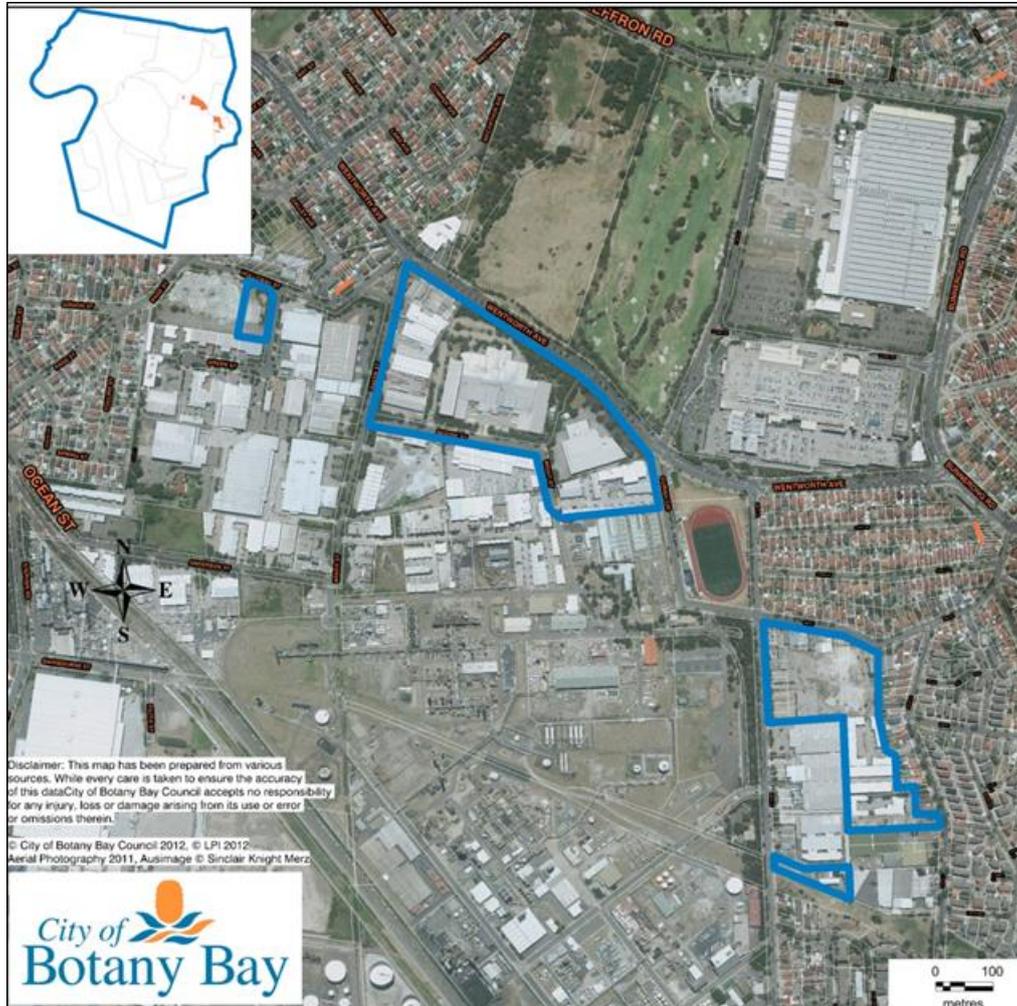
The Study Area includes part of the Banksmeadow Industrial Precinct (Refer to Figure 6).

The Banksmeadow Industrial Precinct includes the following areas [Ref. 1, Part 6.2.8]:

- An area zoned IN2 Light Industrial bounded by Wentworth Avenue, Baker Street, Moore Street, Wight Street, & Corish Circle;
- The B7 Business Park at 32 Page Street, Pagewood; and
- The B5 Business Development and B7 Business Park along Denison, Smith and Rhodes Streets Hillsdale. Note: This is the only part of the Banksmeadow Industrial Precinct located within the Study Area and it is bordered by residential uses in the Hillsdale and Eastgarden Precincts. Refer to Appendix A for description of B5 and B7 land use zones.

The remaining industrial area (Refer to Section 3.1.4) in the Study Area is zoned under the State Environmental Planning Policy (Three Ports) 2013.

**Figure 6 Banksmeadow Industrial Precinct [Ref. 1]**



The main land uses in this Precinct include manufacturing, warehousing and transport. The Bunnings hardware store, which is currently under construction, is the largest single use in the Study Area (Bounded by Denison Street and Smith Street).

### **3.1.4 Three Ports SEPP**

The Three Ports SEPP applies to the leased port areas (i.e. land leased to a private port operator under the Ports Assets (Authorised Transactions) Act 2012) as well as surrounding land that needs to be maintained for port-related and industrial uses.

The Study Area is outside of the port lease area, but does include land that is covered by the Three Ports SEPP (Refer to Figure 3). The Minister for Planning is the relevant consent authority for State Significant Development and the BBCC is the relevant consent authority for other developments on this land as per Clause 8 of the Three Ports SEPP [Ref. 15].

This area also includes a number of pipelines carrying hazardous substances such as natural gas and jet fuel (Note: These pipelines are located outside the Study Area).

The Botany Industrial Park (BIP), which is located to the west of Denison Street, is the largest industrial use within the Study Area. This area is covered by the Three Ports SEPP and several companies own and operate plants at the BIP. The facilities at the BIP include: a chloralkali plant (manufacture of chlorine, hydrochloric acid, caustic soda, ferric chloride, and sodium hypochlorite), operated by Ixom (Formerly operated by Orica); an olefines plant and plastics manufacturing plants operated by Qenos; and a surfactants facility operated by Huntsman Chemicals. These are potentially hazardous facilities and are categorised as Major Hazard Facilities (MHFs) in accordance with the NSW Work Health and Safety Regulations [Ref. 16].

Land covered by the Three Ports SEPP is also located to the east of Denison Street (Refer to Figure 3). This is currently used for manufacturing and warehousing (i.e. Similar to the adjacent Banksmeadow Industrial Precinct – Refer to Section 3.1.3).

### **3.2 Land Use Zoning**

Land use zones for the Study Area are defined in the BBLEP2013 [Ref. 14] and Three Ports SEPP [Ref. 15]. All of the land in the Study Area that this covered by the Three Ports SEPP is zoned for general industrial use (IN1) [Ref. 5]. The section of the land use zone map from the BBLEP2013 that is applicable to the Study Area is reproduced below (Refer to Figure 7).

The description of each relevant zone (i.e. B5, R2, etc. as shown on Figure 7) from the BBLEP2013 and Three Ports SEPP is reproduced in Appendix A. Each zone description includes:

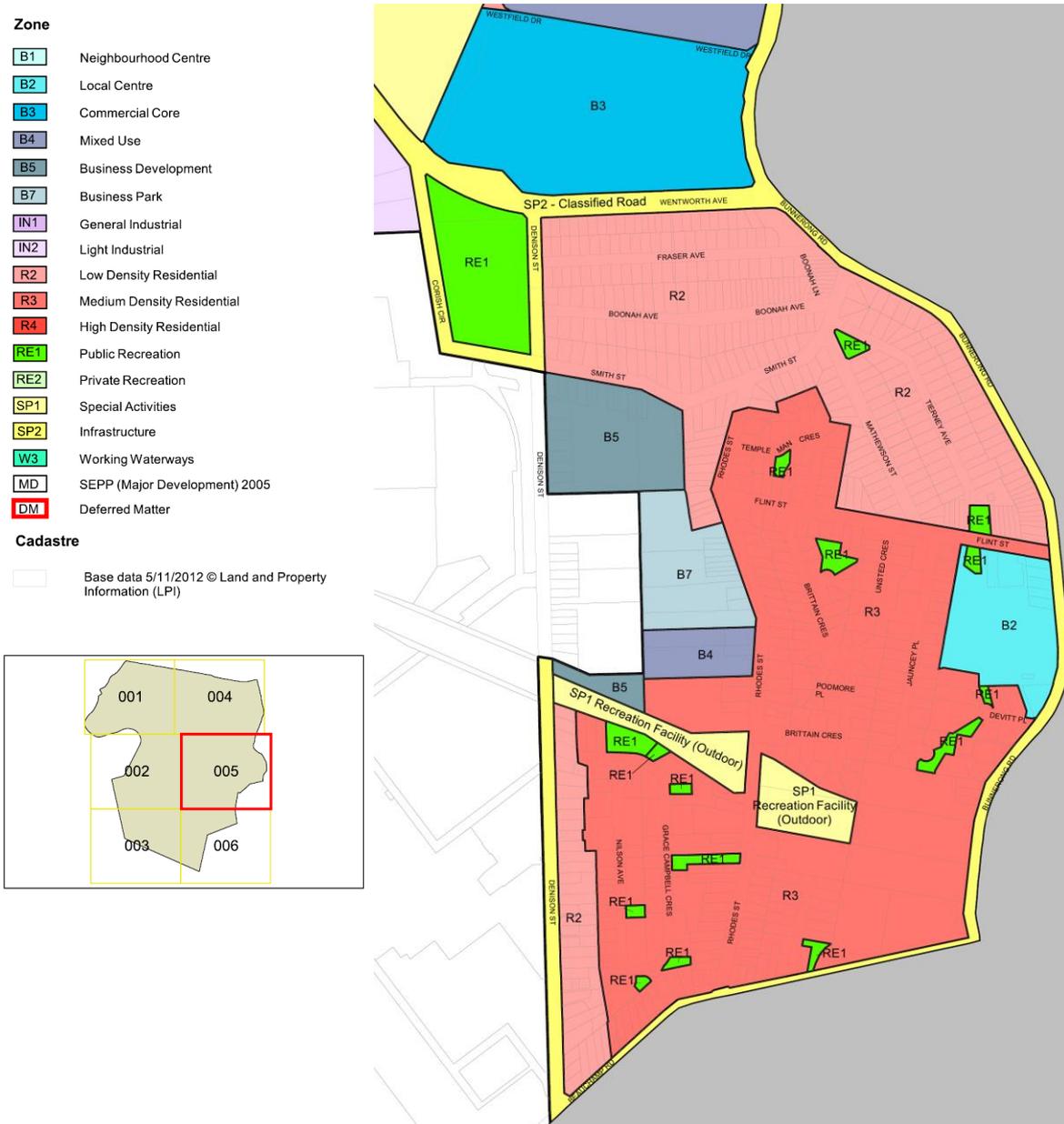
- The objectives for development;
- Development that may be carried out without development consent;
- Development that may be carried out only with development consent; and
- Development that is prohibited.

The consent authority is required to have regard to the objectives for development in a zone when determining a development application in respect of land within the zone.

Additional permitted uses also apply for the Hensley Athletics Field and Rhodes Street Reserve [Ref. 14, Schedule 1]. Specifically:

- Development at the Hensley Athletics Field for the purposes of a car park, entertainment facility, food and drink premises, function centre and registered club is permitted with development consent.
- Development at the Rhodes Street Reserve for the purposes of a recreation area is permitted with development consent.

**Figure 7 Land Use Zones in Study Area [Ref. 14]**



### 3.3 Population

Current and forecast population data for the Hillsdale - Eastgardens precincts is presented on the forecast.id website [Ref. 12]. Whilst the average number of persons per household is forecast to remain relatively constant (viz. 2.57 in 2011 to 2.58 by 2026), the total population is forecast to grow from 6,103 in 2011 to 9,306 by 2026 - an increase of over 1,200 households with an average annual growth rate of 1.89% to 4.25% [Ref. 12]. The forecast.id data is reproduced in Table 1 below.

The forecast.id data does not indicate where the additional households would be located and it is not clear if the forecast growth can be accommodated within the existing land use zones (particularly the R3 zone for medium density residential uses) or if future rezoning will be necessary. However, recent development applications for medium density residential units to the west of Rhodes Street (Refer to Section 3.4) would suggest that land to the east of Rhodes Street has already been developed for this use.

**Table 1 Population Forecast for Hillsdale – Eastgardens [Ref. 12]**

	Forecast year					
	2011	2016	2021	2026	2031	2036
<b>Population</b>	6,103	6,883	7,558	9,306	11,126	12,691
<b>Change in population (5 yrs)</b>	--	780	676	1,748	1,820	1,565
<b>Average annual change</b>	--	2.43%	1.89%	4.25%	3.64%	2.67%
<b>Households</b>	2,373	2,664	2,941	3,611	4,334	4,988
<b>Average household size</b>	2.57	2.58	2.57	2.58	2.57	2.54
<b>Dwellings</b>	2,437	2,740	3,033	3,743	4,503	5,196
<b>Dwelling occupancy rate</b>	97.37	97.23	96.97	96.47	96.25	96.00

### 3.4 Current and Predicted Future Development

#### 3.4.1 Residential Development

Up to 568 additional dwellings are forecast for the Hillsdale and Eastgardens Precincts between 2016 and 2021 (Refer to data presented in Table 1). At the time of this Review, the following residential development applications were being considered by BBCC in the Study Area:

- 41 to 45 Rhodes Street – Demolition of the existing buildings (a vehicle repair building and residential dwelling) and the erection of a 6 storey residential apartment building with 46 apartments.
- 51 to 53 Rhodes Street – Three multi-storey residential apartment buildings with 70-85 residential apartments. This Site is currently zoned B7 Business Park and would require rezoning to permit residential development.
- 42 Beauchamp Road – Replacement of existing residential dwelling with 2 x 3 bedroom townhouses and 1 x 4 bedroom townhouse. This was refused on 14/4/16.

These development applications appear to be representative of the recent residential intensification in the Study Area, which includes a mixture of medium density apartments and townhouses. For example, the multi-storey apartment complex currently being constructed at 39 Rhodes Street includes three apartment blocks and up to 250 apartments.

The current residential development applications for the Study Area, which represent only a part of the Hillsdale and Eastgardens Precincts, suggest that the increases being forecast in Table 1 are not unrealistic.

#### 3.4.2 Commercial and Industrial Development

An expansion to the Westfields Eastgardens shopping centre was approved in March 2015. This extension to level 3 has been estimated to increase the number of staff by 168 and persons visiting the centre by c. 84 per day [Ref. 26].

A subdivision of the BIP was approved by the DP&E in August 2015 [Ref. 2]. This reduced the area occupied by the BIP and has released some land for future development along Denison Street and

Corish Circle. This land (Refer to Figure 8) is still within the area that is covered by the Three Ports SEPP and is still zoned for general industrial use (IN1).

No current or predicted future major industrial developments were identified within the Study Area.

**Figure 8 Sub-Division of BIP Approved in August 2015 [Ref. 2]**

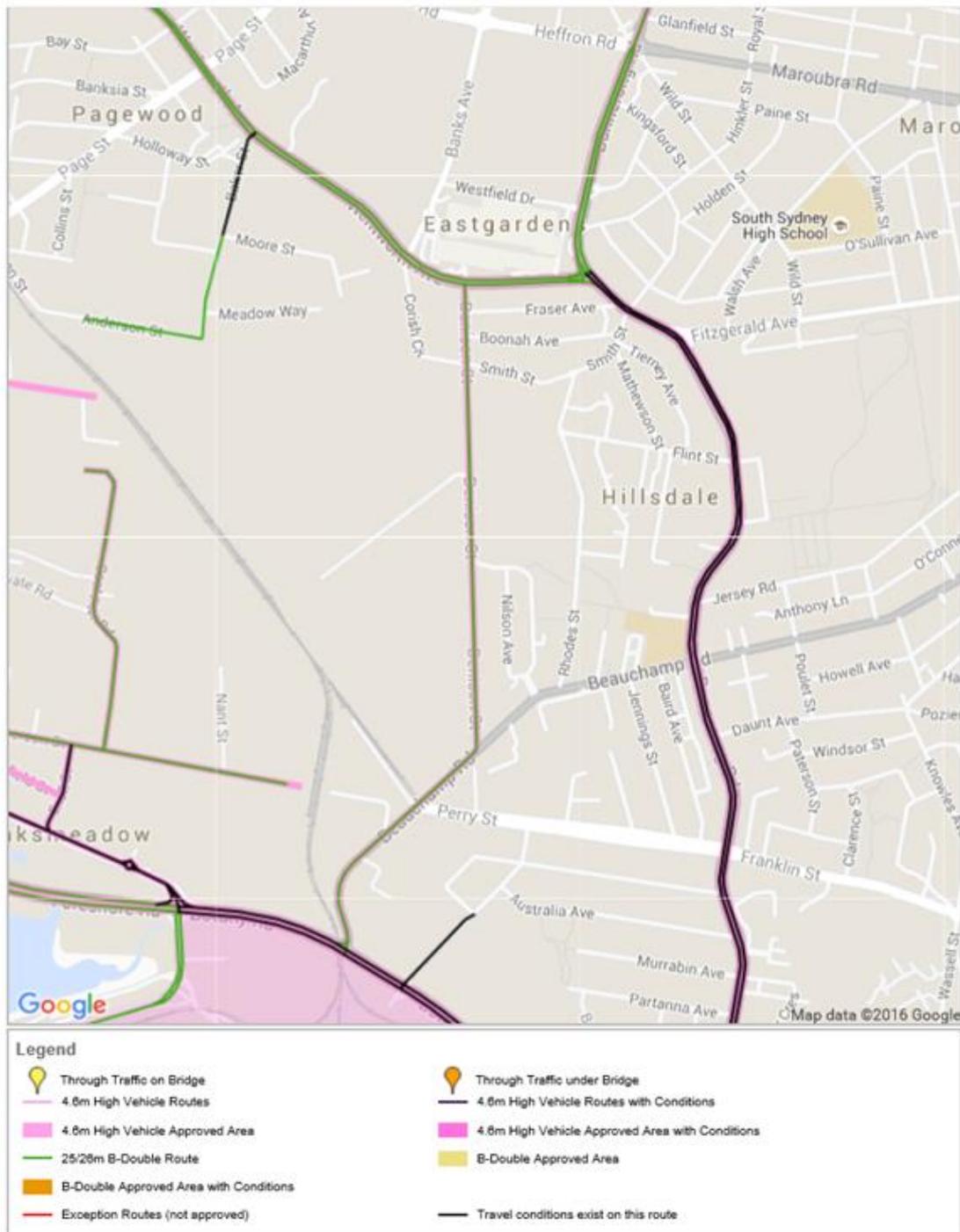


### 3.5 Roads and Traffic Management

Denison Street is a Roads and Maritime Services (RMS) approved road for heavy vehicles, including vehicles 4.6 m high and B-double trucks up to 25/26 m long (Refer to Figure 9).

Although referred to as a ‘designated DG route’ in the Botany-Randwick Land Use Safety Study (LUSS, and subsequently cited in the BBDCP2013 – Refer to Section 7.1), this designation appears to have been created for the LUSS and is not based on an RMS policy. RMS does not designate specific roads for the transport of DGs (Note: DGs are prohibited in Sydney’s road tunnels).

**Figure 9 Heavy Vehicle Access for Denison Street [Ref. 20]**



The only proposed change to traffic management on Denison Street is provision of a new intersection (with traffic lights) to access the Bunnings development (under construction). This intersection will control access to / from the new Bunnings Access Road and is proposed to include a restriction on right hand turns from Denison Street (Northbound) into the Bunnings Access Road between 6 am and 10 am Monday to Friday [Ref. 21]. A new left-hand exit lane will be provided for southbound traffic on Denison Street to access the new Bunnings Access Road.

### **3.6 Summary of Key Points**

The following characteristics of the Study Area are particularly relevant for the review of development controls:

- There are multiple precincts in the Study Area: Hillsdale; Eastgardens; and, the Banksmeadow Industrial Precinct. These precincts include a mixture of residential, industrial / commercial and recreational land uses.
- The Hillsdale Precinct and Banksmeadow Industrial Precinct overlap.
- The industrial zoned land covered by the Three Ports SEPP is land that should be maintained for port-related and industrial use [Ref. 15]. The subdivision of the BIP, approved in August 2015, has released some land for future development along Denison Street and Corish Circle.
- There are adjacent residential and industrial land uses, including multiple MHFs in the BIP.
- The forecast population growth could increase the demand for higher density residential development to the east of Rhodes Street.

## 4 TRANSPORT OF DANGEROUS GOODS IN STUDY AREA

### 4.1 Current Transport of DGs

An estimate of the frequency of DG heavy vehicle movements along Denison Street is included in the DG Transport QRA ('Transport QRA' and 'Transport QRA Addendum') issued by Scott-Lister in 2015 [Ref. 24 and 25]. It is reported in Section 1 of the more recent Transport QRA Addendum [Ref. 24] that the DG heavy vehicle movements were based on:

- Survey data collected by ROAR Data Pty Ltd (Traffic counts collected during June to July, 2012) [Ref. 23];
- Maximum potential traffic movements from the BIP, based on maximum approved operational capacity and consultation with BIP operators; and
- Northbound through traffic of 4,000 movements per year of DG Class 2.1 liquefied flammable gases (principally LPG) from the bulk liquid and gas storage facilities in Port Botany. Note: This was not included in the original Transport QRA and was added to the later Transport QRA Addendum.

Based on this information, Scott-Lister estimated the frequency of DG heavy vehicle movements along Denison Street [Ref. 25].

It was assumed in the Transport QRA and Transport QRA Addendum that the heavy vehicles travelling south to Port Botany were empty and the heavy vehicles travelling north were full [Ref. 25, Section A2.1]. Therefore, the majority of the southbound vehicle movements are 'empty' vehicles. The 'empty' DG Class 2 and Class 3 bulk tankers were still assumed to contain a heel of liquid and were modelled accordingly [Ref. 25, Section A2.1].

Although not explicitly stated in the Transport QRA and Transport QRA Addendum, the reported data appears to include both packaged DGs and bulk DGs. This is based on the observation that the cited ROAR survey data [Ref. 23] includes vehicle types used for packaged and bulk DGs (viz. Rigid, Rigid Tanker, Articulated, Articulated Tanker, B-Double and B-Double Tanker) and that Chlorine is referred to in Section 2.1.1 of the Transport QRA as being transported in "drums, cylinders or isotainers". The distribution of packaged vs. bulk DG movements cannot be determined from the information provided in the Transport QRA and Transport QRA Addendum, although the emphasis would appear to be on bulk DG movements (i.e. tankers).

In 2003, Sydney Ports' (now NSW Ports) estimated that 1% of the total containerised trade through Port Botany would be transported via Beauchamp Road [Cited in Ref. 19, Section 7.3], which would then presumably follow Denison Street. In 2015, NSW Ports reported that "around 10 per cent of port related trucks using Beauchamp Road/Denison Street to travel to and/or from Port Botany" [Ref. 17, p.49], and this % appears to include both containerised and bulk trade.

In 2015, NSW Ports reported that that there were 3,900 heavy vehicle movements per day at the port [Ref. 17, p.47], which includes approximately: 3,580 trucks per day (full and empty containers) and 320 bulk tankers per day from the bulk liquid and gas storage facilities. 10% of the 320 bulk liquid tankers per day equates to 11,680 tankers per year along Denison Street. This is very close to the total northbound (i.e. laden) vehicle movements used in the Transport QRA Addendum for the southern section of Denison Street (i.e. prior to additional laden vehicles entering Denison Street from Gate 3 at the BIP).

In 2015, NSW Ports reported that that the total container trade at Port Botany was 2.3 million TEUs [Ref. 17, p.37]. Currently, approximately 3% of containerised goods include DGs.

## 4.2 Predicted Changes to DG Transport

It is difficult to predict accurately how the transport of DGs will change along Denison Street in the future. There are many external factors that could change the frequency of vehicle movements and/or the type of DGs being transported. These factors include: major changes to road infrastructure (e.g. such as the proposed WestConnex project); changes to the modes of transport for DGs (e.g. more or less use of rail infrastructure); and/or changes to the global and local market for DGs (viz. changes to the type and quantity of chemicals imported / exported through Port Botany and those produced locally). Therefore, the longer the forecast period, the greater would be the uncertainty associated with any prediction.

Over the next 10 years, NSW Ports has predicted that the frequency of bulk tanker movements at Port Botany could increase to between 390 to 430 tankers per day (Refer to Table 2). This represents an increase of approximately 22% to 34% on the 390 actual movements per day in 2015 [Ref. 17]. This increased volume is currently predicted to remain relatively constant through to 2045 (Refer to Table 2).

Over the same 10 years, NSW Ports has predicted that the frequency of container truck movements (full / empty containers) at Port Botany could increase to between 4,310 to 5,270 trucks per day (Refer to Table 2); an increase of approximately 20% to 47% on the 2015 actual movements of 3,580 per day [Ref. 17]. The longer term forecast is an increase of approximately 80% (Refer to Table 2).

**Table 2 Forecast Increase to Heavy Vehicle Movements (per day) at Port Botany [Ref. 17]**

Heavy Vehicle Type	Year			
	2015	2025	2035	2045
Trucks (Full / empty containers)	3,580	4,310 to 5,270	5,310 to 6,470	5,910 to 6,470
Bulk Tankers	320	390 to 430	390 to 430	390 to 430
Total =	3,900	4,700 to 5,700	5,700 to 6,900	6,300 to 6,900

In 2015, NSW Ports reported that that the total container trade at Port Botany was forecast to grow from 2.3 million TEUs in 2015 to: between 3.4 and 4.3 million TEUs per year by 2025; and, between 7.5 million and 8.4 million TEUs per year by 2045 [Ref. 17, p.37]. NSW Ports does not believe that the proportion of containerised goods including DGs (currently c. 3%) will change in the next 5 to 10 years.

It is understood from discussions with ARTC and NSW Ports that there is no current plan to increase the proportion of DGs transported by rail.

## 4.3 Summary of Key Points on DG movements in Study Area

The following points summarise the discussions in Sections 4.1 and 4.2.

- The scope of this Review did not include a detailed verification of the transport data used in any of the currently available QRAs for the Study Area (Refer to Section 1.3). However, based on the information presented in Section 4.1:

- The frequency of DG heavy vehicle movements for Denison Street reported in the Transport QRA / Transport QRA Addendum [Ref. 24 and 25] and in the NSW Ports' 30 Year Master Plan [Ref. 17] appear to be comparable when applied for 2015. However, the uncertainty in this data could be high due to the relatively short survey period (viz. June to July, 2012) reported in the Transport QRA / Transport QRA Addendum.
- The data reported in the Transport QRA / Transport QRA Addendum [Ref. 24 and 25] appears to include both packaged DGs and bulk DGs, although the emphasis would appear to be on bulk DG movements (i.e. tankers). The split is unknown.
- It is reported in the Transport QRA / Transport QRA Addendum [Ref. 24 and 25] that the DG heavy vehicle movements were based on the maximum potential traffic movements from the BIP (i.e. based on maximum approved operational capacity). It is not known if the facilities operate to the approved capacity.
- NSW Ports has predicted that the frequency of bulk DG tanker movements at Port Botany could increase by 34% over the next 10 years, and will then remain relatively constant through to 2045 (Refer to Section 4.2). A similar proportional increase may be applicable for Denison Street, although many factors have the potential to affect the frequency of vehicle movements and/or the type of DGs being transported at this specific location (Refer to Section 4.2).
- It is understood from discussions with ARTC and NSW Ports that there is no current plan to increase the proportion of DGs transported by rail.
- A 50% increase to DG heavy vehicle movements along Denison Street would appear to be a reasonable conservative assumption for the Study Area over the next 10 years.

## 5 RISK ANALYSES FOR STUDY AREA

### 5.1 Introduction

Quantitative Risk Assessments (QRA) and Land Use Safety Studies (LUSS) have been undertaken for the industrial facilities in the Study Area since 1985. These studies have, on occasion, also included consideration of DG transport along Denison Street.

The first risk study undertaken by the DP&E specifically for land use safety planning was in 1985 and included the industrial facilities in the Botany-Randwick area and Port Botany. This was followed by two LUSSs: (i) The *Port Botany Land Use Safety Study* in 1996; and; the *Botany / Randwick Industrial Area Land Use Safety Study* in 2001.

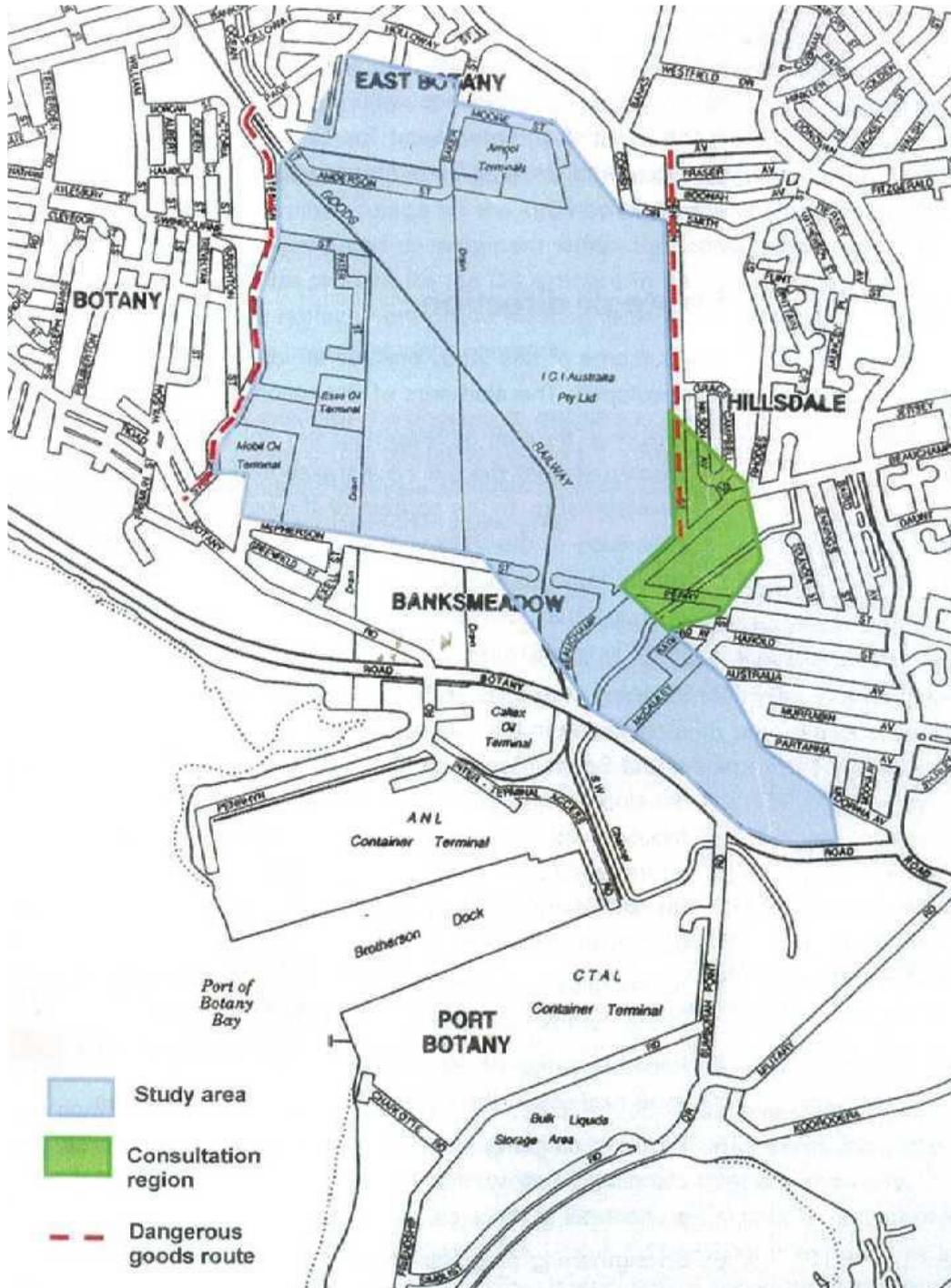
The most relevant QRAs for industrial facilities and DG transport in the Study Area, currently include:

- Industrial facilities:
  - *Quantitative Risk Assessment, Summary Report, Botany Industrial Park* [Ref. 27].
- DG transport:
  - *Port Botany Expansion Preliminary Hazard Analysis (June 2003)* [Ref. 19].
  - *Dangerous Goods Transport QRA, Denison Street Hillsdale (12 February 2015)* [Ref. 25] and *Addendum to Dangerous Goods Transport QRA, Denison Street Hillsdale (19 May 2015)* [Ref. 24].

### 5.2 Land Use Safety Studies for Botany-Randwick Industrial Area

The risk study undertaken by the DP&E in 1985 for the industrial facilities in the Botany-Randwick area recommended there be no intensification of residential development within areas identified in the study and that planning controls be implemented accordingly. A similar finding was made in the most recent LUSS for the Botany-Randwick industrial area in 2001 [Ref. 9], however, the extent of the cumulative individual risk contours has progressively reduced as operations have changed. In particular, the change to the Chlorine production process at the Ixom facility (including ceasing the bulk storage of liquid chlorine) has significantly reduced the cumulative risk. Only part of the Hillsdale Precinct is now identified in the 2001 LUSS as being an area where 'residential intensification' or 'sensitive use intensification' should be specifically reviewed in consultation with the DP&E (Refer to Figure 10). Note: The 2001 LUSS did not include the impacts of DG traffic along Stephen Road and Denison Street.

**Figure 10 Consultation Region from 2001 LUSS [Ref. 9]**



The key recommendations from the 2001 LUSS are summarised in the current BBDCP2013 as follows:

1. Future developments in the Botany / Randwick industrial area should be subject to early risk assessment and comprehensive environmental impact processes to conclusively demonstrate they will not contribute to risk impacts outside the industrial area that are inappropriate for surrounding land uses.

2. Effective land use safety planning should be implemented to allow future developments in the area, and to reconcile any potential land use planning conflicts.
3. A process of regular reviews and updates for site safety management systems should be undertaken.
4. Emergency plans and procedures, and fire prevention and protection systems should be kept up-to-date.
5. Industrial facilities should adopt community right-to-know principles to ensure the community is adequately informed about activities, associated risks and safety management measures adopted within the Botany / Randwick industrial area.

### 5.3 QRA for Botany Industrial Park

In 2012, a cumulative QRA was undertaken by Sherpa Consulting (Sherpa) for the facilities in the Botany Industrial Park (BIP) [Ref. 27]. This QRA ('2012 BIP QRA') was carried out to comply with the following Condition of Consent [Ref. 10]:

#### **Site Cumulative Risk Assessment**

- (a) *The SPC will maintain an updated Cumulative Risk Assessment for the BIP. The Assessment report: shall include individual fatality, injury and irritation risk and societal risk using the most recently available population and meteorological data. This report and all documentation shall be in accordance with the Department's Hazardous Industry Planning Advisory Paper No 6: Hazard Analysis Guidelines.*
- (b) *Each member of SPC must provide the relevant information and resources to the SPC to ensure that the Assessment is reviewed and updated as necessary.*
- (c) *The Site Cumulative Risk Assessment report shall be maintained as a 'living document' and updated as modifications occur on the BIP. The updated report shall be submitted to the Director-General for approval on a three yearly basis.*
- (d) *All State significant development applications submitted to the Department for consideration containing a preliminary hazard analysis must include updated BIP Cumulative Risk Assessment results.*

(Note: 'SPC' stands for 'Special Purpose Company'. The SPC was set up for the BIP to address this, and other Conditions of Consent).

The Condition of Consent requiring a site cumulative risk assessment was subsequently modified in 2015 and the standard renewal period for the QRA was extended from 3 to 5 years. The modified Condition of Consent is as follows [Ref. 2]:

#### **Site Cumulative Risk Assessment**

- (a) *The SPC shall maintain an updated Quantitative Risk Assessment for the BIP. This Risk Assessment shall be updated:*
  - i. *if there is a change at the BIP, which will significantly change the results of the Risk Assessment; or*
  - ii. *if required by the Secretary; or*
  - iii. *in accordance with the provisions of the Work Health and Safety Regulation 2011; or*
  - iv. *at least every 5 years.*

- (b) *Each quantitative risk assessment (or update to such an assessment) shall include individual, fatality, injury, and irritation risks and societal risks using the most recently available population and meteorological data. Each quantitative risk assessment (or update to such an assessment) shall be in accordance with Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (DoP, 2011).*
- (c) *Each member of SPC shall provide the relevant information and resources to the SPC to ensure that each quantitative risk assessment (or update to such an assessment) is reviewed and updated as necessary.*
- (d) *Each quantitative risk assessment (or update to such an assessment) shall be submitted to the Secretary for approval.*

The QRA model was first compiled in 2006; and, the 2012 version, which included some relatively minor updates made as a result of the MHF/Safety Report process, only included some minimal differences to the overall risk results presented in the 2010 version [Ref. 27, Section 1.6].

The 2012 BIP QRA did not include [Ref. 27, Section 2.10]:

- Vehicle movements within the BIP.
- Vehicle transport to and from the BIP.
- Pipelines external to the BIP.

In Section 8.4 of the 2012 BIP QRA it is reported that “the largest impact distance is from a liquid chlorine leak from an in-transit 13 tonne road tanker”. Other high consequence events with the potential to affect populations in proximity to the BIP are listed in Section 1.9 of the BIP QRA as follows:

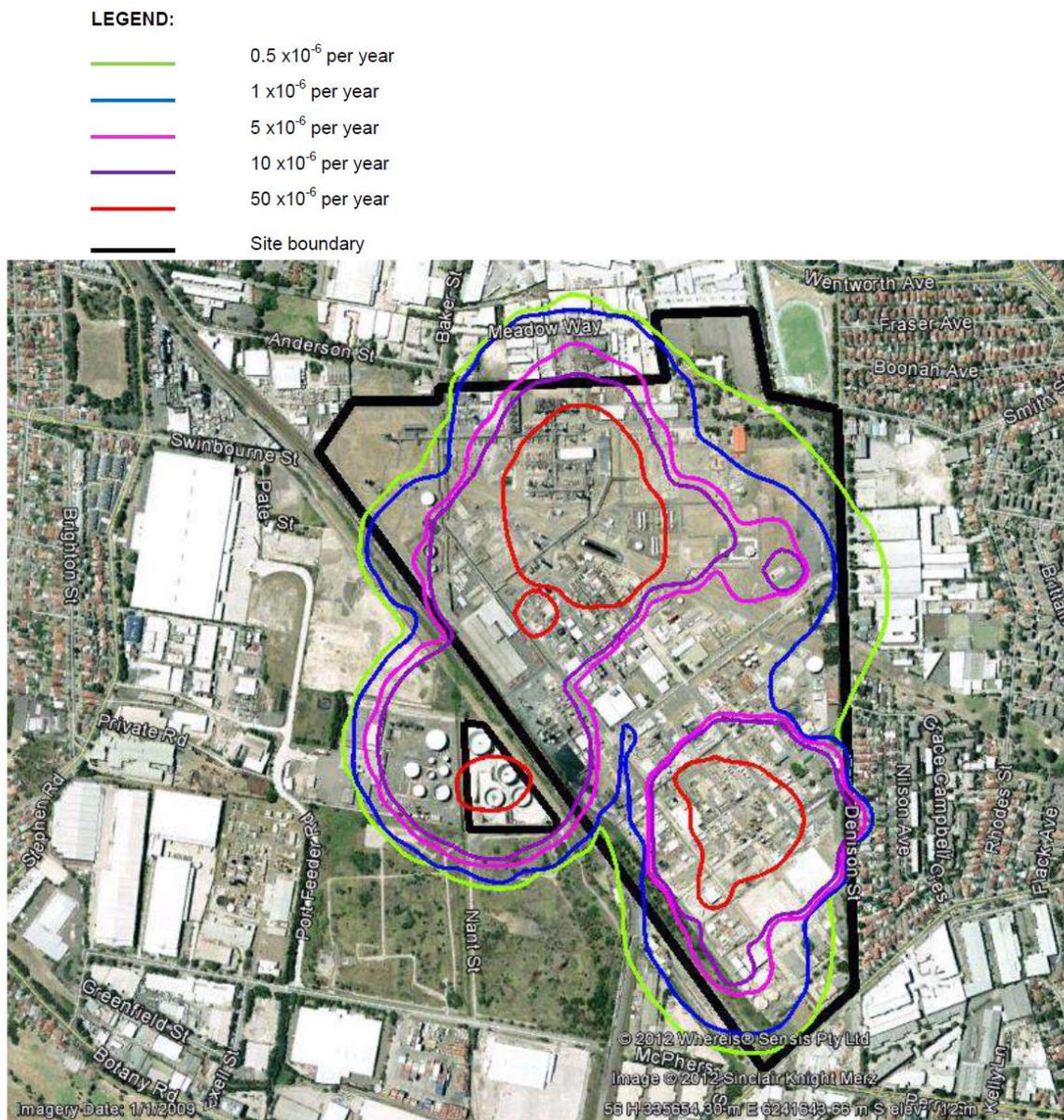
- Flashfire / explosions due to large leak or rupture of the ethylene sphere.
- Flashfire / explosions (including BLEVEs) due to large leak or rupture of the propane / propylene storages.
- Ethylene oxide decomposition events.
- Liquid chlorine leaks from in-transit road tanker or in-transit drums.

### **5.3.1 Individual Fatality Risk**

The cumulative individual fatality risk contours included in the 2012 BIP QRA are shown on Figure 11. Whilst the cumulative individual fatality risk contours generally comply with the DP&E’s relevant risk criteria for proposed developments (Refer to Section 6.2.3.1), there is a small encroachment (c. 30 m) of the  $1 \times 10^{-6}$  per year individual fatality risk contour to the east of the Huntsman facility across the Denison Street eastern BIP boundary into the residential area [Ref. 27, Section 10.1] (Refer to Figure 11).

The  $0.5 \times 10^{-6}$  per year contour extends approximately 50 to 100 m beyond the BIP site boundary in most directions, but does not reach any sensitive land uses [Ref. 27, Section 1.7] (Refer to Figure 11). The individual fatality risk at the nearest sensitive use (viz. Matraville Public School around 400 m from the Denison St boundary) is reported to be below  $1 \times 10^{-8}$  per year [Ref. 27, Section 1.7].

**Figure 11 Cumulative Individual Fatality Risk for BIP in 2012 [Ref. 27]**



### 5.3.2 Injury Risk

The cumulative individual injury risk contours included in the 2012 BIP QRA are shown on Figure 12 (Heat Radiation  $\geq 4.7 \text{ kW/m}^2$ ), Figure 13 (Overpressure  $\geq 7 \text{ kPa}$ ), Figure 14 (Acute Toxic Injury) and Figure 15 (Acute Toxic Irritation).

The  $50 \times 10^{-6}$  per year injury risk contours for heat radiation ( $\geq 4.7 \text{ kW/m}^2$ ) and overpressure ( $\geq 7 \text{ kPa}$ ) marginally extend into residential areas along Denison Street.

The  $50 \times 10^{-6}$  per year acute toxic injury and irritation risk contours extend several hundred metres into residential areas (Predominantly south of the Rhodes Street Reserve and west of Rhodes Street).

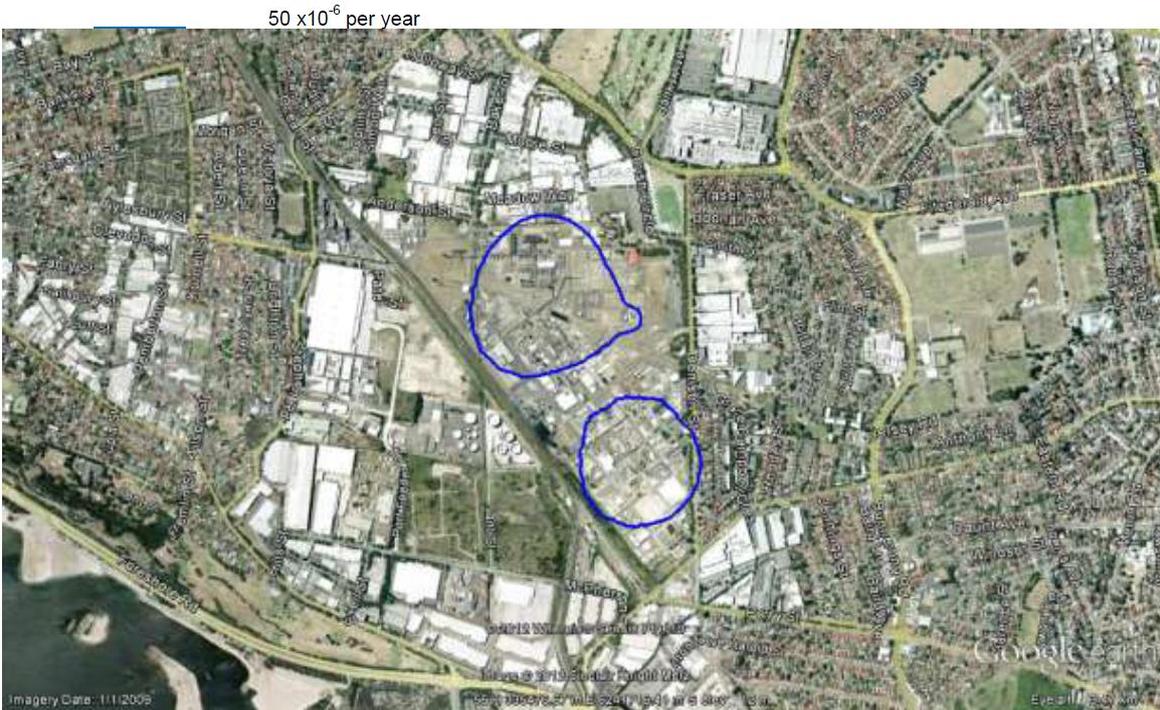
**Figure 12 Cumulative Risk of Heat Radiation  $\geq 4.7 \text{ kW/m}^2$  for BIP in 2012 [Ref. 27]**

**LEGEND:**



**Figure 13 Cumulative Risk of Overpressure  $\geq 7 \text{ kPa}$  for BIP in 2012 [Ref. 27]**

**LEGEND:**



**Figure 14 Cumulative Acute Toxic Injury Risk (ERPG-3) for BIP in 2012 [Ref. 27]**

**LEGEND:**

  $10 \times 10^{-6}$  per year



**Figure 15 Cumulative Acute Toxic Irritation Risk (ERPG-2) for BIP in 2012 [Ref. 27]**

**LEGEND:**

  $50 \times 10^{-6}$  per year



### 5.3.3 Risk of Property Damage and Accident Propagation

The cumulative property damage and accident propagation risk contours included in the 2012 BIP QRA are shown on Figure 16 (Heat Radiation  $\geq 23 \text{ kW/m}^2$ ) and Figure 17 (Overpressure  $\geq 14 \text{ kPa}$ ). The  $50 \times 10^{-6}$  per year risk contours for heat radiation ( $\geq 23 \text{ kW/m}^2$ ) and overpressure ( $\geq 14 \text{ kPa}$ ) do not extend beyond the boundary of the BIP into any industrial use areas along Denison Street.

**Figure 16 Cumulative Risk of Heat Radiation  $\geq 23 \text{ kW/m}^2$  for BIP in 2012 [Ref. 27]**



**Figure 17 Cumulative Risk of Overpressure  $\geq 14 \text{ kPa}$  for BIP in 2012 [Ref. 27]**



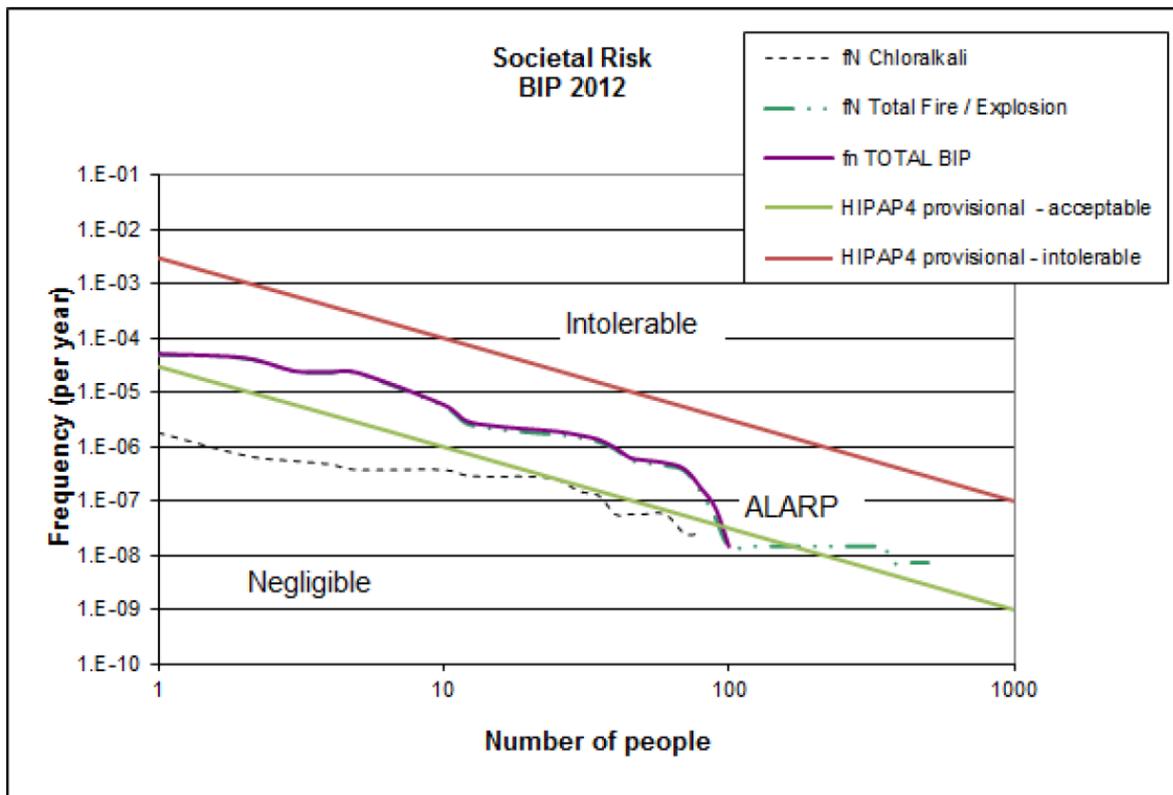
### 5.3.4 Societal Fatality Risk

The societal fatality risk results ('FN Curve') included in the 2012 BIP QRA are shown on Figure 18. These results exclude the populations at the BIP, Nant Street, the rail corridor and Southlands; and this approach is reported to have been agreed with the DP&E [Ref. 27, Section 9.5.2].

It is reported in the 2012 BIP QRA that the societal risk is dominated by fire / explosion events (viz. > 80%, which is difficult to determine on Figure 18 as this almost coincides with the 'total' curve), rather than toxic exposure events (viz. c. 10%-15%) [Ref. 27, Section 9.5.2].

The societal risk results ('FN Curve') for the toxic events alone is wholly within the 'Negligible' risk zone (Refer to Figure 18). The societal risk results ('FN Curve') for all events is predominantly within the 'Tolerable if ALARP' zone and does not extend into the 'Intolerable' zone (Refer to Figure 18).

**Figure 18 Societal Fatality Risk for BIP in 2012 [Ref. 27]**

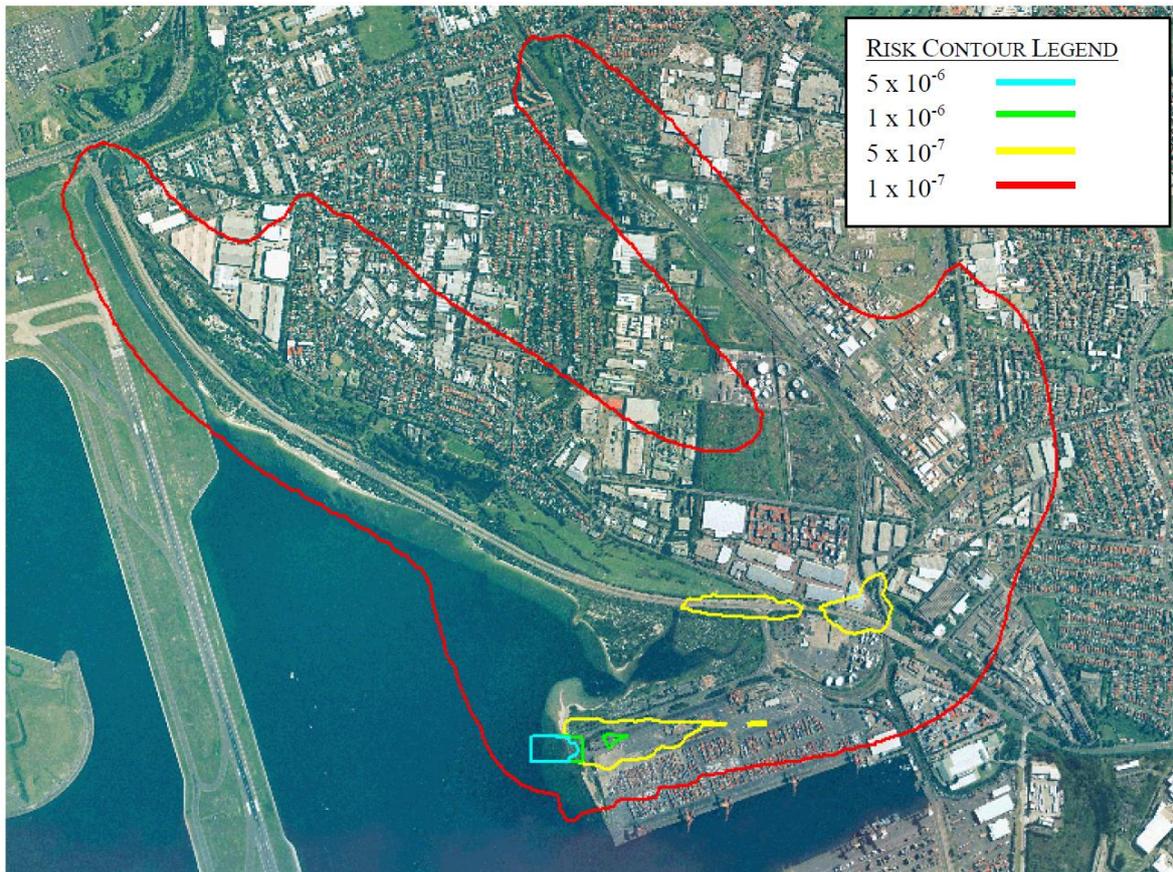


## 5.4 QRAs for Transport of Dangerous Goods

### 5.4.1 Port Botany Terminal Expansion

In 2003, Qest Consulting Group undertook a QRA for the expansion of the container terminal at Port Botany [Ref. 19]. This included an estimate of the individual fatality risk associated with a forecast 3.4 million TEUs throughput for the entire terminal (i.e. not just the throughput for the expansion) and only included the transport of containerised DGs [Ref. 19, Section 7.2]. The individual fatality risk along Denison Street (Refer to Figure 19) was based on Sydney Ports' (now NSW Ports) estimate that 1% of the total containerised trade would be transported via Beauchamp Road [Ref. 19, Section 7.3], which would then presumably follow Denison Street.

**Figure 19 Cumulative Individual Fatality Risk for Transport of 3.4 Million TEUs - Port Botany Terminal Expansion, 2003 [Ref. 19]**



The total trade of containerised goods in 2015 was 2.1 million TEUs per year and based on NSW Ports' current forecast estimates (Refer to Section 4.2) it is not expected to reach 3.4 million TEUs until c. 2025. Therefore, the individual fatality risk contour shown on Figure 19 may still be valid (Assuming the mix of DGs has not significantly changed).

#### 5.4.2 QRA for Transport of DGs on Denison Street

In February 2015, Scott-Lister issued a Transport QRA for movement of DGs along Denison Street [Ref. 25]. Later in 2015, Scott-Lister issued an addendum [Ref. 24] to include the risks associated with an additional 4,000 movements per year of DG Class 2.1 liquefied flammable gases (principally LPG) from the bulk liquids berth in Port Botany. As noted in Section 4.1, the Scott-Lister Transport QRA and Transport QRA Addendum appear to predominantly focus on bulk DG movements (i.e. road tankers) and the transport of Chlorine in "drums, cylinders or isotainers"

In Section 2.2.2 of the Transport QRA [Ref. 25] it is reported that an analysis of the RMS accident data was undertaken and this revealed that 66% of accidents had occurred at main intersections and the remaining 33% had occurred "mid-block". Therefore, 66% of the release frequency was allocated to the three main intersections (22% at each) at:

- Denison Street and Beauchamp Road;
- Denison Street and Wentworth Avenue; and
- Denison Street and BIP Gate 3.

The remaining release frequency was evenly distributed along Denison St.

More recent crash data (Refer to Table 3) was obtained from RMS for Denison Street (Including the intersections at Wentworth Avenue and Beauchamp Road) for 1 Jan 2010 to 31 Dec 2014 [Ref. 22]. This includes *all* vehicle types and would appear to justify the assumption from the Transport QRA that the majority of crashes may be expected to occur at intersections (Refer to Table 3). The majority of the reported crashes involved multiple vehicles (c. 94%) and did not result in an injury (c. 67%). Approximately two-thirds of the reported crashes occurred between midday and 7 pm.

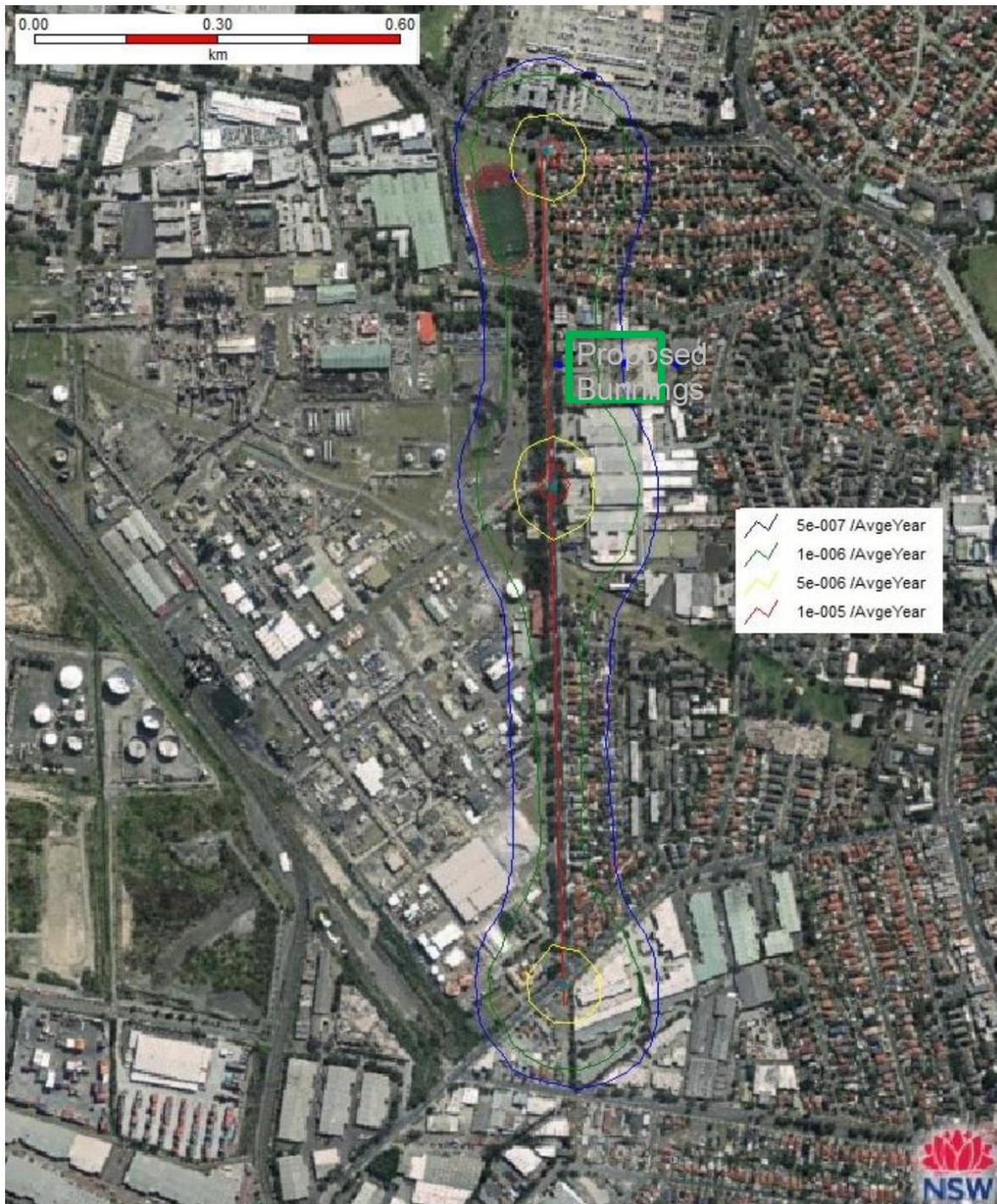
**Table 3 Vehicle Crash Data for Denison Street (2010 to 2014) [Ref. 22]**

Location Type	No. of Crashes	%
Intersection (Includes up to 10 m from an intersection)	41	83.7%
Non intersection	8	16.3%
Collision Type	No. of Crashes	%
Single Vehicle	3	6.1%
Multi Vehicle	46	93.9%

The effect of assuming a higher accident rate at intersections is clearly indicated by the shape of the cumulative individual fatality risk contours (Refer to Figure 20). The magnitude and extent of the contours is the greatest in the vicinity of three intersections, particularly the intersection of Denison Street and BIP Gate 3.

In Section 3.1.1 of the Transport QRA it is reported that events involving the transport of Polymer Grade Propylene (PGP) account for over 65% of the ‘near field’ fatality risk and events involving the transport of Chlorine account for over 97% of ‘far field’ fatality risk (i.e. at the extremity of the contours presented) [Ref. 25].

**Figure 20 Cumulative Individual Fatality Risk for Transport of DGs along Denison St [Ref. 24]**



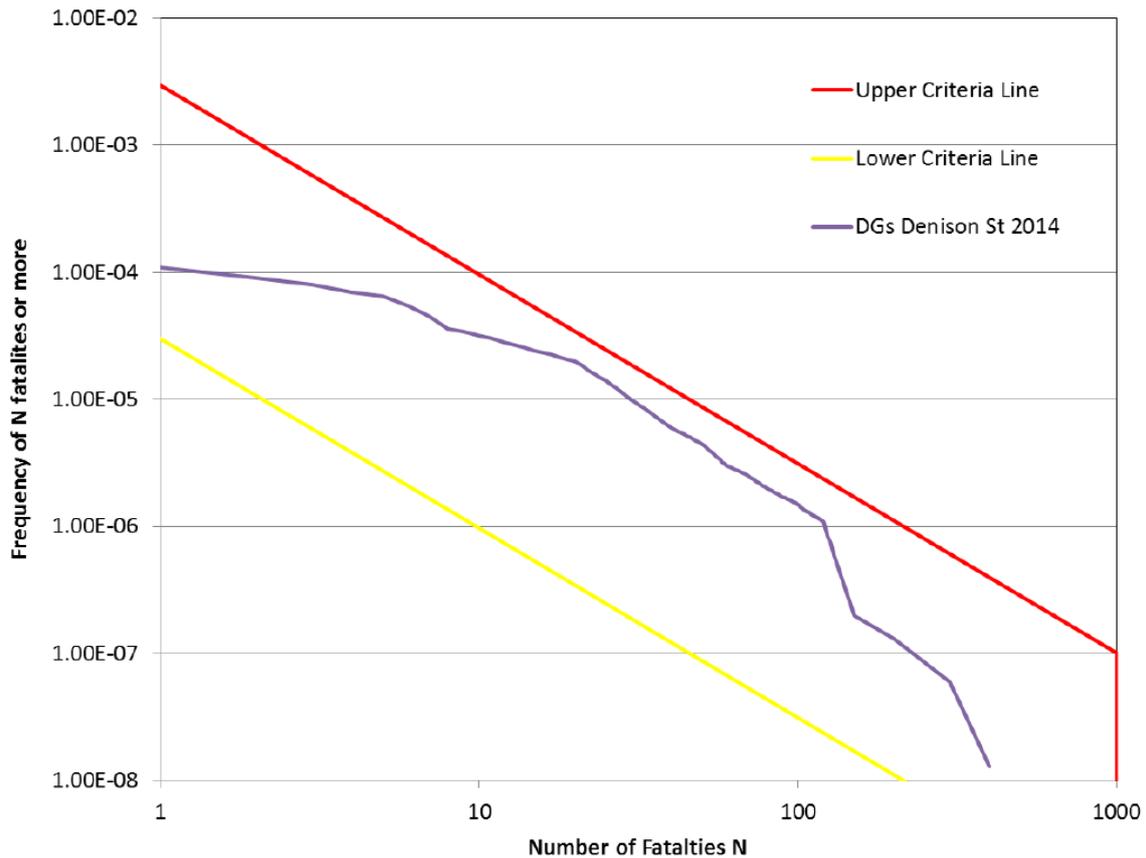
The maximum fatality risk from transport of containerised goods along Denison Street (Refer to Figure 19) appears to be an order of magnitude lower than the corresponding risk from transport of (predominantly) bulk DGs (Refer to Figure 20).

The societal fatality risk results ('FN Curve') included in the Transport QRA Addendum are shown on Figure 21 [Ref. 24]. These results include nearby industrial populations in addition to all other population categories, as described in the Transport QRA [Ref. 25, Appendix A, Section 2.4].

The societal risk results ('FN Curve') for all DG transport events is predominantly within the 'Tolerable if ALARP' zone and does not extend into the 'Intolerable' zone (Refer to Figure 21).

However, it is noted that the societal risk results ('FN Curve') included in the Transport QRA Addendum is closer to the 'Intolerable' zone than for the fixed facilities at the BIP (Refer to Figure 18 in Section 5.3.4). This may be in part due to the population at the BIP being excluded from the societal risk calculations in the 2012 BIP QRA, whereas it was included in the societal risk calculations in the Transport QRA (Note: This is consistent with the standard practice for QRAs of fixed industrial facilities and the transport of DGs).

**Figure 21 Societal Fatality Risk for Transport of DGs along Denison St [Ref. 24]**



## 5.5 Cumulative Risk for Fixed Facilities and Transport of DGs

### 5.5.1 Current Cumulative Risk

There are no cumulative individual fatality risk contours presented in the available risk assessments that show the combined individual fatality risk for the fixed facilities at the BIP and the transport of DGs along Denison Street. The cumulative individual fatality risk for the fixed facilities at the BIP and the transport of DGs along Denison Street can only be estimated from Figure 11 (Section 5.3.1) and Figure 20 (Section 5.4.2).

There are two locations where the cumulative individual fatality risk would increase sufficiently to be relevant for development of planning controls in the Study Area: (i) to the east of the intersection of Denison Street and BIP Gate 3; and (ii) the location where the  $1 \times 10^{-6}$  per year individual fatality risk contour from the fixed facilities at the BIP extends across Denison Street. The individual fatality risk from the transport of DGs along Denison Street appears to be the major contributor at both of these locations.

The following issues were considered when developing the planning controls for the Study Area:

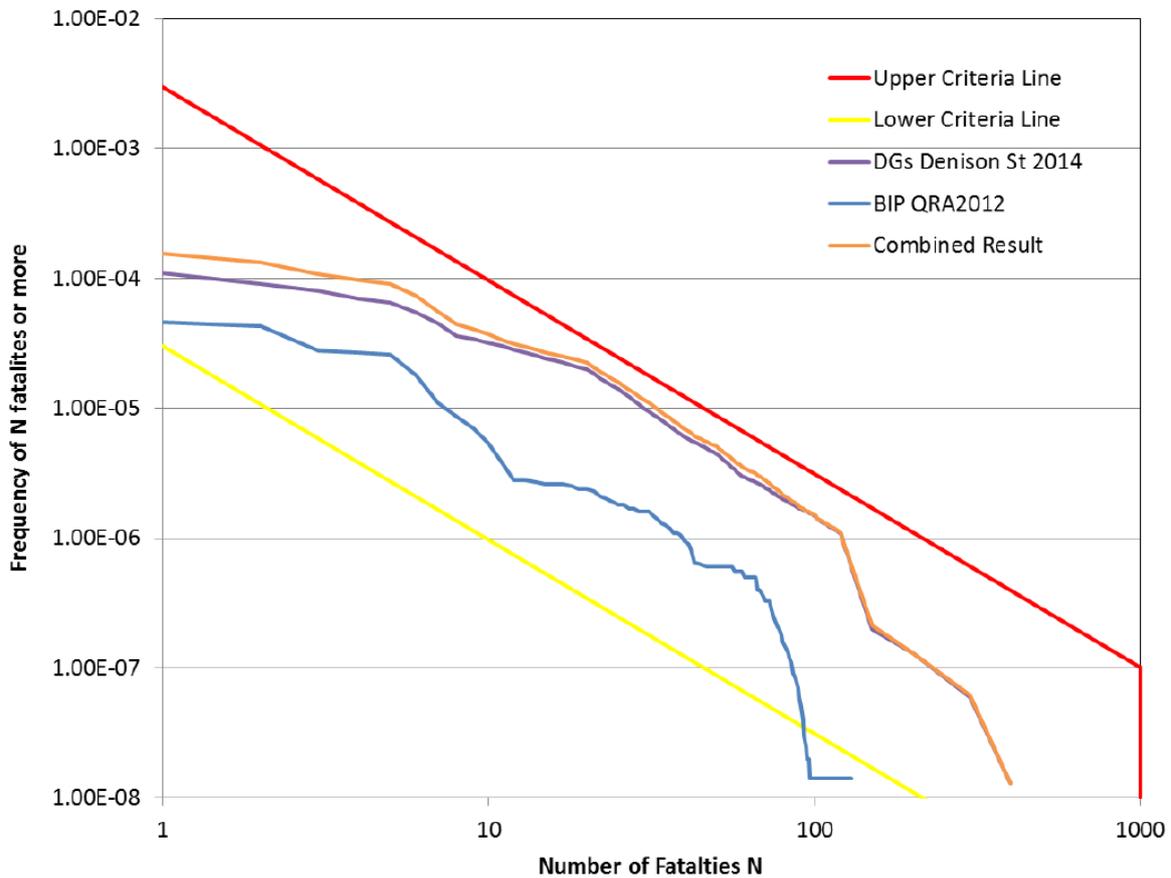
- The DP&E's societal risk criteria (viz. upper and lower criteria lines shown on Figure 22 below) do not strictly apply for the transport of DGs (Refer to Section 6.3). However, due to the absence of any other equivalent criteria in NSW, these have previously been adopted in the Transport QRA and Transport QRA Addendum [Ref. 24, 25].
- The DP&E's societal risk criteria are not 'scalable' to the length of the road network being considered (i.e. the criteria do not change irrespective of the length of road being considered). This is partly addressed in the Netherlands by only applying a similar upper criterion to the 'worst-case' 1 km road segment (Refer to Section 6.3). In this case, Denison Street is approximately 1 km long.

The population at the BIP was excluded from the societal risk calculations in the 2012 BIP QRA, whereas it was included in the societal risk calculations in the Transport QRA. This is consistent with the standard practice for QRAs of fixed industrial facilities and the transport of DGs, and is another reason why the societal risk results ('FN Curves') are not normally combined (As in the Netherlands – Refer to Section 6.3).

The cumulative societal risk ('FN Curve') for the fixed facilities at the BIP and the transport of DGs along Denison Street is provided in the Transport QRA Addendum [Ref. 24]. It appears that the 'FN Curve' from the 2012 BIP QRA [Ref. 27] and Transport QRA [Ref. 25] have been combined to obtain a cumulative 'FN Curve', which is included in the Transport QRA Addendum [Ref. 24]. Details of how this cumulative 'FN Curve' was determined are not available in the Transport QRA Addendum [Ref. 24]. This Review is based on the cumulative 'FN Curve' in the Transport QRA Addendum [Ref. 25] and a projection based on the future changes to DG movements along Denison Street.

The cumulative societal risk ('FN Curve') is wholly within the 'Tolerable if ALARP' zone and is relatively close to the 'Intolerable' zone (Refer to Figure 22). It is noted that the transport of DGs along Denison Street is the dominant contributor to the cumulative societal risk results ('FN Curve').

**Figure 22 Cumulative Societal Fatality Risk for Fixed Facilities at the BIP and Transport of DGs along Denison St [Ref. 24]**



### 5.5.2 Predicted Change to Cumulative Risk

The predicted change to the cumulative individual fatality risk over the next 10 years for the fixed facilities at the BIP and the transport of DGs along Denison Street can be estimated from Figure 11 (Section 5.3.1) and Figure 20 (Section 5.4.2) based on the assumption that the risk contribution from the transport of DGs along Denison Street will potentially increase by up to 50% due to the projected increase in DG traffic (Refer to Section 4.2).

If it assumed that the individual fatality risk due to the transport of DGs along Denison Street will increase by 50% over the next 10 years, and that the individual fatality risk contribution from the fixed facilities at the BIP will remain constant, then:

- To the south of the Rhodes Reserve:
  - The future location of the  $0.5 \times 10^{-6}$  per year cumulative individual fatality risk contour would probably extend to the eastern side of Nilson Avenue.
  - The future location of the  $1 \times 10^{-6}$  per year cumulative individual fatality risk contour would be closer to Nilson Avenue, potentially close to the current location of the  $0.5 \times 10^{-6}$  per year individual fatality risk contour shown in the Transport QRA Addendum (Refer to Figure 20 in Section 5.4.2).
  - The future cumulative individual fatality risk is not expected to reach  $10 \times 10^{-6}$  per year at the Rhodes Reserve or any of the other small reserves in the Study Area to the south of Rhodes Reserve.

- The future cumulative individual fatality risk is not expected to reach  $50 \times 10^{-6}$  per year.
- To the east of BIP Gate 3:
  - The future location of the  $0.5 \times 10^{-6}$  per year cumulative individual fatality risk contour would extend further into the Banksmeadow Industrial Precinct, but probably would not extend as far as Rhodes Street.
  - The future location of the  $1 \times 10^{-6}$  per year cumulative individual fatality risk contour would extend further east into the Banksmeadow Industrial Precinct, potentially as far as the current location of the  $0.5 \times 10^{-6}$  per year individual fatality risk contour shown in the Transport QRA Addendum (Refer to Figure 20 in Section 5.4.2).
  - The future location of the  $5 \times 10^{-6}$  per year cumulative individual fatality risk contour would extend further east into the Three Ports SEPP land to the east of BIP Gate 3, but is not expected to extend as far as the Banksmeadow Industrial Precinct (Except possibly into the part of the Banksmeadow Industrial Precinct adjacent to the Rhodes Reserve).
  - The future cumulative individual fatality risk is not expected to reach  $50 \times 10^{-6}$  per year.
- To the north of BIP Gate 3:
  - The future location of the  $0.5 \times 10^{-6}$  per year cumulative individual fatality risk contour would extend further east and north into the Eastgardens Precinct (A similar distance as for east of BIP Gate 3 – see above).
  - The future location of the  $1 \times 10^{-6}$  per year cumulative individual fatality risk contour would extend further east and north into the Eastgardens Precinct, but is not expected to extend as far as the current location of the  $0.5 \times 10^{-6}$  per year individual fatality risk contour shown in the Transport QRA Addendum (Refer to Figure 20 in Section 5.4.2).
  - The future location of the  $5 \times 10^{-6}$  per year cumulative individual fatality risk contour at the intersection of Denison Street and Wentworth Avenue would only marginally extend across the southern boundary of the Eastgardens Shopping Centre.
  - The future location of the  $10 \times 10^{-6}$  per year cumulative individual fatality risk contour at the intersection of Denison Street and Wentworth Avenue would extend into the Hensley Athletic Field, but is not expected to extend as far as the current location of the  $5 \times 10^{-6}$  per year individual fatality risk contour shown in the Transport QRA Addendum (Refer to Figure 20 in Section 5.4.2).
  - The future cumulative individual fatality risk is not expected to reach  $50 \times 10^{-6}$  per year.

A 50% increase in the transport of DGs along Denison Street will potentially increase the cumulative societal risk ('FN Curve') close to the 'Intolerable' zone (Refer to Figure 22). The risk is still in the ALARP range, which does not automatically mean that it is 'tolerable', but it means that it is 'tolerable if ALARP criteria are satisfied', i.e. risk must be reduced further to as low as reasonably practicable.

Therefore, even where the future cumulative individual fatality risk complies with the relevant DP&E fatality risk criteria, a development proposal may still be inappropriate if there is an increase in the

population density, as the FN curve may exceed the tolerability limit. For example, the future cumulative individual fatality risk at Hensley Athletic Field is predominantly less than the DP&E criterion of 10 pmpy (with only a marginal exceedence in the north east corner). A development at the Hensley Athletic Field that complies with the DP&E criterion for individual fatality risk may not comply with the cumulative societal risk ('FN Curve') criterion if it significantly increases the population density (e.g. new stands for spectators).

It is difficult to determine the permissible future population density for all lots within the Study Area based on the information in the available QRAs. However, any intensification of the population to the east of Denison Street (particularly to approximately halfway between Denison Street and Rhodes Street) is expected to drive the future cumulative societal risk ('FN Curve') into the 'Intolerable' zone. Similarly, since the population at the BIP is included in the calculation of the societal risk ('FN Curve') from transport of DGs along Denison Street, any intensification of the population to the west of Denison Street (particularly where the individual fatality risk is higher) is expected to drive the cumulative societal risk ('FN Curve') into the 'Intolerable' zone.

## 5.6 Summary of Key Points

The following observations can be made from a review of existing risk literature for the study area.

- The most recent QRA for the BIP was undertaken in 2012 by Sherpa Consulting [Ref. 27]. This QRA ('2012 BIP QRA') did not include vehicle transport to and from the BIP or the population at the BIP (Refer to Section 5.3). The risk due to road transport of DGs was assessed separately by Scott-Lister and the most recent risk results for Denison Street are presented in the 2015 Transport QRA Addendum [Ref. 24].
- Whilst the cumulative individual fatality risk contours from the existing facilities presented in the 2012 BIP QRA generally comply with the DP&E's relevant risk criteria for proposed developments (Refer to Section 6.2.3.1), there is a small encroachment (c. 30 m) of the  $1 \times 10^{-6}$  per year individual fatality risk contour to the east of the Huntsman facility across the Denison Street eastern BIP boundary into the residential area [Ref. 27, Section 10.1] (Refer to Figure 11).
- The extent of the acute toxic injury and irritation risk contours presented in the 2012 BIP QRA (Refer to Figure 14 and Figure 15 in Section 5.3.2) is greater than the 'consultation zone' shown in the Botany-Randwick LUSS in 2001 (Refer to Section 5.2).
- The societal risk ('FN Curve') presented in the 2012 BIP QRA is predominantly within the 'Tolerable if ALARP' zone and does not extend into the 'Intolerable' zone (Refer to Figure 18 in Section 5.3.4). It is reported in the 2012 BIP QRA that the societal risk is dominated by fire / explosion events (viz. > 80%), rather than toxic exposure events (viz. c. 10%-15%) [Ref. 27, Section 9.5.2].
- The cumulative individual and societal risks ('FN Curve') from the 2012 BIP QRA comply with the risk criteria applicable for existing use situations (Refer to Section 6.2.5).
- To comply with the relevant development consent condition (Refer to Section 5.3), the 2012 BIP QRA is due to be updated in 2017.
- The subdivision of the BIP, approved in August 2015, has released some land for future development along Denison Street and Corish Circle. This will potentially introduce new populations that were not included in the 2012 BIP QRA (Since this land would have been considered part of the BIP at that time and therefore any population would have been excluded from the societal risk calculations – Refer to Section 5.3.4).

- The individual fatality risk contour included in the QRA for the container terminal expansion at Port Botany [Ref. 19] is assumed to be valid for containerised DG movements through to c. 2025 (Refer to Section 5.4.1).
- The individual fatality risk contours presented in the Transport QRA Addendum may be valid for 2015, however, the risk may potentially increase by up to 50% over the next 10 years due to the projected increase in DG traffic (Refer to Section 4.2).
- The intersection of Denison Street and Smith Street and the new intersection to access the Bunnings development do not appear to have been considered as major intersections in the Transport QRA and Transport QRA Addendum. Consequently, these intersections were not allocated an increased accident rate in the same way as the other main intersections (viz. Denison Street and Beauchamp Road; Denison Street and Wentworth Avenue; and Denison Street and BIP Gate 3). Furthermore, a review of more recent accident data for Denison Street (Refer to Section 5.4.2) suggests that a higher proportion of accidents occur at intersections than was assumed in the Transport QRA and Transport QRA Addendum. The net effect of these observations is that the larger risk contours shown at the intersections should probably also apply for the two additional intersections and hence the risk on the road between the intersections may have been overestimated. However, this would not appear to be so significant as to affect the overall conclusions from the Transport QRA and Transport QRA Addendum.
- The societal risk results ('FN Curve') included in the Transport QRA Addendum is closer to the 'Intolerable' zone than for the fixed facilities at the BIP (Refer to Figure 18 in Section 5.3.4). This may be in part due to the population at the BIP being excluded from the societal risk calculations in the 2012 BIP QRA, whereas it was included in the societal risk calculations in the Transport QRA.
- The cumulative individual and societal risks ('FN Curve') from the Transport QRA and Transport QRA Addendum comply with the risk criteria applicable for existing use situations (Refer to Section 6.2.5 – Note: In the absence of established quantitative risk criteria in NSW for land use safety planning due to the transport of DGs, the (location-specific) individual fatality risk and societal risk criteria for fixed facilities have been used).
- There are no cumulative individual fatality risk contours presented in the available risk assessments that show the combined fatality risk for the fixed facilities at the BIP and the transport of DGs along Denison Street. The cumulative individual fatality risk for the fixed facilities at the BIP and the transport of DGs along Denison Street can only be estimated from Figure 11 (Section 5.3.1) and Figure 20 (Section 5.4.2). There are two locations where the cumulative individual fatality risk would increase sufficiently to be relevant for development of planning controls in the Study Area: (i) the intersection of Denison Street and BIP Gate 3; and (ii) the location where the  $1 \times 10^{-6}$  per year contour from the fixed facilities at the BIP extends across Denison Street. The individual fatality risk from the transport of DGs along Denison Street appears to be the major contributor at both of these locations.
- The projected increase in DG traffic along Denison Street over the next 10 years (Refer to Section 4.2) will marginally increase the extent of the cumulative individual fatality risk contours. This increase does not materially affect the nature of the proposed planning controls, but will eventually affect the extent of the area where development should be limited (e.g. future residential development within the extent of the  $1 \times 10^{-6}$  per year cumulative individual fatality risk contour).

- The projected increase in DG traffic along Denison Street over the next 10 years will have a significant effect on the cumulative societal risk as it will potentially increase the cumulative societal risk ('FN Curve') to very close to the 'Intolerable' zone (Refer to Figure 22). If the projected increase in DG traffic occurs in conjunction with intensification of the population in the Study Area, then the cumulative societal risk ('FN Curve') is likely to extend into the 'Intolerable' zone. It is not possible with the existing risk reports available to predict exactly when and where this will occur due to the large number of factors involved.

## **6 RISK CRITERIA FOR LAND USE SAFETY PLANNING**

### **6.1 Introduction**

Land use safety planning (including the development of planning controls) for the Study Area, requires an understanding of the hazards and risks posed by the relevant potentially hazardous operations. However, a hazard and risk analysis cannot be carried out in isolation and requires criteria against which the acceptability of the estimated risk can be assessed.

Qualitative and quantitative risk criteria for land use safety planning have been established in NSW by the Department of Planning & Environment (DP&E) and these apply for three broad contexts [Ref. 7 (Section 2.1.4) and Ref. 8 (Section 5.1.2)]:

1. Strategic planning (Zoning and rezoning).
2. Assessment of development for potentially hazardous development.
3. Assessment of development in the vicinity of potentially hazardous development.

The qualitative and quantitative risk criteria for land use safety planning currently established in NSW, which may be common to more than one context, are summarised in Section 6.2.

There are no established quantitative risk criteria in NSW for land use safety planning due to the transport of DGs. Therefore, the (location-specific) individual fatality risk and societal risk criteria for fixed facilities have been used to assess the risks from the transport of DGs (Refer to Section 6.3). The established qualitative principles should still be considered (Refer to Section 6.2.1).

The risk criteria used to establish the development controls for the Study Area are summarised in Section 6.4.

### **6.2 Risk Criteria for Land Use Safety Planning in NSW**

Two aspects of risk need to be considered for land use safety planning [Ref. 7, Section 2) and Ref. 8, Section 5.2]:

- individual risk, which considers the acceptability of a particular level of risk to an exposed individual; and
- societal risk, which takes into account society's aversion to accidents which can result in multiple fatalities.

#### **6.2.1 Qualitative Risk Criteria**

While it is relevant to have quantitative risk criteria, qualitative principles are equally important. These are applicable for all three planning contexts and include [Ref. 7 (Section 2) and Ref. 8 (Section 5.2)]:

- all 'avoidable' risks should be avoided;
- particular attention needs to be given to eliminating or reducing major hazards, irrespective of whether numerical criteria are met;
- as far as possible, the consequences of significant events should be kept within facility boundaries; and
- where the risk from an existing installation is already high, further development should not pose any incremental risk.

## 6.2.2 Strategic Planning (Zoning)

Strategic planning (Zoning and rezoning) is typically undertaken by the relevant planning authorities as part of a periodic review of the LEP and DCP (i.e. not as a result of a specific development application) or if a planning proposal is submitted to the relevant planning authority.

When assessing the zoning around a potentially hazardous facility, it is important to ensure that this will not introduce or aggravate existing land use safety conflicts. As noted in HIPAP No. 10 [Ref.8, Section 5.3]: “When considering strategic planning, the primary emphasis needs to be on the suitability of land for the proposed range of uses, having regard to existing risk exposure and the sensitivity of the current land use. For example, it would be inappropriate for land to be zoned for residential or more sensitive uses if there was already a significant risk exposure from nearby industrial activities.”

In addition to the qualitative risk criteria (Refer to Section 6.2.1), the quantitative risk criteria set out in HIPAP No. 10 [Ref. 8, Section 5.5] are relevant to strategic planning (Zoning and rezoning). These quantitative criteria are discussed in Section 6.2.4 of this report.

If a land use safety conflict arises from a rezoning decision (i.e. the relevant risk criteria for the new zone would be exceeded), then the parties to the rezoning should bear the responsibility for resolving the conflict [Ref. 8, Section 4.2.4]. Possible approaches include [Ref. 8, Section 4.2.4]:

- (a) Rezoning of risk affected portions of the land to a less sensitive use;
- (b) Placing conditions of consent on new development that will reduce the risk exposure for people within the development to less than the relevant risk criteria (Note: while this approach may be feasible for industrial or commercial land uses, it is not appropriate for sensitive uses); and
- (c) Negotiation with the Operator of the risk source to implement appropriate risk reduction measures.

## 6.2.3 Assessment of Development for Potentially Hazardous Development

In addition to the qualitative risk criteria (Refer to Section 6.2.1), quantitative risk criteria for the assessment of development for potentially hazardous development are included in HIPAP No. 4 [Ref. 7]. The main quantitative criteria are for: individual fatality risk; injury risk; property damage and incident propagation; and environmental damage.

### 6.2.3.1 Individual Fatality Risk

The individual fatality risk imposed by a proposed industrial activity should be low relative to the background risk. This forms the basis for the following location-specific individual fatality risk (‘LSIFR’) criteria adopted by the NSW DP&E [Ref. 7].

**Table 4 Individual Fatality Risk Criteria [Ref. 7]**

Land Use	Risk Criterion [per million per year]
Hospitals, schools, child care facilities and old age housing developments	0.5
Residential developments and places of continuous occupancy, such as hotels and tourist resorts	1
Commercial developments, including offices, retail centres, warehouses with showrooms, restaurants and entertainment centres	5
Sporting complexes and active open space areas	10
Industrial sites	50 *

\* HIPAP No. 4 allows flexibility in the interpretation of this criterion. For example, 'where an industrial site involves only the occasional presence of people, such as in the case of a tank farm, a higher level of risk may be acceptable'.

The DP&E has adopted a fatality risk criterion of  $1 \times 10^{-6}$  p.a. (or 1 chance of fatality per million per year) for residential area exposure because this risk is very low in relation to typical background risks for individuals in NSW.

### 6.2.3.2 Injury Risk

The DP&E has adopted risk criteria for levels of effects that may cause injury to people but will not necessarily cause fatality. Criteria are included in HIPAP No. 4 [Ref. 7] for potential injury caused by exposure to heat radiation, explosion overpressure and toxic gas/ smoke/dust.

The DP&E's suggested injury risk criterion for heat radiation is as follows:

- *Incident heat flux radiation at residential and sensitive use areas should not exceed 4.7 kW/m<sup>2</sup> at a frequency of more than 50 chances in a million per year.*

The DP&E's suggested injury/damage risk criterion for explosion overpressure is as follows:

- *Incident explosion overpressure at residential and sensitive use areas should not exceed 7 kPa at frequencies of more than 50 chances in a million per year.*

The DP&E's suggested injury risk criteria for toxic gas/ smoke/dust exposure are as follows:

- *Toxic concentrations in residential and sensitive use areas should not exceed a level which would be seriously injurious to sensitive members of the community following a relatively short period of exposure at a maximum frequency of 10 in a million per year.*
- *Toxic concentrations in residential and sensitive use areas should not cause irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community over a maximum frequency of 50 in a million per year.*

### 6.2.3.3 Risk of Property Damage and Accident Propagation

The DP&E's criteria for risk of damage to property and accident propagation are as follows [Ref. 7]:

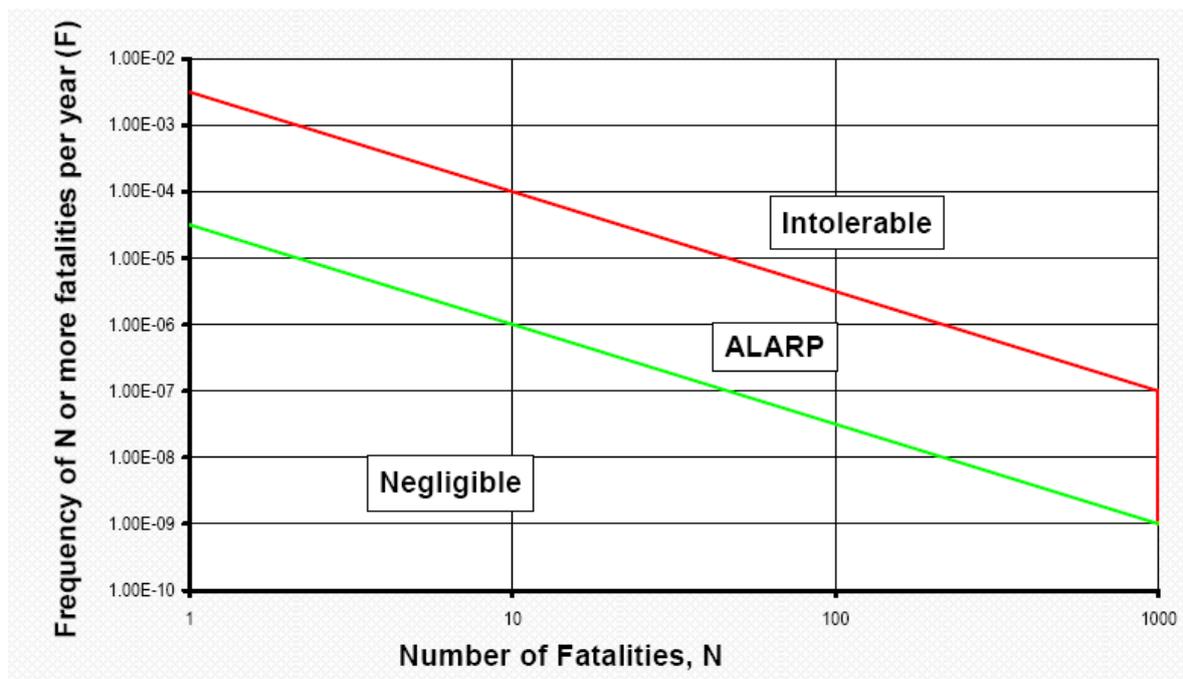
- *Incident heat flux radiation at neighbouring potentially hazardous installations or at land zoned to accommodate such installations should not exceed a risk of 50 in a million per year for the 23 kW/m<sup>2</sup> heat flux level.*

- *Incident explosion overpressure at neighbouring potentially hazardous installations, at land zoned to accommodate such installations or at nearest public buildings should not exceed a risk of 50 in a million per year for the 14 kPa explosion overpressure level.*

### 6.2.3.4 Societal Fatality Risk

The DP&E’s suggested societal risk criteria (Refer to Figure 23), take into account the fact that society is particularly intolerant of accidents, which though infrequent, have a potential to create multiple fatalities [Ref. 7 and 8]. Below the negligible line, provided other individual criteria are met, societal risk is not considered significant. Above the intolerable level, an activity is considered undesirable, even if individual risk criteria are met. Within the ‘As Low As Reasonably Practicable’ (ALARP) region, the emphasis is on reducing risks as far as possible towards the negligible line. Provided other quantitative and qualitative criteria of HIPAP 4 are met, and additional risk reduction measures considered to reduce the risk to as low as reasonably practicable, the risks from the activity would be considered tolerable in the ALARP region.

**Figure 23 Indicative Societal Risk Criteria [Ref. 7 and 8]**



### 6.2.3.5 Risk to Biophysical Environment

The DP&E suggests the following criteria for assessing the risk to the biophysical environment:

- *Industrial developments should not be sited in proximity to sensitive natural environmental areas where the effects (consequences) of the more likely accidental emissions may threaten the long-term viability of the ecosystem or any species within it.*
- *Industrial developments should not be sited in proximity to sensitive natural environmental areas where the likelihood (probability) of impacts that may threaten the long-term viability of the ecosystem or any species within it is not substantially lower than the background level of threat to the ecosystem.*

## 6.2.4 Assessment of Development in the Vicinity of Potentially Hazardous Development

In addition to the qualitative risk criteria (Refer to Section 6.2.1), quantitative risk criteria for the assessment of development in the vicinity of potentially hazardous development are included in HIPAP No. 10 [Ref. 8, Section 5.5].

The following principles apply to residential and sensitive use development in the vicinity of existing industry [Ref. 8, Section 5.5.2.1]:

- the half in a million per year individual fatality risk level is an appropriate criterion above which no intensification of sensitive use development should take place;
- the one in a million per year individual fatality risk level is an appropriate criterion above which no intensification of residential development should take place;
- residential intensification may be appropriate where mitigating measures can be implemented to reduce risk exposure to less than the one in a million per year individual fatality risk level, provided the pre-mitigation residual risk levels are below the 10 in a million per year individual fatality risk level; and
- no residential intensification should take place where pre-mitigation residual risk levels are in excess of the 10 in a million per year individual fatality risk level.

For other types of development (e.g. commercial, industrial) in the vicinity of existing industry, the relevant fatality risk criteria are the same as for a new industrial development (Refer to Section 6.2.3.1). Where these criteria are initially exceeded, commercial and industrial land development may be appropriate where mitigating measures can be implemented to reduce risk exposure to less than the target individual fatality risk level [Ref. 8, Section 5.5.2.2].

The possible injury and irritation impacts should also be considered in the case of proposed development for residential and sensitive uses [Ref. 8, Section 5.5.3]. The relevant risk criteria are the same as for a new industrial development (Refer to Section 5.3.2).

If a development proposal involves a significant intensification of population (e.g. medium to high density residential development, shopping complexes) in the vicinity of potentially hazardous facility, then the change in societal risk needs to be taken into account, even if individual risk criteria are met [Ref. 8, Section 5.5.4].

The *incremental* societal risk should be compared against the indicative societal risk criteria (Refer to Figure 23 in Section 6.2.3.4). If the *incremental* societal risk lies within the 'Negligible' region, then the development should not be precluded and if it lies within the 'Tolerable if ALARP' region, then options should be considered to relocate people away from the affected areas [Ref. 8, Section 5.5.4]. If, after taking this step, there is still a significant portion of the societal risk plot within the 'Tolerable if ALARP' region, the proposed development should only be approved if benefits clearly outweigh the risks [Ref. 8, Section 5.5.4].

## 6.2.5 Risk Criteria for Existing Land Uses

In Section 3 of HIPAP No. 4 [Ref. 7], it is noted that the implementation of the risk criteria should differentiate between existing land use situations and new situations. This is to reflect a tighter locational and technological standard applying now than at earlier times.

For existing situations, the following principles should be applied [Ref. 7, Section 3]:

- The criteria suggested in Section 6.2.4 are still relevant.

- Safety updates/reviews and risk reduction at facilities where resultant levels are in excess of the  $10 \times 10^{-6}$  individual fatality risk level should be implemented to ensure that operational and organisational safety measures are in place to reduce the likelihood of major hazardous events to low levels. A target level is to be established on an area basis.
- Intensification of hazardous activities in an existing complex accommodating a number of industries of a hazardous nature should only be allowed if the resultant  $1 \times 10^{-6}$  individual fatality risk level is not exceeded by the proposed facility and subject to cumulative risk threshold considerations.
- Mitigating the impact on existing residential areas from existing hazardous activities (in addition to safety review/updates) should essentially include specific area-based emergency plans. Emergency planning should be on the basis of consequences for credible scenarios with emphasis on areas within the  $1 \times 10^{-6}$  risk contour.

### 6.3 Risk Criteria for Land Use Safety Planning due to Transport of DGs

There are no established quantitative risk criteria in NSW for land use safety planning related to the transport of DGs. Therefore, the individual fatality risk and societal (fatality) risk criteria for fixed facilities have been used, which is consistent with the approach adopted in previous QRAs in NSW and a review of international approaches (See below). The established qualitative principles should still be considered (Refer to Section 6.2.1).

In 2014, DNV GL published a review of risk criteria adopted by European Countries for the transport of DGs [Ref. 11]. Significantly different approaches were identified in the DNV GL report, with some countries having no criteria at all and others having qualitative / quantitative criteria that were not explicitly stated in relevant legislation. The following finding is included in Section 5.5 of the DNV GL report (Note: RAC = Risk Acceptance Criteria):

“It appears that the only approaches considered immediately suitable as harmonised RAC are approaches used in the Netherlands and Spain. It is significant that these are very different to each other, being mainly quantitative in the Netherlands and based on judgement in Spain” [Ref. 11].

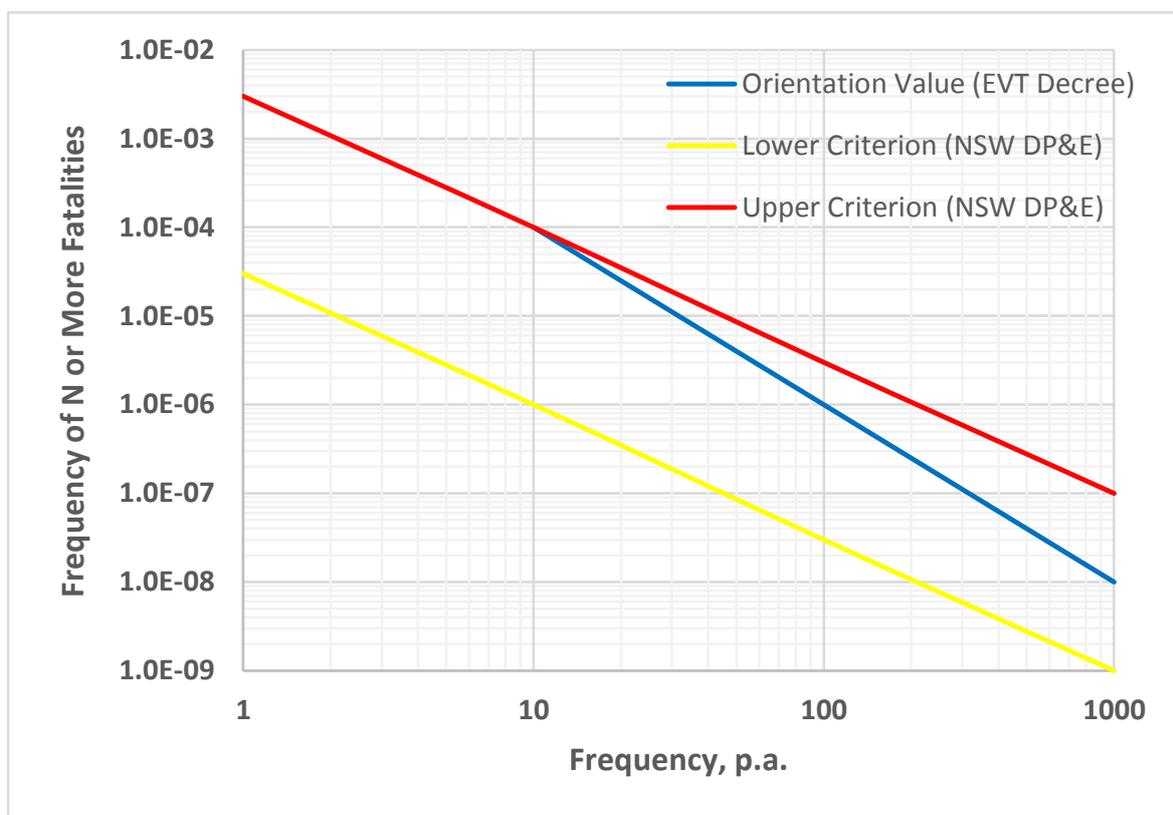
The quantitative criteria used in the Netherlands for DG transport are very similar to the quantitative risk criteria adopted in NSW for fixed facilities (See below).

In the Netherlands, the Externe Veiligheid Transportroutes (‘External Safety Transport Routes’) decree of 11 November 2013, includes the following risk criteria for the transport of dangerous goods:

- Individual fatality risk criterion: The individual fatality risk criterion in the EVT Decree [Ref. 13], which is referred to as a ‘limit value’, is  $1 \times 10^{-6}$  per year. This applies for a person who would stay sustained and unprotected at a location and is therefore defined on the same basis as the NSW DP&E individual fatality risk criterion for residential land uses due to fixed facilities (viz.  $1 \times 10^{-6}$  per year - Refer to Section 6.2.3.1).

- Societal risk ('FN Curve') criterion: A single criterion line (Referred to as an 'orientation value') is included in the EVT Decree. This is defined as the: "value for the group risk represented by the line connecting the dots where the probability of an accident with ten or more fatalities  $10^{-4}$  per year, the risk of an accident with 100 or more fatalities  $10^{-6}$  per year and the probability of an accident with 1000 or more fatalities  $10^{-8}$  per year". The 'orientation value' is shown on Figure 24 below, together with the lower and upper indicative societal risk criterion lines for NSW. The 'orientation value' applies to the 'worst-case' 1 km transport route segment and only applies for incidents capable of causing 10 or more fatalities. It is understood to include all people along the DG route, but excludes any individuals involved in the transport activity (i.e. DG vehicle driver).

**Figure 24 Societal Risk 'Orientation Value' for DG Transport in the Netherlands [Ref. 13]**



During this review, quantitative individual fatality risk and societal fatality risk criteria were not identified for DG transport in any other non-European countries (e.g. Hong Kong, USA). Nor were quantitative criteria identified for injury or property damage risks.

The quantitative individual fatality risk and societal fatality risk criteria currently being used in the Netherlands for DG transport are similar to the quantitative risk criteria adopted in NSW for fixed facilities. Therefore, the risk criteria for individual fatality risk and societal (fatality) risk due to DG transport in the Study Area were assumed to be the same as the current criteria for fixed facilities. This is consistent with the approach adopted in the Transport QRA and Transport QRA Addendum.

#### **6.4 Risk Criteria Proposed for Study Area**

Qualitative and quantitative risk criteria for land use safety planning have been established in NSW by the DP&E for three broad contexts [Ref. 7 (Section 2.1.4) and Ref. 8 (Section 5.1.2)]:

- strategic planning (Zoning and rezoning);
- assessment of development for potentially hazardous development; and
- assessment of development in the vicinity of potentially hazardous development.

These criteria are applicable for land use safety planning in the Study Area and are summarised in Table 5.

**Table 5 Summary of Risk Criteria for Land Use Safety Planning in the Study Area**

Land Use Safety Planning Context	Risk Source	Risk Receptor	Risk Criteria for Land Use Safety Planning in the Study Area
Strategic Planning (Zoning and Rezoning)	Existing potentially hazardous fixed facility	Existing land use (i.e. Zoning) or proposed change to land use category (i.e. Rezoning) <i>Note: 'Industrial', 'residential', etc. uses, as defined in Section 2.4.2.1 of HIPAP No. 4, may not align with land use zones defined in the LEP (e.g. IN1, etc.).</i>	Existing land uses (i.e. Zoning), and any proposed change to land uses (i.e. Rezoning), should be consistent with all relevant qualitative and quantitative risk criteria from HIPAP No. 4 and HIPAP No. 10 (Refer to Section 6.2.1, Section 6.2.2 and Section 6.2.4). Risk mitigation measures, and/or rezoning of risk affected portions of the land to a less sensitive use, should be considered if the risk criteria are not being met (Refer to Section 6.2.2).  Although not explicitly stated in HIPAP No. 4 and HIPAP No. 10, strategic planning decisions should be based on the cumulative risks from all risk sources. This approach is consistent with the DP&E's LUSS for the Botany-Randwick area [Ref. 9] and the development consent conditions for the BIP, which require a cumulative risk assessment [Ref. 2].
	Existing potentially hazardous transport operation		There are no established quantitative risk criteria in NSW for land use safety planning related to the transport of DGs. Therefore, the (location-specific) individual fatality risk and societal risk criteria for fixed facilities should be used to assess the risks from the transport of DGs (Refer to Section 6.3). The established qualitative principles should still be considered (Refer to Section 6.2.1).  Existing land uses (i.e. Zoning), and any proposed change to land uses (i.e. Rezoning), in the Study Area should be consistent with the quantitative risk criteria (Refer to Section 6.2.5 and Section 6.3).  Although not explicitly stated in HIPAP No. 4 and HIPAP No. 10, strategic planning decisions should be based on the cumulative risks from all risk sources. This approach is consistent with the QRA undertaken for transport of DGs along Denison Street [Ref. 24 and 25], in which the cumulative (location-specific) individual fatality risk and cumulative societal risk were assessed (i.e. for the BIP <u>and</u> transport of DGs along Denison Street). Note: Whilst this is appropriate for the Study Area, the assessment of cumulative societal risk from fixed facilities and transport of DGs might not be appropriate for other areas (Refer to Section 6.3). There is still one difficulty in this approach for the present study. The cumulative risk on Denison street is due to BIP industrial activity from fixed installations, as well as DG transport in Denison street. The latter is not contributed entirely by BIP, but a significant part from Port Botany facilities. Therefore, any risk reduction on Denison Street must not be placed entirely on BIP Operators, if these facilities comply with the fixed facilities risk criteria.

Land Use Safety Planning Context	Risk Source	Risk Receptor	Risk Criteria for Land Use Safety Planning in the Study Area
Assessment of Development for Potentially Hazardous Development	New potentially hazardous fixed facility or modifications to an existing potentially hazardous fixed facility	Existing land use (i.e. Zoning) <i>Note: 'Industrial', 'residential', etc. uses, as defined in Section 2.4.2.1 of HIPAP No. 4, may not align with land use zones defined in the LEP (e.g. IN1, etc.).</i>	<p>A new potentially hazardous fixed facility, or modifications to an existing potentially hazardous fixed facility, should be assessed against all relevant qualitative and quantitative risk criteria from HIPAP No. 4 and HIPAP No. 10 (Refer to Section 6.2.1 and Section 6.2.3).</p> <p>Typically, the risk for a proposed development is assessed based on the incremental risk from this development alone (i.e. not cumulatively with other potentially hazardous developments). However, the development consent conditions for the BIP require a cumulative risk assessment [Ref. 2] and therefore the risks associated with any modifications to the BIP, including new facilities/subdivisions within the boundary of the BIP, should be assessed cumulatively.</p> <p>If another potentially hazardous development (i.e. outside BIP) were to affect the Study Area, then it should be assessed individually and in the context of the cumulative risk presented in the BIP QRA [Ref. 27] and Transport QRA Addendum [Ref. 24].</p>
	New or modified potentially hazardous transport operation		<p>There are no established quantitative risk criteria in NSW for land use safety planning due to the transport of DGs. Therefore, the (location-specific) individual fatality risk and societal risk criteria for fixed facilities should be used to assess the risks from the transport of DGs (Refer to Section 6.3). The established qualitative principles should still be considered (Refer to Section 6.2.1).</p> <p>Any proposed changes to the transport of DGs within the Study Area (including new operations or modifications to existing operations), should be assessed individually and in the context of the cumulative risk presented in the BIP QRA [Ref. 27] and Transport QRA Addendum [Ref. 24].</p>

Land Use Safety Planning Context	Risk Source	Risk Receptor	Risk Criteria for Land Use Safety Planning in the Study Area
Assessment of Development in the Vicinity of Potentially Hazardous Development	Existing potentially hazardous fixed facility	Development in the vicinity of an existing potentially hazardous fixed facility and/or transport operation (e.g. increase in number of potentially exposed individuals due to residential or commercial intensification)	<p>Any development in the vicinity of an existing potentially hazardous fixed facility should be consistent with all relevant qualitative and quantitative risk criteria from HIPAP No. 10 (Refer to Section 6.2.1 and Section 6.2.4). A proposed development may still be appropriate if mitigating measures can be implemented to reduce the risk exposure to less than the relevant criteria (Refer to Section 6.2.4).</p> <p>Although not explicitly stated in HIPAP No. 10, the assessment of a proposed development in the vicinity of an existing potentially hazardous fixed facility should be based on the cumulative risk from all risk sources. Therefore, any proposed development in the Study Area should be assessed in the context of the cumulative risks presented in the BIP QRA [Ref. 17] and Transport QRA Addendum [Ref. 16].</p> <p>For societal risk, the incremental societal risk should be compared against the indicative criteria in HIPAP 10 (Refer to Section 6.2.4). If this incremental societal risk lies within the negligible region, then the development should not be precluded. If incremental risks lie within the ALARP region, options should be considered to relocate people away from the affected areas. If, after taking this step, there is still a significant portion of the societal risk plot within the ALARP region, the proposed development should only be approved if the benefits clearly outweigh the risks, and other reasonably practicable risk reduction measures are adopted.</p>
	Existing potentially hazardous transport operation		<p>There are no established quantitative risk criteria in NSW for land use safety planning relating to the transport of DGs. Therefore, the (location-specific) individual fatality risk and societal risk criteria for fixed facilities should be used to assess the risks from the transport of DGs (Refer to Section 6.3). The established qualitative principles should still be considered (Refer to Section 6.2.1).</p> <p>Although not explicitly stated in HIPAP No. 10, the assessment of a proposed development in the vicinity of an existing potentially hazardous transport operation should be based on the cumulative risk from all risk sources. Therefore, any proposed development in the Study Area should be assessed in the context of the cumulative risks presented in the BIP QRA [Ref. 17] and Transport QRA Addendum [Ref. 16].</p> <p>For societal risk, the incremental societal risk should be compared against the indicative criteria in HIPAP 10 (Refer to Section 6.2.4). If this incremental societal risk lies within the negligible region, then the development should not be precluded. If incremental risks lie within the ALARP region, options should be considered to relocate people away from the affected areas. If, after taking this step, there is still a significant portion of the societal risk plot within the ALARP region, the proposed development should only be approved if the benefits clearly outweigh the risks.</p>

## 6.5 Summary of Key Points

- Qualitative and quantitative risk criteria for land use safety planning have been established in NSW by the DP&E for three broad contexts: strategic planning (Zoning and rezoning); assessment of development for potentially hazardous development; and assessment of development in the vicinity of potentially hazardous development. These criteria are applicable for land use safety planning in the Study Area.
- There are no established quantitative risk criteria in NSW for land use safety planning due to the transport of DGs. Therefore, the (location-specific) individual fatality risk and societal risk criteria for fixed facilities should be used to assess the risks from the transport of DGs (Refer to Section 6.3).
- The application of the risk criteria is based on a risk assessment that inherently contains a number of assumptions, primarily the truck accident frequency applicable to the Study Area.

## 7 PLANNING CONTROLS FOR STUDY AREA

### 7.1 Current Risk-Related Planning Controls

The risk-related planning controls in the BBDCP2013 are currently included in: Part 6 ('Employment Zones', which includes the IN1 and IN2 industrial zones and the B5 and B7 business zones); and, Part 8 ('Character Zones', which are predominantly the residential precincts in the Study Area). There are no risk-related planning controls in the BBDCP2013 for the IN1 zoned land covered by the Three Ports SEPP.

The relevant text from Part 6 and Part 8 of the BBDCP2013 is reproduced below in Sections 7.1.1 - 7.1.3.

#### 7.1.1 Hillsdale Precinct (Part 8.2 of DCP)

The existing and desired future character of the Hillsdale Precinct (Refer to Section 3.1.1) is included in Part 8.2 of the BBDCP2013 [Ref. 1]. Risk-related development controls are referred to in Part 8.2.1 of the BBDCP2013 for the existing local character and Part 8.2.1 for the desired future character. The relevant text from these parts is reproduced below.

#### Extract from Section 8.2.1 of the Botany Bay Development Control Plan 2013 [Ref. 1]

##### **Risk**

The Botany / Randwick industrial area forms a significant industrial complex of State and National significance. The location of the industrial area, within the vicinity of residential areas, has required that safety studies into the cumulative risk of industrial activity be undertaken to quantify and measure hazard risk associated with such activities.

The Department of Planning & Environment has released three studies that investigate industrial operations and make land use planning recommendations. Studies released to date include the '*Risk Assessment Study for the Botany / Randwick Industrial Complex and Port Botany*' (1985), the '*Port Botany Land Use Safety Study*' (1996) and the '*Botany / Randwick Industrial Area Land Use Safety Study*' (2001).

##### **A Risk Assessment Study for the Botany / Randwick Industrial Complex and Port Botany - 1985**

Analysis of hazard risk implications within the Botany / Randwick Industrial area was first examined in 1985 by Planning NSW (formerly the Department of Environment and Planning) within a report titled '*A Risk Assessment Study for the Botany / Randwick Industrial Complex and Port Botany*'. The risk assessment study was initiated by the Department in response to concerns expressed by community groups and local councils about the intensification of potentially hazardous installations and associated facilities in the area and their risk implications on nearby residential land uses.

The recommendations from the 1985 study that relate to residential risk implications and land use controls under recommendation 12, state that:

- No intensification of residential developments should be allowed within areas identified in the study;
- Provisions within a planning instrument that permit an increase in existing residential dwelling density should be reviewed;
- New residential intensification within the cumulative risk areas identified within the study should be the subject of the Director's concurrence.

The study had no statutory significance under the Environmental Planning and Assessment Act 1979 and subsequently relied on the support of Council to implement the recommendations contained in the study. Council has supported the recommendations of the study relating to land use planning and has in practice referred residential development applications, which aim to intensify development to Planning NSW for concurrence.

#### **Port Botany Land Use Safety Study – 1996**

Port Botany is a major infrastructure facility that handles and accommodates activities involving hazardous materials including - loading / unloading, storage and distribution of dangerous goods and materials.

The Port Botany Land Use Safety Study was undertaken by the Department of Planning to update the 1985 Study, develop updated cumulative risk contours (to provide a framework for assessment and decision making for future developments) and formulate a strategic land use safety framework.

The recommendations of the Study were:

- Future developments in the Port should undergo early risk assessment and comprehensive environmental impact processes to demonstrate that the use will not contribute to any cumulative risk – as identified in the Port area.
- Development controls are put in place to ensure there is no significant increase in the number of people exposed to risk – as identified in the residential risk contour.
- Individual site studies are undertaken to develop programs that are then implemented to create risk reduction and safety management measures.
- The Port and Port users prepare emergency plans / procedures and fire prevention / protection systems.
- The Port and Port users adopt a program to ensure the community is adequately informed on Port activities, associated risks and safety management measures.

#### **Botany / Randwick Industrial Area Land Use Safety Study**

Planning NSW in 2001 published the 'Botany / Randwick Industrial Area Land Use Safety Study' with the objectives of:

- Updating the 1985 cumulative risk study for the Botany / Randwick industrial area;
- Developing a framework for the efficient assessment and decision making for future developments; and
- Formulating a strategic land use safety framework for future developments in the Botany / Randwick Industrial Area and surround land uses.

The review investigated two cases based on two industrial scenarios. The cases were aimed at identifying the cumulative risk levels resulting from the industrial area under the current conditions (pre – 2001) and a predicted future case (2001). An explanation of the cases are as follows:-

- The Existing Case (Pre-2001): The Orica mercury cell chlorine plant and chlorine liquefaction facilities and associated bulk chlorine storage. Risks associated with the chlorine plant include incidences such as a chlorine vapour cloud release due to equipment failure or due to fire / radiation impacts on the plant and storage from a fire in the vicinity.

- The Future Case (2001): The Existing Orica chlorine plant being replaced with membrane production facilities. The bulk storage of chlorine has ceased. The removal of chlorine liquefaction and storage on site will reduce the likelihood of chlorine releases occurring.

It should be noted that Council received a letter from the then Planning NSW dated 31 October 2002 advising that the recommendations in the Land Use Safety Study for the Future Case now apply. The Future Case applied from 31 October 2002.

The key findings of the Botany / Randwick Industrial Area Land Use Safety Study has been a significant improvement in the cumulative risk areas that result from the industrial operations located within the Botany / Randwick industrial area

Recommendations that resulted from the study were:

1. Future developments in the Botany / Randwick industrial area should be subject to early risk assessment and comprehensive environmental impact processes to conclusively demonstrate they will not contribute to risk impacts outside the industrial area that are inappropriate for surrounding land uses.
2. Effective land use safety planning should be implemented to allow future developments in the area, and to reconcile any potential land use planning conflicts.
3. A process of regular reviews and updates for site safety management systems should be undertaken.
4. Emergency plans and procedures, and fire prevention and protection systems should be kept up-to-date.
5. Industrial facilities should adopt community right-to-know principles to ensure the community is adequately informed about activities, associated risks and safety management measures adopted within the Botany / Randwick industrial area.

Implementation of recommendations 1, 3, 4, and 5 listed above are the responsibility of State, Local Governments and industry to administer through consultation and development approvals. Implementation of recommendation 2 is achieved by the City of Botany Bay Council through the preparation of this Development Control Plan to give the Study status under the Environmental Planning and Assessment Act 1979.

#### Extract from Section 8.2.2 of the Botany Bay Development Control Plan 2013 [Ref. 1]

##### **Risk**

- Recognise that development within the 'Consultation Region' identified in **Figure 4** that will result in 'residential intensification' or 'sensitive use intensification' will require the concurrence of the Department of Planning & Environment.
- Recognise that development for 'residential intensification', 'sensitive use intensification', and development that will result in increased traffic volumes or access points onto Denison Street (being a designated Dangerous Goods Route) must:

- Consider a transport risk assessment report. The contents and outcomes of a transport risk assessment report are to be in general accordance with the principles outlined in the *Hazardous Industry Advisory Paper N<sup>o</sup> 6: Guidelines for Hazard Analysis* (Planning NSW, 1992), *Hazardous Industry Advisory Paper N<sup>o</sup> 4: Risk Criteria for Land Use Safety Planning* (Planning NSW, 1992), *'Hazardous Industry Planning Advisory Paper No. 10 Land Use Safety Planning'* published by the NSW Department of Planning in January 2011 and *'Hazardous Industry Planning Advisory Paper No. 11 – Route Selection* dated January 2011.
- Receive development concurrence for the application from the Department of Planning & Environment.
- Any other applications for development adjacent to / or within the vicinity of routes designated as 'Dangerous Goods Routes' will be assessed under the relevant Council planning instruments and controls.
- Where a site is considered by Council to be located partly within any region or adjacent to a dangerous goods route defined in this plan, any development on the site will be assessed and viewed as though it was located within the area with the more stringent risk-related development controls specified in this development control plan.

**Note:** In 2012, BBCC commissioned a traffic count for Denison Street (in both directions, north and south); which includes a separate count for dangerous goods traffic as Council wanted to compare the overall traffic to the dangerous goods traffic. Whilst this data is available to applicants who are required to prepare a Transport Risk Assessment Report, the data is over 12 months old and depending on the proposed development Council may require a new Transport Risk Survey to be conducted at the applicant's costs. Please contact Council for more information.

**Figure 4 - Consultation Region shown in Blue**



**Definitions:**

**Dangerous Goods Routes** means identified within the Botany/Randwick Industrial Area Land Use Safety Study.

The Botany / Randwick Industrial Area Land Use Safety Study does not include an assessment of the risk implications of dangerous goods transport, but does identify some routes as having a significant likelihood of carrying such goods. The routes identified within the Botany / Randwick Industrial Area Land Use Safety Study form a wider local and regional road network that may also carry traffic containing dangerous goods. The consideration of risk arising from the transportation of dangerous goods on this local and regional road network and the impacts this may have on residential and sensitive use development within the Study area needs to be considered as part of the assessment process for future development activity.

**Residential intensification** means an increase in the number of dwellings or an increase in the number of rooms providing temporary or permanent accommodation.

Residential land uses considered incompatible with residential fatality risk, injury or irritation risk (as defined in *Hazardous Industry Planning Advisory Paper No.4 – Risk Criteria for Land Use Safety Planning* - Planning NSW, 1992) resulting from operations within the Botany / Randwick industrial area under this plan include dwelling houses, hotels, motels, and caretakers residences resulting from any of the following:

- The alteration and / or addition of an existing building;
- The conversion and / or utilisation of an existing building or vacant land;
- The subdivision of land to create a new allotment; and
- The rezoning of land.

**Sensitive use intensification** means the establishment of a sensitive use or an increase in the gross operational floor space of an existing building that is occupied by a sensitive land use.

Sensitive land uses that are considered incompatible with fatality risk, injury or irritation risk (as defined in *Hazardous Industry Planning Advisory Paper No.4 – Risk Criteria for Land Use Safety Planning* - Planning NSW, 1992) resulting from operations within the Botany / Randwick industrial area under this plan include:- child care centres, nursing homes, educational establishments, hospitals and units for aged persons.

### **7.1.2 Eastgardens Precinct (Part 8.8 of DCP)**

The existing and desired future character of the Eastgardens Precinct (Refer to Section 3.1.2) is included in Part 8.8 of the DCP [Ref. 1]. Risk-related development controls are referred to in Part 8.8.1 of the DCP for the existing local character and Part 8.8.1 for the desired future character. The relevant text from these parts is reproduced below.

#### Extract from Section 8.8.1 of the Botany Bay Development Control Plan 2013 [Ref. 1]

##### **Risk**

Eastgardens is adjacent to the Botany / Randwick industrial area which forms a significant industrial complex of State and National significance. The location of the industrial area, within the vicinity of residential areas, has required that safety studies into the cumulative risk of industrial activity be undertaken to quantify and measure hazard risk associated with such activities.

The Department of Planning & Environment has released three studies that investigate industrial operations and make land use planning recommendations. Studies released to date include the '*Risk Assessment Study for the Botany / Randwick Industrial Complex and Port Botany*' (1985), the

'Port Botany Land Use Safety Study' (1996) and the 'Botany / Randwick Industrial Area Land Use Safety Study' (2001).

#### **A Risk Assessment Study for the Botany / Randwick Industrial Complex and Port Botany - 1985**

Analysis of hazard risk implications within the Botany / Randwick Industrial area was first examined in 1985 by Planning NSW (formerly the Department of Environment and Planning) within a report titled 'A Risk Assessment Study for the Botany / Randwick Industrial Complex and Port Botany'. The risk assessment study was initiated by the Department in response to concerns expressed by community groups and local councils about the intensification of potentially hazardous installations and associated facilities in the area and their risk implications on nearby residential land uses.

The recommendations from the 1985 study that relate to residential risk implications and land use controls under recommendation 12, state that:-

- no intensification of residential developments should be allowed within areas identified in the study;
- provisions within a planning instrument that permit an increase in existing residential dwelling density should be reviewed;
- new residential intensification within the cumulative risk areas identified within the study should be the subject of the Director's concurrence.

The study had no statutory significance under the Environmental Planning and Assessment Act 1979 and subsequently relied on the support of Council to implement the recommendations contained in the study. Council has supported the recommendations of the study relating to land use planning and has in practice referred residential development applications, which aim to intensify development to Planning NSW for concurrence.

#### **Port Botany Land Use Safety Study – 1996**

Port Botany is a major infrastructure facility that handles and accommodates activities involving hazardous materials including - loading / unloading, storage and distribution of dangerous goods and materials.

The Port Botany Land Use Safety Study was undertaken by the Department of Planning to update the 1985 Study, develop updated cumulative risk contours (to provide a framework for assessment and decision making for future developments) and formulate a strategic land use safety framework.

The recommendations of the Study were:

- Future developments in the Port should undergo early risk assessment and comprehensive environmental impact processes to demonstrate that the use will not contribute to any cumulative risk – as identified in the Port area.
- Development controls are put in place to ensure there is no significant increase in the number of people exposed to risk – as identified in the residential risk contour.
- Individual site studies are undertaken to develop programs that are then implemented to create risk reduction and safety management measures.
- The Port and Port users prepare emergency plans / procedures and fire prevention / protection systems.
- The Port and Port users adopt a program to ensure the community is adequately informed on Port activities, associated risks and safety management measures.

## Botany / Randwick Industrial Area Land Use Safety Study

Planning NSW in 2001 published the '*Botany / Randwick Industrial Area Land Use Safety Study*' with the objectives of:

- Updating the 1985 cumulative risk study for the Botany / Randwick industrial area;
- Developing a framework for the efficient assessment and decision making for future developments;
- Formulating a strategic land use safety framework for future developments in the Botany / Randwick Industrial Area and surround land uses.

The review investigated two cases based on two industrial scenarios. The cases were aimed at identifying the cumulative risk levels resulting from the industrial area under the current conditions (pre – 2001) and a predicted future case (2001). An explanation of the cases are as follows:

- The Existing Case (Pre-2001): The Orica mercury cell chlorine plant and chlorine liquefaction facilities and associated bulk chlorine storage. Risks associated with the chlorine plant include incidences such as a chlorine vapour cloud release due to equipment failure or due to fire / radiation impacts on the plant and storage from a fire in the vicinity.
- The Future Case (2001): The Existing Orica chlorine plant being replaced with membrane production facilities. The bulk storage of chlorine has ceased. The removal of chlorine liquefaction and storage on site will reduce the likelihood of chlorine releases occurring.

It should be noted that Council received a letter from the then Planning NSW dated 31 October 2002 advising that the recommendations in the Land Use Safety Study for the Future Case now apply. The Future Case applied from 31 October 2002.

The key findings of the Botany / Randwick Industrial Area Land Use Safety Study has been a significant improvement in the cumulative risk areas that result from the industrial operations located within the Botany / Randwick industrial area.

Recommendations that resulted from the study were:

1. Future developments in the Botany / Randwick industrial area should be subject to early risk assessment and comprehensive environmental impact processes to conclusively demonstrate they will not contribute to risk impacts outside the industrial area that are inappropriate for surrounding land uses.
2. Effective land use safety planning should be implemented to allow future developments in the area, and to reconcile any potential land use planning conflicts.
3. A process of regular reviews and updates for site safety management systems should be undertaken.
4. Emergency plans and procedures, and fire prevention and protection systems should be kept up-to-date.
5. Industrial facilities should adopt community right-to-know principles to ensure the community is adequately informed about activities, associated risks and safety management measures adopted within the Botany / Randwick industrial area.

Implementation of recommendations 1, 3, 4, and 5 listed above are the responsibility of State, Local Governments and industry to administer through consultation and development approvals. Implementation of recommendation 2 is achieved by the City of Botany Bay Council through the

preparation of this Development Control Plan to give the Study status under the Environmental Planning and Assessment Act 1979.

Extract from Section 8.8.2 of the Botany Bay Development Control Plan 2013 [Ref. 1]

**Risk**

- Recognise that development for ‘residential intensification’, ‘sensitive use intensification’, and development that will result in increased traffic volumes or access points onto Denison Street (being a designated Dangerous Goods Route) must:
  - Consider a transport risk assessment report. The contents and outcomes of a transport risk assessment report are to be in general accordance with the principles outlined in the *Hazardous Industry Advisory Paper N<sup>o</sup> 6: Guidelines for Hazard Analysis* (Planning NSW, 1992), *Hazardous Industry Advisory Paper N<sup>o</sup> 4: Risk Criteria for Land Use Safety Planning* (Planning NSW, 1992), ‘*Hazardous Industry Planning Advisory Paper No. 10 Land Use Safety Planning*’ published by the NSW Department of Planning in January 2011 and ‘*Hazardous Industry Planning Advisory Paper No. 11 – Route Selection*’ dated January 2011.
  - Receive development concurrence for the application from the Department of Planning & Environment.
- Any other applications for development adjacent to / or within the vicinity of routes designated as ‘Dangerous Goods Routes’ will be assessed under the relevant Council planning instruments and controls.
- Where a site is considered by Council to be located adjacent to a dangerous goods route defined in this plan, any development on the site will be assessed and viewed as though it was located within the area with the more stringent risk-related development controls specified in this development control plan.

**Note:** Council in 2012 commissioned a traffic count for Denison Street (in both directions, north and south); which includes a separate count for dangerous goods traffic as Council wanted to compare the overall traffic to the dangerous goods traffic. Whilst this data is available to applicants who are required to prepare a Transport Risk Assessment Report, the data is over 12 months old and depending on the proposed development Council may require a new Transport Risk Survey to be conducted at the applicant’s costs. Please contact Council for more information.

**Definitions:**

**Dangerous Goods Routes** means identified within the Botany/Randwick Industrial Area Land Use Safety Study.

The Botany / Randwick Industrial Area Land Use Safety Study does not include an assessment of the risk implications of dangerous goods transport, but does identify some routes as having a significant likelihood of carrying such goods. The routes identified within the Botany / Randwick Industrial Area Land Use Safety Study form a wider local and regional road network that may also carry traffic containing dangerous goods. The consideration of risk arising from the transportation of dangerous goods on this local and regional road network and the impacts this may have on residential and sensitive use development within the Study area needs to be considered as part of the assessment process for future development activity.

**Residential intensification** means an increase in the number of dwellings or an increase in the number of rooms providing temporary or permanent accommodation.

Residential land uses considered incompatible with residential fatality risk, injury or irritation risk (as defined in *Hazardous Industry Planning Advisory Paper No.4 – Risk Criteria for Land Use Safety Planning* - Planning NSW, 1992) resulting from operations within the Botany / Randwick industrial area under this plan include dwelling houses, hotels, motels, and caretakers residences resulting from any of the following:-

- The alteration and / or addition of an existing building;
- The conversion and / or utilisation of an existing building or vacant land;
- The subdivision of land to create a new allotment; and
- The rezoning of land.

**Sensitive use intensification** means the establishment of a sensitive use or an increase in the gross operational floor space of an existing building that is occupied by a sensitive land use.

Sensitive land uses that are considered incompatible with fatality risk, injury or irritation risk (as defined in *Hazardous Industry Planning Advisory Paper No.4 – Risk Criteria for Land Use Safety Planning* - Planning NSW, 1992) resulting from operations within the Botany / Randwick industrial area under this plan include:- child care centres, nursing homes, educational establishments, hospitals and units for aged persons.

### **7.1.3 Banksmeadow Industrial Precinct (Parts 6.2.8 and 6.3.15 of the DCP)**

Part 6 of the DCP includes planning controls for ‘employment zones’ (i.e. IN1 and IN2 industrial zones and the B5 and B7 business zones). Risk-related development controls for the Banksmeadow Industrial Precinct are referred to in Part 6.2.8 of the DCP. Risk-related development controls applicable for all employment zones are also included in Part 6.3.15 and these include a cross-reference to Part 6.2.8. The relevant text from these parts is reproduced below.

Extract from Section 6.2.8 of the Botany Bay Development Control Plan 2013 [Ref. 1]

#### **Controls**

##### **General**

- C1** Business Park and industrial uses with access from Rhodes Street or Smith Street are to have low vehicular generation characteristics and exclude the use of container handling or semi-trailers.
- C2** Development on the B7 Business Park Zone at the corner of Holloway and Green Streets are to have their commercial offices (or other non-industrial activity) fronting Holloway Street and the school with a return (no less than 10m) to Green Street. All industrial activities are to be undertaken behind the commercial building buffer.
- C3** The transport of hazardous substances should be directed away from residential areas and a Traffic Route Study showing the proposed traffic route of such transport is required.
- C4** Development fronting Denison Street, Rhodes Street, and Smith Street are to have their commercial offices (or other non-industrial activity) fronting the road/street. All industrial activities are to be undertaken behind the commercial building buffer.

- C5** Development is not to adversely impact on the surrounding established residential areas through noise, traffic, pollution and risk.
- C6** A survey is required to identify any pipelines, easements etc affecting the development site. If the pipeline enters Council land an appropriate deed of agreement is to be executed.
- C7** Redevelopment of land at the corner of Denison Street & Beauchamp Road (the Orica site) is to take into account the road widening affectation proposed by RMS.
- C8** Developments within the vicinity of Floodvale Drain, Springvale Drain and Bunnerong Stormwater Channel No. 11 (SWC 11 – Sydney State Water) shall submit a detailed Flood Study/Assessment for 1 in 100 year average recurrence interval (ARI) design storm events and probable maximum flood (PMF). The Flood Study/Assessment is to be prepared by a suitably qualified and experienced civil engineer. The Flood Study/Assessment is required to:
- (i) Be in accordance with the current version of Australian Rainfall and Runoff (ARR) and the NSW Floodplain Development Manual; and
  - (ii) Consider the impacts from Climate Change and Sea Level Rise.
- C9** Development shall:
- (i) Have finished floor levels of a minimum 500mm above the 1 in 100 year flood level for habitable areas and 300mm for industrial areas and garages; and
  - (ii) Not impede the passage of floodwater to cause a rise (afflux) in the flood level upstream and/or increase the downstream velocities of flow.
- C10** Restricted Access Vehicles (RAV) classified by Roads and Maritime Services (RMS) (including B-Doubles) are not permitted to access:
- (i) Holloway Street;
  - (ii) Green Street;
  - (iii) Ocean Street;
  - (iv) Swinbourne Street;
  - (v) Stephen Road;
  - (vi) Smith Street; and
  - (vii) Rhodes Street.
- C11** The maximum size of vehicle accessing Smith Street and Rhodes Street is restricted to Medium Rigid Vehicles (MRV) as defined by AS2890.2.

**Risk Management:**

- C12** In order to address the recommendations, a Risk Assessment Evaluation is required to accompany all applications for sites:
- (i) Within the study area of the Botany/Randwick Industrial Area Land Use Safety Study - 2001; and/or
  - (ii) Affected by the recommendations of the Port Botany Land Use Safety Study Overview Report - 1996.

**Note:** Recommendation No. 2-2.2 of the Port Botany Safety Study states that proposals for the development or redevelopment of residential, commercial or high density developments

outside the Port area, particularly inside the one in a million residential risk contour, identified in figure 2 of the Port Botany Land Use Safety Study Overview Report should not take place.

- C13** The Risk Assessment Evaluation to Council is to be completed by a qualified risk management professional and take into account the nature of the proposed business and the proximity of the site to surrounding hazardous facilities. The report is to recommend safety procedures to be followed.

The report needs to conclude whether or not the activities proposed for the premises constitute an escalation of existing hazards, and that the risk posed by neighbouring uses in the exposure of hazards to the site is acceptable.

Applicants are to refer to the applicable Hazardous Industry Planning Advisory Papers (HIPAPs) and other guidelines such as *Applying SEPP 33* and *Multi-level Risk Assessment* found at <http://www.planning.nsw.gov.au/planning-guidelines-for-hazardous-development>

- C14** If a site fronts Denison Street a Transport Risk Assessment Report is required to be lodged with Council. The assessment report to Council should be completed by a qualified risk management professional and address the hazard analysis methodology outlined within the Hazardous Industry Advisory Paper N<sup>o</sup> 6: Guidelines for Hazard Analysis. The areas of assessment should include:

- (i) Identification of potential release scenarios, including analysis of the hazards associated with transport of potentially hazardous materials;
- (ii) Estimation of release frequencies, using information available from such sources as Botany Bay City Council, the Bureau of Statistics and from the Roads and Traffic Authority, NSW;
- (iii) Assessment of consequences in terms of effect zones following the ignition or dispersion of a release, including the assessment of the evaporation and permeation of a spill and of the resulting heat radiation in case of ignition;
- (iv) Estimation of risk by combining release frequencies, consequences, and population distribution for the particular route under survey; and
- (v) Comparing the estimated risk with relevant tolerability criteria and guidelines.

Results from the traffic hazard analysis should be assessed on the basis of generally accepted land use safety guidelines provided in the 'Hazardous Industry Planning Advisory Paper N<sup>o</sup> 4: Risk Criteria for Land Use Safety Planning' published by Planning NSW in 1992 and 'Hazardous Industry Planning Advisory Paper No. 10 Landuse Safety Planning' published by the NSW Department of Planning in January 2011.

**Note:** Council in 2012 commissioned a traffic count for Denison Street (in both directions, north and south); which includes a separate count for dangerous goods traffic as Council wanted to compare the overall traffic to the dangerous goods traffic. Whilst this data is available to applicants who are required to prepare a Transport Risk Assessment Report, the data is over 12 months old and depending on the proposed development Council may require a new Transport Risk Survey to be conducted at the applicant's costs. Please contact Council for more information.

- C15** Where a site is considered by Council to be located partly adjacent to a dangerous goods route defined in this plan, any development on the site will be assessed and viewed as though

it was located within the area or route with the more stringent risk-related development controls specified in this development control plan.

**Dangerous Goods Routes** means identified within the Botany/Randwick Industrial Area Land Use Safety Study.

The Botany / Randwick Industrial Area Land Use Safety Study does not include an assessment of the risk implications of dangerous goods transport, but does identify some routes as having a significant likelihood of carrying such goods. The routes identified within the Botany / Randwick Industrial Area Land Use Safety Study form a wider local and regional road network that may also carry traffic containing dangerous goods. The consideration of risk arising from the transportation of dangerous goods on this local and regional road network and the impacts this may have on residential and sensitive use development within the Study area needs to be considered as part of the assessment process for future development activity.

**Sensitive use intensification** means the establishment of a sensitive use or an increase in the gross operational floor space of an existing building that is occupied by a sensitive land use.

Sensitive land uses that are considered incompatible with fatality risk, injury or irritation risk (as defined in *Hazardous Industry Planning Advisory Paper No.4 – Risk Criteria for Land Use Safety Planning* - Planning NSW, 1992) resulting from operations within the Botany / Randwick industrial area under this plan include:- child care centres, nursing homes, educational establishments, hospitals and units for aged persons.

**Additional information:** A number of other Hazardous Industry Planning Advisory Papers (HIPAPs) and other guidelines have been issued by the Department of Planning & Environment to assist stakeholders in implementing an integrated risk assessment process and can be found at <http://www.planning.nsw.gov.au/planning-guidelines-for-hazardous-development>

Applicants are also to refer to **Part 6.3.15 - Risk**.

#### Extract from Section 6.3.15 of the Botany Bay Development Control Plan 2013 [Ref. 1]

##### **Controls**

**C1** Should the proposed use involve the storage and/or transport hazardous substances Council will require an assessment of the Development Application under **State Environmental Planning Policy No. 33 - Hazardous and Offensive Development**.

**Note:** All applications to carry out potentially hazardous or potentially offensive development will have to be advertised.

**C2** Development Applications to carry out potentially hazardous development will also have to be supported by a Preliminary Hazard Analysis (PHA). Applicants should refer to the provisions of **State Environmental Planning Policy No. 33 - Hazardous and Offensive Development**

**Note:** Applicants are to refer to the applicable Hazardous Industry Planning Advisory Papers (HIPAPs) and other guidelines such as *Applying SEPP 33* and *Multi-level Risk Assessment* found on the Department of Planning and Environment's website at <http://www.planning.nsw.gov.au/planning-guidelines-for-hazardous-development>

**C3** Development adjacent or adjoining sites/uses/pipelines that involve the storage and/or transport of hazardous substances are to prepare a risk assessment in accordance with the Hazardous Industry Planning Advisory Papers.

**Note:** Banksmeadow Industrial Precinct has specific risk related controls that have to be complied with. If your site is within the Banksmeadow Industrial Precinct you need to also refer to the Precinct controls in **Part 6.2.8 - Banksmeadow Industrial Precinct**.

### 7.1.4 Three Ports SEPP

The Three Ports SEPP applies to land at the three ports covering both the lease areas (i.e. land leased to a private port operator under the Ports Assets (Authorised Transactions) Act 2012) as well as surrounding land that needs to be maintained for port-related and industrial uses. The Study Area is outside of the lease area and therefore the BBCC is the relevant consent authority for this land in accordance with Clause 8 of the Three Ports SEPP [Ref. 15].

There are no risk-related planning controls in the BBDCP2013 for the IN1 zoned land covered by the Three Ports SEPP.

## 7.2 Proposed Planning Controls

Within the Study Area, there are 20 areas where the combination of land use zoning and major risk contributor/s warrants specific risk-based planning controls (Refer to Figure 25). The large number of areas arises because the Study Area includes nine different land use zones (B3, B4, B5, B7, R2, R3, RE1, IN1 and SP1) and the dominant risk contributor (e.g. cumulative LSIFR, cumulative injury / irritation risk and/or cumulative societal risk) varies throughout the Study Area. For example, to the east of the Orica chloralkali plant, the LSIFR is the dominant risk near Denison Street, but the cumulative injury / injury risk and societal risk are more relevant to the east of Nilson Avenue.

A summary table is included after Figure 25 for each of the 20 specific areas. The information in each table provides a guide for land use safety planning throughout the Study Area. How this is achieved needs to be determined by BBCC in conjunction with the DP&E as some of the proposed controls will only apply to the areas identified in Figure 25 and should not be applied to all other similarly zoned areas defined within the BBLEP2013. For example, sensitive use developments (e.g. child care centres) are currently 'permitted with consent' in areas zoned RE1; however, this type of development should be prohibited in Area A (Hensley Athletic Field), despite its RE1 zoning, since the cumulative risk from the fixed facilities and DG transport along Denison Street exceeds the relevant DP&E risk criteria for land use safety planning.

The current zoning, and any potential restrictions on future rezoning (particularly to a more sensitive use category), is identified in each table for each area. Also, the proposed controls for future developments (i.e. potentially hazardous industry and/or other types of development in the vicinity of existing potentially hazardous industry) are included, together with the basis for each control. If it is proposed to change a control from the current BBLEP2013, then this is highlighted in red.

The following points are of interest:

1. If the projected increase in DG traffic occurs in conjunction with intensification of the population in the Study Area, then the cumulative societal risk ('FN Curve') is likely to extend into the 'Intolerable' zone (Refer to Section 5.5.2). Therefore, any modification to an existing development that may increase population density (i.e. including subdivision, multiple occupancy, etc.) in the Study Area should be reviewed on a case-by-case basis.

2. For Areas close to the BIP and Denison Street, any increase in population density will be constrained by the cumulative individual fatality risk and/or the cumulative societal risk ('FN Curve') and therefore applies for all types of development, not only sensitive use and residential development (Refer to Section 6.2.4).
3. An increase to population density becomes progressively less significant with increasing distance from the BIP and Denison Street, particularly beyond the 0.5 pmpy cumulative individual fatality risk contour. Therefore, increasing the population density at the eastern extremity of the Study Area may be permissible if it can be demonstrated that the development will have a negligible incremental contribution to the cumulative societal risk ('FN Curve'). This has been used as a basis for the proposed planning controls.
4. In the vicinity of the BIP and Denison Street, the societal risk ('FN Curve') is relatively high. The predominant risk contributors are fires in near field and toxic gas exposure in far field. Therefore, the proposed planning controls have not included provision to permit developments by meeting the target individual risk of fatality alone through implementation of mitigating measures (Refer to Section 6.2.4). This approach is consistent with the relevant qualitative risk criteria (Refer to Section 6.2.1).
5. The cumulative individual and societal risks ('FN Curve') from the BIP QRA and Transport QRA / Transport QRA Addendum comply with the risk criteria applicable for existing use situations (Refer to Section 6.2.5). Therefore, the proposed controls are only applicable for: (i) proposed new developments; and/or (ii) modifications to existing developments where these would result in an increase to the average population density (Refer to Section 7.2.1). Alterations to an existing development that do not increase the average population density should be in accordance the BBCC's current assessment process.
6. Where a particular category of new development and/or modification to an existing development would not comply with the relevant risk criteria, then the proposed control has been categorised as 'Prohibited' in the relevant summary table (e.g. child care facilities in Area A). It is recognised that this terminology may have a slightly different context in the NSW statutory planning framework, particularly as the 'Industrial', 'residential', etc. land use categories defined in HIPAP No. 4 do not perfectly align with the zones defined in the LEP (e.g. IN1, etc.). Therefore, how this prohibition is achieved through the relevant planning instrument/s needs to be determined by BBCC in conjunction with the DP&E (This is addressed in Recommendation No. 1 - Refer to Section 8).

### 7.2.1 Population Intensification Issues

The following definition of population intensification should be included in the DCP:

***Population intensification*** means any change that increases the average population density. This may include, but is not limited, to:

- *The addition of a building or room for new occupants or an increase to the number of rooms providing temporary or permanent accommodation (e.g. hotel rooms);*
- *Increasing the gross operational area for non-residential buildings (e.g. child care centres, commercial buildings, etc. that may, or may not, be permanently occupied);*
- *The conversion and / or utilisation of an existing building or vacant land for additional occupation;*

- *The subdivision of land to create a new allotment for additional occupation; and*
- *The rezoning of land for a uses with a higher average population density (e.g. rezoning from low density residential to medium density residential).*

*Population intensification is potentially relevant for all categories of development (e.g. recreational, residential, commercial, industrial, etc.).*

*For residential development, increasing the number of rooms providing temporary or permanent accommodation within the same residence would not normally be considered population intensification. However, this would be considered population intensification for a hotel, motel, boarding house, etc.*

All future development applications for a new development, or a modification to an existing development, in the Study Area that are listed as potentially 'Permissible with Consent' in the relevant tables following Figure 25, must include a risk assessment.

### **7.2.2 Assessment of Development for Potentially Hazardous Development**

- (a) A new potentially hazardous fixed facility, or modifications to an existing potentially hazardous fixed facility, should be assessed against all relevant qualitative and quantitative risk criteria from HIPAP No. 4 and HIPAP No. 10 (Refer to Section 6.2.1 and Section 6.2.3). Such a development may be subject to other development approval requirements (e.g. under the EP&A Act, SEPP No. 33, existing conditions of development consent, etc.).
- (b) The risk for a proposed development is typically assessed based on the incremental risk from this development alone (i.e. not cumulatively with other potentially hazardous developments). However, the development consent conditions for the BIP require a cumulative risk assessment [Ref. 2] and therefore the risks associated with any modifications to the BIP, including new facilities/subdivisions within the boundary of the BIP, should be assessed cumulatively.
- (c) If another potentially hazardous development (i.e. outside BIP) has the potential to affect the risk profile in the Study Area, then it should be assessed individually and in the context of the cumulative risk presented in the most recent available risk assessments for the Study Area (Including the individual and societal risks from fixed facilities and transport of DGs).

### **7.2.3 Assessment of Development in the Vicinity of Potentially Hazardous Development**

- (a) Any development in the vicinity of an existing potentially hazardous fixed facility should be consistent with all relevant qualitative and quantitative risk criteria from HIPAP No. 10 (Refer to Section 6.2.1 and Section 6.2.4). A proposed development may still be appropriate if mitigating measures can be implemented to reduce the risk exposure to less than the relevant criteria (Refer to Section 6.2.4).

- (b) Although not explicitly stated in HIPAP No. 10, the assessment of a proposed development in the vicinity of an existing potentially hazardous fixed facility should be based on the cumulative risk from all risk sources. Therefore, any proposed development within the Study Area should be assessed in the context of the most recent available risk assessments for the Study Area (Including the individual and societal risks from fixed facilities and transport of DGs).
- (c) For societal risk, the incremental societal risk should be compared against the indicative criteria in HIPAP 10 (Refer to Section 6.2.4). If this incremental societal risk lies within the negligible region, then the development should not be precluded on risk grounds. If incremental risks lie within the ALARP region, options should be considered to relocate people away from the affected areas. If, after taking this step, there is still a significant portion of the societal risk plot within the ALARP region, the proposed development may only be approved if the benefits clearly outweigh the risks.

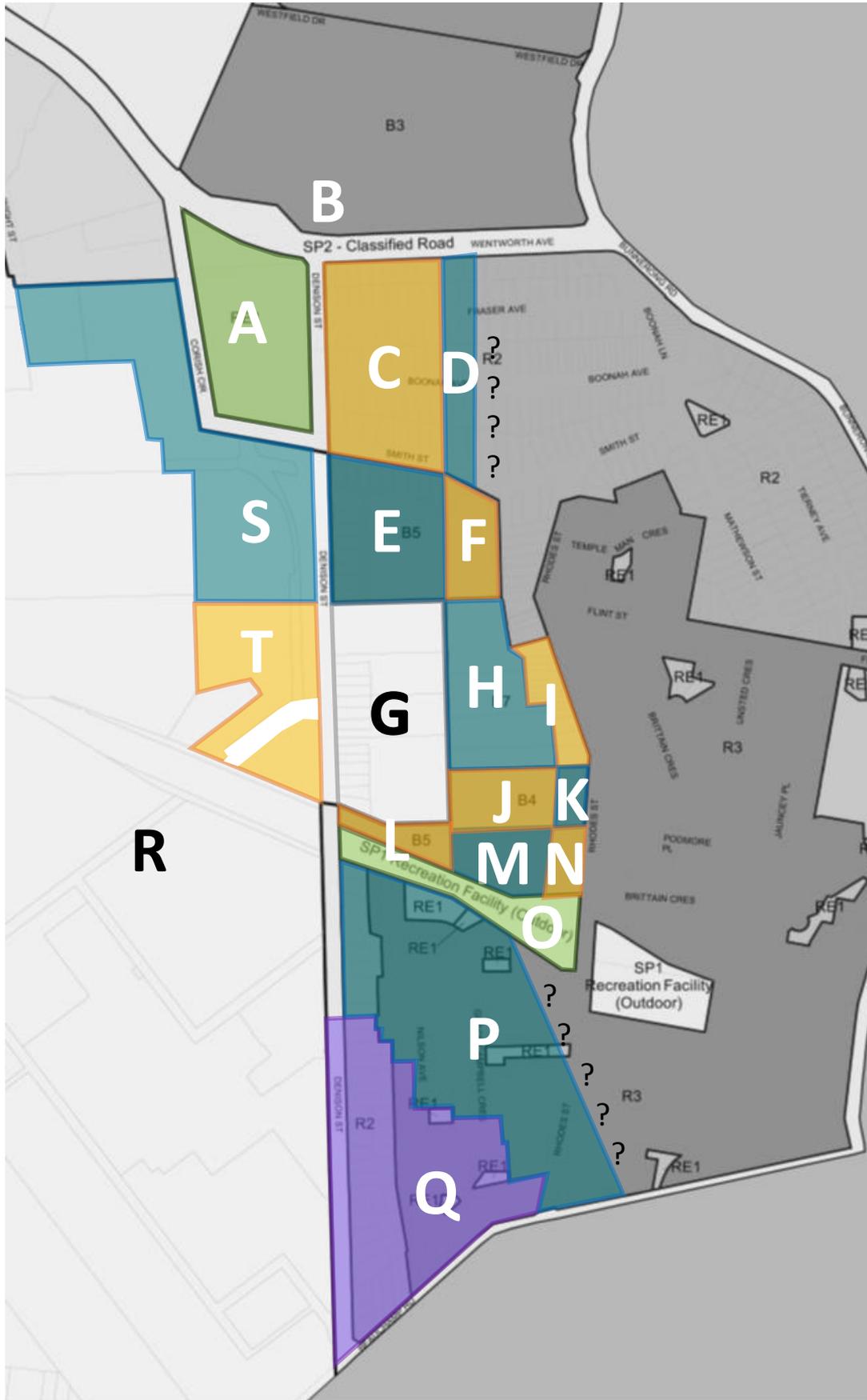
#### **7.2.4 Assessment of Potentially Hazardous Transport Operations**

- (a) A Transport Risk Assessment report should be submitted with all future development applications with the potential to directly or indirectly affect DG traffic along Denison Street. For example, this could include developments outside the Study Area that might significantly increase non-DG traffic along Denison Street, and therefore have the potential to affect the predicted accident rate for DG traffic. This will require ongoing consultation between BBCC and Ports NSW, its neighbouring Councils and the DP&E.
- (b) There are no established quantitative risk criteria in NSW for land use safety planning due to the transport of DGs (Refer to Section 6.3). Therefore, the (location-specific) individual fatality risk and societal risk criteria for fixed facilities should be used to assess the risks from the transport of DGs (Refer to Section 6.3). The established qualitative principles should also be considered (Refer to Section 6.2.1).
- (c) Any proposed changes to the transport of DGs the Study Area (Including new operations or modifications to existing operations), should be assessed individually and in the context of the cumulative risk presented in the most recent available risk assessments for the Study Area (Including the individual and societal from fixed facilities and transport of DGs).

#### **7.2.5 Assessment of Development in the Vicinity of Existing Potentially Hazardous Transport Operations**

- (a) Although not explicitly stated in HIPAP No. 10, the assessment of a proposed development in the vicinity of an existing potentially hazardous transport operation should be based on the cumulative risk from all risk sources. Therefore, any proposed development in the Study Area should be assessed in the context of the cumulative risks presented in the most recent available risk assessments for the Study Area (Including the individual and societal from fixed facilities and transport of DGs).
- (b) For societal risk, the incremental societal risk should be compared against the indicative criteria in HIPAP 10 (Refer to Section 6.2.4). If this incremental societal risk lies within the negligible region, then the development should not be precluded. If incremental risks lie within the ALARP region, options should be considered to relocate people away from the affected areas. If, after taking this step, there is still a significant portion of the societal risk plot within the ALARP region, the proposed development should only be approved if the benefits clearly outweigh the risks.

**Figure 25 Areas Requiring Specific Risk-Based Planning Controls**



## Area A – Hensley Athletics Field

<b>Description</b>	Lots bounded by Wentworth Avenue, Corish Crescent and Denison Street (i.e. principally Hensley Athletics Field).
<b>Zoning</b>	<p><b>RE1 - Public Recreation (With Additional Permitted Uses)</b></p> <p>The zoning for this Area is primarily for recreational uses (viz. Defined as ‘open space’ uses in HIPAP No. 4). However, child care centres and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) are also permissible with consent.</p> <p>Environmental works are permitted without consent. These works are not expected to introduce large populations and a higher LSIFR criterion would typically apply (viz. equivalent to an industrial use as defined in HIPAP No. 4) than for the other permissible uses.</p> <p>It would not be appropriate to rezone this Area for residential or sensitive uses based on the cumulative LSIFR (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area, with a maximum LSIFR of c. 10 pmpy near the NE corner at the intersection of Wentworth Avenue and Denison Street. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, relatively high populations may be present during sporting events and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities & old age housing)	Permitted with consent	<b>Prohibited</b>	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area. There are no existing sensitive use developments and future sensitive use developments are to be prohibited.
<b>RESIDENTIAL</b> (Residential developments & places of continuous occupancy, such as hotels & tourist resorts)	Prohibited	Prohibited	The cumulative LSIFR is $\geq 1$ pmpy at this Area. There are no existing residential developments and future residential developments are prohibited.
<b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants & entertainment centres)	Permitted with consent	Permitted with consent	The cumulative LSIFR is $\leq 5$ pmpy for most of this Area (Note: Commercial development is unlikely to be permitted in the NE corner of this Area where the LSIFR is $\geq 5$ pmpy). There are no existing commercial developments; however, these developments may be permitted in the future. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<b>OPEN SPACE</b> (Sporting complexes & active open space areas)	Permitted with consent	Permitted with consent	The cumulative LSIFR is $\leq 10$ pmpy for most of this Area. There are existing open space uses in this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<b>INDUSTRIAL</b>	Prohibited	Prohibited	This Area is not zoned for industrial uses. There are no existing industrial uses and future industrial uses are prohibited.

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area B – Commercial Core Zone North of Wentworth Avenue

<b>Description</b>	Lot/s in Study Area to the north of Wentworth Avenue (i.e. principally Westfields Shopping Centre).
<b>Zoning</b>	<p><b>B3 – Commercial Core</b></p> <p>The zoning for this Area is primarily for retail, business, office, entertainment, and community uses (viz. Defined as ‘residential’ or ‘commercial’ uses in HIPAP No. 4) including: commercial premises; community facilities; educational establishments; entertainment facilities; function centres; hotel or motel accommodation; information and education facilities; medical centres; passenger transport facilities; recreation facilities (indoor); and, registered clubs. However, respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4), and other ‘sensitive uses’ that are not specifically prohibited (e.g. child care facilities, hospitals) are also permissible with consent and should be prohibited in the southern part of this Area based on the cumulative LSIFR.</p> <p>It would not be appropriate to rezone the southern part of this Area for residential or sensitive uses based on the cumulative LSIFR (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 0.5$ pmpy for the southern part of this Area, with a maximum LSIFR of c. 10 pmpy at the intersection of Wentworth Avenue and Denison Street. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, relatively high populations may be present during operating hours and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities &amp; old age housing)</p>	Permitted with consent	Prohibited (South) or Permitted with consent (North)	<p>The cumulative LSIFR is <math>\geq 0.5</math> pmpy for the southern part of this Area.</p> <p>Any proposed population intensification for the northern part of this Area will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>RESIDENTIAL</b> (Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Prohibited or Permitted with consent #	Prohibited (South) or Permitted with consent (North)	<p># Currently: residential accommodation is prohibited; and, hotels / motels and tourist &amp; visitor accommodation are permitted with consent.</p> <p>The cumulative LSIFR is <math>\geq 1</math> pmpy for the southern part of this Area.</p> <p>Any proposed population intensification for the northern part will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 5</math> pmpy for most of this Area (Note: Commercial development is unlikely to be permitted near the intersection of Denison St and Wentworth Avenue where the LSIFR is <math>\geq 5</math> pmpy).</p> <p>There are existing commercial uses in this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>OPEN SPACE</b> (Sporting complexes &amp; active open space areas)</p>	Permitted with consent #	Permitted with consent	<p># Currently, recreation areas and recreation facilities (indoor) are permitted with consent.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>INDUSTRIAL</b></p>	Prohibited	Prohibited	<p>This Area is not zoned for industrial uses.</p> <p>There are no existing industrial uses and future industrial uses are prohibited.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area C – Low Density Residential Zone in Eastgardens Precinct

<b>Description</b>	Lots bounded by Wentworth Avenue, Denison Street and Smith Street in Eastgardens Precinct.
<b>Zoning</b>	<p><b>R2 – Low Density Residential</b></p> <p>The zoning for this Area is primarily for residential uses and places of continuous occupancy (as defined in HIPAP No. 4), including: attached dwellings; bed and breakfast accommodation; boarding houses; community facilities; dwelling houses; group homes; multi dwelling housing; places of public worship; recreation areas; residential flat buildings; and semi-detached dwellings. Home occupations are permitted without consent.</p> <p>Child care centres, health consulting rooms, hospitals and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) and neighbourhood shops and office premises (viz. Defined as ‘commercial uses’ in HIPAP No. 4) are also permissible with consent.</p> <p>Building identification signs, business identification signs, environmental protection works and flood mitigation works are permissible with consent.</p> <p>It would not be appropriate to rezone this Area for higher density residential or sensitive uses based on the cumulative LSIFR and societal risk (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area, with a maximum LSIFR of c. 10 pmpy in the NW corner at the intersection of Wentworth Avenue and Denison Street. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, residential populations are expected to be present all the time and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities & old age housing)	Permitted with consent	Prohibited	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area.
<b>RESIDENTIAL</b> (Residential developments & places of continuous occupancy, such as hotels & tourist resorts)	Permitted with consent	Prohibited	The cumulative LSIFR is $\geq 1$ pmpy at this Area.
<b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants & entertainment centres)	Permitted with consent #	Permitted with consent	# Currently, neighbourhood shops and office premises are permitted with consent. The cumulative LSIFR is $\leq 5$ pmpy for most of this Area (Note: Commercial development is unlikely to be permitted in the NW corner where the LSIFR is $\geq 5$ pmpy). There are no existing commercial developments; however, these developments may be permitted in the future. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<b>OPEN SPACE</b> (Sporting complexes & active open space areas)	Permitted with consent #	Permitted with consent	# Currently, recreation areas are permitted with consent. The cumulative LSIFR is $\leq 10$ pmpy at this Area (Except for a small area in the NW corner at the intersection of Wentworth Avenue and Denison Street). Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<b>INDUSTRIAL</b>	Prohibited	Prohibited	This Area is not zoned for industrial uses. There are no existing industrial uses and future industrial uses are prohibited.

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area D – Low Density Residential Zone in Eastgardens Precinct

<b>Description</b>	Lots bounded by Wentworth Avenue and Smith Street in Eastgardens Precinct.
<b>Zoning</b>	<p><b>R2 – Low Density Residential</b></p> <p>The zoning for this Area is primarily for residential uses and places of continuous occupancy (as defined in HIPAP No. 4), including: attached dwellings; bed and breakfast accommodation; boarding houses; community facilities; dwelling houses; group homes; multi dwelling housing; places of public worship; recreation areas; residential flat buildings; and semi-detached dwellings. Home occupations are permitted without consent.</p> <p>Child care centres, health consulting rooms, hospitals and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) and neighbourhood shops and office premises (viz. Defined as ‘commercial uses’ in HIPAP No. 4) are also permissible with consent.</p> <p>Building identification signs, business identification signs, environmental protection works and flood mitigation works are permissible with consent.</p> <p>It would not be appropriate to rezone this Area for higher density residential or sensitive uses based on the cumulative LSIFR and societal risk (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area, with a maximum LSIFR of c. 1 pmpy at the boundary with Area C. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, residential populations are expected to be present all the time and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities &amp; old age housing)</p>	Permitted with consent	Prohibited *	<p>The cumulative LSIFR is <math>\geq 0.5</math> pmpy at this Area.</p> <p>* The eastern boundary of this area is difficult to determine from the available risk assessments (This area of uncertainty is indicated by the ‘?’ symbols on Figure 25).</p>
<p><b>RESIDENTIAL</b> (Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 1</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Permitted with consent #	Permitted with consent	<p># Currently, neighbourhood shops and office premises are permitted with consent.</p> <p>The cumulative LSIFR is <math>\leq 5</math> pmpy at this area.</p> <p>There are no existing commercial developments; however, these developments may be permitted in the future.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>OPEN SPACE</b> (Sporting complexes &amp; active open space areas)</p>	Permitted with consent #	Permitted with consent	<p># Currently, recreation areas are permitted with consent.</p> <p>The cumulative LSIFR is <math>\leq 10</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>INDUSTRIAL</b></p>	Prohibited	Prohibited	<p>This Area is not zoned for industrial uses.</p> <p>There are no existing industrial uses and future industrial uses are prohibited.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area E – Business Development Zone in Banksmeadow Industrial Precinct

<b>Description</b>	Lot/s in Banksmeadow Industrial Precinct bounded by Denison Street and Smith Street (i.e. principally Bunnings Development).
<b>Zoning</b>	<p><b>B5 – Business Development</b></p> <p>The zoning for this Area is primarily for business and warehouse uses, and bulky goods premises that require a large floor area (viz. Defined as ‘commercial’ uses in HIPAP No. 4), including: bulky goods premises; food and drink premises; garden centres; hardware and building supplies; high technology industries; landscaping material supplies; neighbourhood shops; passenger transport facilities; vehicle sales or hire premises; warehouse or distribution centres. However, child care centres and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) and tourist &amp; visitor accommodation (viz. Defined as ‘residential uses’ in HIPAP No. 4) are also permissible with consent and should be prohibited based on the cumulative LSIFR (see below). Recreation areas (viz. Defined as ‘open space uses’ in HIPAP No. 4) are also permissible with consent.</p> <p>It would not be appropriate to rezone this Area for residential or sensitive uses based on the cumulative LSIFR (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 1$ pmpy for this Area. The maximum LSIFR appears to be $\leq 5$ pmpy. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, relatively high populations may be present during operating hours and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b></p> <p>(Hospitals, schools, child-care facilities &amp; old age housing)</p>	Permitted with consent	Prohibited	The cumulative LSIFR is $\geq 0.5$ at this Area.
<p><b>RESIDENTIAL</b></p> <p>(Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Permitted with consent #	Prohibited	# Currently, tourist & visitor accommodation is permitted with consent. The cumulative LSIFR is $\geq 1$ pmpy at this Area.
<p><b>COMMERCIAL</b></p> <p>(Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Permitted with consent	Permitted with consent	The cumulative LSIFR is $\leq 5$ pmpy at this Area. There are existing commercial uses in this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<p><b>OPEN SPACE</b></p> <p>(Sporting complexes &amp; active open space areas)</p>	Permitted with consent #	Permitted with consent	# Currently, recreation areas are permitted with consent. The cumulative LSIFR is $\leq 10$ pmpy at this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<p><b>INDUSTRIAL</b></p>	Permitted with consent #	Permitted with consent	# Currently, high-technology industry is permitted with consent. The cumulative LSIFR is $\leq 50$ pmpy at this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area F – Business Development Zone in Banksmeadow Industrial Precinct

<b>Description</b>	Lot/s in Banksmeadow Industrial Precinct bounded by Area E and Smith Street.
<b>Zoning</b>	<p><b>B5 – Business Development</b></p> <p>The zoning for this Area is primarily for business and warehouse uses, and bulky goods premises that require a large floor area (viz. Defined as ‘commercial’ uses in HIPAP No. 4), including: bulky goods premises; food and drink premises; garden centres; hardware and building supplies; high technology industries; landscaping material supplies; neighbourhood shops; passenger transport facilities; vehicle sales or hire premises; warehouse or distribution centres. However, child care centres and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4), tourist &amp; visitor accommodation (viz. Defined as ‘residential uses’ in HIPAP No. 4) and recreation areas (viz. Defined as ‘open space uses’ in HIPAP No. 4) are also permissible with consent.</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\leq 0.5$ pmpy at this Area, with a maximum LSIFR of c. 0.5 pmpy near the boundary with Area E. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, relatively high populations may be present during operating hours and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities &amp; old age housing)</p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 0.5</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>RESIDENTIAL</b> (Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Permitted with consent #	Permitted with consent	<p># Currently, tourist &amp; visitor accommodation is permitted with consent.</p> <p>The cumulative LSIFR is <math>\leq 0.5</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 5</math> pmpy at this Area.</p> <p>There are no existing commercial developments; however, these developments may be permitted in the future.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>OPEN SPACE</b> (Sporting complexes &amp; active open space areas)</p>	Permitted with consent #	Permitted with consent	<p># Currently, recreation areas are permitted with consent.</p> <p>The cumulative LSIFR is <math>\leq 10</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>INDUSTRIAL</b></p>	Permitted with consent #	Permitted with consent	<p># Currently, high-technology industry is permitted with consent.</p> <p>The cumulative LSIFR is <math>\leq 50</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area G – Land Covered by Three Ports SEPP (East of Denison Street)

<b>Description</b>	Lot/s to the east of Denison Street covered by the Three Ports SEPP.
<b>Zoning</b>	<p><b>IN1 – General Industrial</b></p> <p>The zoning for this Area is primarily for port-related general industrial uses (viz. Defined as ‘commercial’ or ‘industrial’ uses in HIPAP No. 4), including: boat building and repair facilities; business premises; depots; food and drink premises; freight transport facilities; general industries; jetties; light industries; neighbourhood shops; office premises; signage; truck depots; vehicle body repair workshops; vehicle repair stations; warehouse or distribution centres; waste or resource management facilities.</p> <p>It would not be appropriate to rezone this Area for residential or sensitive uses based on the cumulative LSIFR and acute toxic irritation risk (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 1$ pmpy at this Area and is $\geq 5$ pmpy for the western half adjacent to Denison Street. The maximum LSIFR appears to be c. 10 pmpy, however this only occurs near the BIP Gate 3 on Denison Street. The cumulative acute toxic injury (10 pmpy) contour does not appear to extend to this Area. The cumulative acute toxic irritation (50 pmpy) contour does extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, relatively high populations may be present during operating hours and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities &amp; old age housing)</p>	Prohibited	Prohibited	The cumulative LSIFR is $\geq 0.5$ pmpy, and the cumulative acute toxic irritation risk is $\geq 50$ pmpy, at this Area.
<p><b>RESIDENTIAL</b> (Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Prohibited	Prohibited	The cumulative LSIFR is $\geq 1$ pmpy at this Area. The cumulative acute toxic irritation risk is $\geq 50$ pmpy at this area.
<p><b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Prohibited *	Prohibited *	The cumulative LSIFR is $\leq 5$ pmpy at the eastern, and $\geq 5$ pmpy at the western, half of this Area. * Office premises, shops, etc. are only permissible in this area if they are associated with, or ancillary to, a port-related industrial use (See below). Other commercial uses are prohibited.
<p><b>OPEN SPACE</b> (Sporting complexes &amp; active open space areas)</p>	Prohibited	Prohibited	This Area is not zoned for open space uses. There are no existing open space uses and future open space uses are prohibited.
<p><b>INDUSTRIAL</b></p>	Permitted with consent	Permitted with consent *	The cumulative LSIFR is $\leq 50$ pmpy at this Area. * Lower risk general and light industries that will not increase the cumulative risk in the Study Area would be the preferred type of development in this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area H – Business Park Zone in Banksmeadow Industrial Precinct

<b>Description</b>	Lot/s in Banksmeadow Industrial Precinct bounded by Areas F, G, H and I.
<b>Zoning</b>	<p><b>B7 – Business Park</b></p> <p>The zoning for this Area is primarily for office and light industrial uses (viz. Defined as ‘commercial’ or ‘industrial’ uses in HIPAP No. 4), including: food and drink premises; light industries; neighbourhood shops; office premises; passenger transport facilities; vehicle sales or hire premises; warehouse or distribution centres. However, child care centres and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) are also permissible with consent and should be prohibited based on the cumulative LSIFR (see below).</p> <p>Home occupations are permitted without consent and dwelling houses and home industries (viz. Defined as ‘residential’ uses in HIPAP No. 4) are permissible with consent. Recreation areas and recreation facilities (indoor) (viz. Defined as ‘open space uses’ in HIPAP No. 4) are also permissible with consent.</p> <p>It would not be appropriate to rezone this Area for sensitive uses based on the cumulative LSIFR (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area, with a maximum LSIFR of c. 1 pmpy near the boundary with Area G. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, some people may be present and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities & old age housing)	Permitted with consent	<b>Prohibited</b>	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area.
<b>RESIDENTIAL</b> (Residential developments & places of continuous occupancy, such as hotels & tourist resorts)	Permitted with consent	Permitted with consent *	<p>The cumulative LSIFR is <math>\leq 1</math> pmpy at this Area.</p> <p>* Higher density residential development (including hotels, etc.) is prohibited under the current zoning and is unlikely to be permissible in this Area due to its potential contribution to the cumulative societal risk. It would not be appropriate to rezone this Area for higher density residential uses.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants & entertainment centres)	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 5</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<b>OPEN SPACE</b> (Sporting complexes & active open space areas)	Permitted with consent #	Permitted with consent	<p># Currently, recreation areas and recreation facilities (indoor) are permitted with consent.</p> <p>The cumulative LSIFR is <math>\leq 10</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<b>INDUSTRIAL</b>	Permitted with consent	Permitted with consent *	<p>The cumulative LSIFR is <math>\leq 50</math> pmpy at this Area.</p> <p>* Lower risk general and light industries that will not increase the cumulative risk in the Study Area would be the preferred type of development in this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area I – Business Park Zone in Hillsdale Precinct

<b>Description</b>	Lot/s in Banksmeadow Industrial Precinct bounded by Area H and Rhodes Street.
<b>Zoning</b>	<p><b>B7 – Business Park</b></p> <p>The zoning for this Area is primarily for office and light industrial uses (viz. Defined as ‘commercial’ or ‘industrial’ uses in HIPAP No. 4), including: food and drink premises; light industries; neighbourhood shops; office premises; passenger transport facilities; vehicle sales or hire premises; warehouse or distribution centres. However, child care centres and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) are also permissible with consent.</p> <p>Home occupations are permitted without consent and dwelling houses and home industries (viz. Defined as ‘residential’ uses in HIPAP No. 4) are permissible with consent. Recreation areas and recreation facilities (indoor) (viz. Defined as ‘open space uses’ in HIPAP No. 4) are also permissible with consent.</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\leq 0.5$ pmpy at this Area. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, some people may be present and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities &amp; old age housing)</p>	Permitted with consent	Permitted with consent	The cumulative LSIFR is $\leq 0.5$ pmpy at this Area.
<p><b>RESIDENTIAL</b> (Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Permitted with consent	Permitted with consent *	<p>The cumulative LSIFR is <math>\leq 1</math> pmpy at this Area.</p> <p>* Higher density residential development (including hotels, etc.) is prohibited under the current zoning. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 5</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>OPEN SPACE</b> (Sporting complexes &amp; active open space areas)</p>	Permitted with consent #	Permitted with consent	<p># Currently, recreation areas and recreation facilities (indoor) are permitted with consent.</p> <p>The cumulative LSIFR is <math>\leq 10</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>INDUSTRIAL</b></p>	Permitted with consent	Permitted with consent *	<p>The cumulative LSIFR is <math>\leq 50</math> pmpy at this Area.</p> <p>* Lower risk general and light industries that will not increase the cumulative risk in the Study Area would be the preferred type of development in this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

### Area J – Mixed Use Zone in Hillsdale Precinct

<b>Description</b>	Lot/s in Hillsdale Precinct bounded by Areas G, H, M and K.
<b>Zoning</b>	<p><b>B4 – Mixed Use</b></p> <p>The zoning for this Area is primarily for a mixture of business, office, residential and retail development (viz. Defined as ‘residential’, ‘commercial’ or ‘industrial’ uses in HIPAP No. 4), including: boarding houses; commercial premises; community facilities; dwelling houses; educational establishments; entertainment facilities; function centres; hotel or motel accommodation; information and education facilities; light industries; medical centres; passenger transport facilities; recreation facilities (indoor); registered clubs; residential flat buildings; restricted premises; and shop top housing. However, child care centres, respite day care centres and seniors housing (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) are also permissible with consent and should be prohibited based on the cumulative LSIFR (see below).</p> <p>Home occupations are permitted without consent.</p> <p>Recreation areas (viz. Defined as ‘open space uses’ in HIPAP No. 4) are also permissible with consent.</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area, with a maximum LSIFR of c. 1 pmpy near the boundary with Area G. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area (Although the 50 pmpy irritation contour appears to be close to the SW corner of this Area).
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, some people may be present and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b></p> <p>(Hospitals, schools, child-care facilities &amp; old age housing)</p>	Permitted with consent	Prohibited	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area.
<p><b>RESIDENTIAL</b></p> <p>(Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Permitted with consent	Permitted with consent *	<p>The cumulative LSIFR is <math>\leq 1</math> pmpy at this Area.</p> <p>* Higher density residential development (including hotels, etc.) is permissible with consent under the current zoning.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>COMMERCIAL</b></p> <p>(Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 5</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>OPEN SPACE</b></p> <p>(Sporting complexes &amp; active open space areas)</p>	Permitted with consent #	Permitted with consent	<p># Currently, recreation areas and recreation facilities (indoor) are permitted with consent.</p> <p>The cumulative LSIFR is <math>\leq 10</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>INDUSTRIAL</b></p>	Permitted with consent	Permitted with consent *	<p>The cumulative LSIFR is <math>\leq 50</math> pmpy at this Area.</p> <p>* Lower risk general and light industries that will not increase the cumulative risk in the Study Area would be the preferred type of development in this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

### Area K – Mixed Use Zone in Hillsdale Precinct

<b>Description</b>	Lot/s in Hillsdale Precinct bounded by Area J and Rhodes Street.
<b>Zoning</b>	<p><b>B4 – Mixed Use</b></p> <p>The zoning for this Area is primarily for a mixture of business, office, residential and retail development (viz. Defined as ‘residential’, ‘commercial’ or ‘industrial’ uses in HIPAP No. 4), including: boarding houses; commercial premises; community facilities; dwelling houses; educational establishments; entertainment facilities; function centres; hotel or motel accommodation; information and education facilities; light industries; medical centres; passenger transport facilities; recreation facilities (indoor); registered clubs; residential flat buildings; restricted premises; and shop top housing. However, child care centres, respite day care centres and seniors housing (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) are also permissible with consent.</p> <p>Home occupations are permitted without consent.</p> <p>Recreation areas (viz. Defined as ‘open space uses’ in HIPAP No. 4) are also permissible with consent.</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\leq 0.5$ pmpy at this Area. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area (Although the 50 pmpy irritation contour appears to be close to the SW corner of this Area).
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, some people may be present and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities &amp; old age housing)</p>	Permitted with consent	Permitted with consent	The cumulative LSIFR is $\leq 0.5$ pmpy at this Area.
<p><b>RESIDENTIAL</b> (Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Permitted with consent	Permitted with consent *	<p>The cumulative LSIFR is <math>\leq 1</math> pmpy at this Area.</p> <p>* Higher density residential development (including hotels, etc.) is permissible with consent under the current zoning.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 5</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>OPEN SPACE</b> (Sporting complexes &amp; active open space areas)</p>	Permitted with consent #	Permitted with consent	<p># Currently, recreation areas and recreation facilities (indoor) are permitted with consent.</p> <p>The cumulative LSIFR is <math>\leq 10</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>INDUSTRIAL</b></p>	Permitted with consent	Permitted with consent *	<p>The cumulative LSIFR is <math>\leq 50</math> pmpy at this Area.</p> <p>* Lower risk general and light industries that will not increase the cumulative risk in the Study Area would be the preferred type of development in this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area L – Business Development Zone in Banksmeadow Industrial Precinct

<b>Description</b>	Lot/s in Banksmeadow Industrial Precinct adjacent to Denison Street and Rhodes Street Reserve
<b>Zoning</b>	<p><b>B5 – Business Development</b></p> <p>The zoning for this Area is primarily for business and warehouse uses, and bulky goods premises that require a large floor area (viz. Defined as ‘commercial’ uses in HIPAP No. 4), including: bulky goods premises; food and drink premises; garden centres; hardware and building supplies; high technology industries; landscaping material supplies; neighbourhood shops; passenger transport facilities; vehicle sales or hire premises; warehouse or distribution centres. However, child care centres and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) and tourist &amp; visitor accommodation (viz. Defined as ‘residential uses’ in HIPAP No. 4) are also permissible with consent and should be prohibited based on the cumulative LSIFR (see below). Recreation areas (viz. Defined as ‘open space uses’ in HIPAP No. 4) and high-technology industry (viz. Defined as an ‘industrial use’ in HIPAP No. 4) are also permissible with consent.</p> <p>It would not be appropriate to rezone this Area for residential or sensitive uses based on the cumulative LSIFR and acute toxic irritation risk (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 1$ pmpy at this Area. The maximum LSIFR appears to be $\leq 5$ pmpy. The cumulative acute toxic injury (10 pmpy) contour does not appear to extend to this Area. The cumulative acute toxic irritation (50 pmpy) contour does extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, relatively high populations may be present during operating hours and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities & old age housing)	Permitted with consent	Prohibited	The cumulative LSIFR is $\geq 0.5$ at this Area. The cumulative acute toxic irritation risk is $\geq 50$ pmpy at this area.
<b>RESIDENTIAL</b> (Residential developments & places of continuous occupancy, such as hotels & tourist resorts)	Permitted with consent #	Prohibited	# Currently, tourist & visitor accommodation is permitted with consent. The cumulative LSIFR is $\geq 1$ pmpy at this Area. The cumulative acute toxic irritation risk is $\geq 50$ pmpy at this area.
<b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants & entertainment centres)	Permitted with consent	Permitted with consent	The cumulative LSIFR is $\leq 5$ pmpy at this Area. There are existing commercial uses in this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<b>OPEN SPACE</b> (Sporting complexes & active open space areas)	Permitted with consent #	Permitted with consent	# Currently, recreation areas are permitted with consent. The cumulative LSIFR is $\leq 10$ pmpy at this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<b>INDUSTRIAL</b>	Permitted with consent #	Permitted with consent	# Currently, high-technology industry is permitted with consent. The cumulative LSIFR is $\leq 50$ pmpy at this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area M – Medium Density Residential Zone in Hillsdale Precinct

<b>Description</b>	Lot/s in Hillsdale Precinct bounded by Areas J, L, N and O.
<b>Zoning</b>	<p><b>R3 – Medium Density Residential</b></p> <p>The zoning for this Area is primarily for medium density residential uses and places of continuous occupancy (as defined in HIPAP No. 4), including: attached dwellings; bed and breakfast accommodation; boarding houses; community facilities; dwelling houses; group homes; multi dwelling housing; places of public worship; residential flat buildings; and, semi-detached dwellings. Child care centres, respite day care centres and seniors housing (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) and neighbourhood shops and office premises (viz. Defined as ‘commercial’ uses in HIPAP No. 4) are also permissible with consent.</p> <p>Home occupations are permitted without consent.</p> <p>Recreation areas (viz. Defined as ‘open space uses’ in HIPAP No. 4) are also permissible with consent.</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\leq 0.5$ pmpy at this Area. The cumulative acute toxic injury (10 pmpy) contour does not appear to extend to this Area. The cumulative acute toxic irritation (50 pmpy) contour does extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, some people may be present and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities &amp; old age housing)</p>	Permitted with consent	Prohibited	The cumulative LSIFR is $\leq 0.5$ pmpy at this Area. However, the cumulative acute toxic irritation risk is $\geq 50$ pmpy at this area.
<p><b>RESIDENTIAL</b> (Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Permitted with consent	Prohibited	The cumulative LSIFR is $\leq 1$ pmpy at this Area. However, the cumulative acute toxic irritation risk is $\geq 50$ pmpy at this area.
<p><b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Permitted with consent	Permitted with consent	The cumulative LSIFR is $\leq 5$ pmpy at this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<p><b>OPEN SPACE</b> (Sporting complexes &amp; active open space areas)</p>	Permitted with consent #	Permitted with consent	# Currently, recreation areas are permitted with consent. The cumulative LSIFR is $\leq 10$ pmpy at this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<p><b>INDUSTRIAL</b></p>	Prohibited	Prohibited	This Area is not zoned for industrial uses. There are no existing industrial uses and future industrial uses are prohibited.

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area N – Medium Density Residential Zone in Hillsdale Precinct

<b>Description</b>	Lot/s in Hillsdale Precinct bounded by Area M and Rhodes Street.
<b>Zoning</b>	<p><b>R3 – Medium Density Residential</b></p> <p>The zoning for this Area is primarily for medium density residential uses and places of continuous occupancy (as defined in HIPAP No. 4), including: attached dwellings; bed and breakfast accommodation; boarding houses; community facilities; dwelling houses; group homes; multi dwelling housing; places of public worship; residential flat buildings; and, semi-detached dwellings. Child care centres, respite day care centres and seniors housing (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) and neighbourhood shops and office premises (viz. Defined as ‘commercial’ uses in HIPAP No. 4) are also permissible with consent.</p> <p>Home occupations are permitted without consent.</p> <p>Recreation areas (viz. Defined as ‘open space uses’ in HIPAP No. 4) are also permissible with consent.</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\leq 0.5$ pmpy at this Area. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, some people may be present and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities &amp; old age housing)</p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 0.5</math> pmpy at this Area.</p> <p>The cumulative acute toxic injury risk is <math>\leq 10</math> pmpy, and the cumulative acute toxic irritation risk is <math>\leq 50</math> pmpy, at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>RESIDENTIAL</b> (Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 1</math> pmpy at this Area.</p> <p>The cumulative acute toxic injury risk is <math>\leq 10</math> pmpy, and the cumulative acute toxic irritation risk is <math>\leq 50</math> pmpy, at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 5</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>OPEN SPACE</b> (Sporting complexes &amp; active open space areas)</p>	Permitted with consent #	Permitted with consent	<p># Currently, recreation areas are permitted with consent.</p> <p>The cumulative LSIFR is <math>\leq 10</math> pmpy at this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<p><b>INDUSTRIAL</b></p>	Prohibited	Prohibited	<p>This Area is not zoned for industrial uses.</p> <p>There are no existing industrial uses and future industrial uses are prohibited.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area O – Rhodes Street Reserve

<b>Description</b>	Lots bounded by Denison Street and Rhodes Street (i.e. principally Rhodes Street Reserve).
<b>Zoning</b>	<p><b>SP1 – Special Activities</b></p> <p>The zoning for this Area is primarily for the purpose shown on the Land Zoning Map (i.e. recreational uses, which are defined as ‘open space’ uses in HIPAP No. 4).</p> <p>Environmental works are permitted without consent. These works are not expected to introduce large populations and a higher LSIFR criterion would typically apply (viz. equivalent to an industrial use as defined in HIPAP No. 4) than for the other permissible uses.</p> <p>It would not be appropriate to rezone this Area for residential or sensitive uses based on the cumulative LSIFR and acute toxic injury risk (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 0.5$ pmpy for the western half of this Area, with a maximum LSIFR $\leq 5$ pmpy at the NW corner near Denison Street. The cumulative acute toxic injury (10 pmpy) contour does not extend to this Area. The cumulative acute toxic irritation (50 pmpy) contour does extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, relatively low populations may be present at the park and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities & old age housing)	Prohibited	Prohibited	<p>The cumulative LSIFR is <math>\geq 0.5</math> pmpy at the western half of this Area.</p> <p>The cumulative acute toxic irritation risk is <math>\geq 50</math> pmpy at this Area.</p> <p>This Area is not zoned for sensitive uses.</p> <p>There are no existing sensitive uses and future sensitive uses are prohibited.</p>
<b>RESIDENTIAL</b> (Residential developments & places of continuous occupancy, such as hotels & tourist resorts)	Prohibited	Prohibited	<p>The cumulative LSIFR is <math>\geq 1</math> pmpy at the western half of this Area.</p> <p>The cumulative acute toxic irritation risk is <math>\geq 50</math> pmpy at this Area.</p> <p>This Area is not zoned for residential uses.</p> <p>There are no existing residential uses and future residential uses are prohibited.</p>
<b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants & entertainment centres)	Prohibited	Prohibited	<p>The cumulative LSIFR is <math>\leq 5</math> pmpy at this Area.</p> <p>This Area is not zoned for commercial uses.</p> <p>There are no existing commercial uses and future commercial uses are prohibited.</p>
<b>OPEN SPACE</b> (Sporting complexes & active open space areas)	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\leq 10</math> pmpy at this Area.</p> <p>There are existing open space uses in this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>
<b>INDUSTRIAL</b>	Prohibited	Prohibited	<p>This Area is not zoned for industrial uses.</p> <p>There are no existing industrial uses and future industrial uses are prohibited.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area P – Low and Medium Residential Zone in Hillsdale Precinct

<b>Description</b>	Lot/s in Hillsdale Precinct bounded by Denison Street and Rhodes Street.
<b>Zoning</b>	<p>The zoning in this Area includes low and medium density residential and small open spaces for public recreation.</p> <p><b>R2 – Low Density Residential / R3 – Medium Density Residential</b></p> <p>The R2 and R3 zoning in this Area is primarily for low and medium residential uses and places of continuous occupancy (as defined in HIPAP No. 4), including: attached dwellings; bed and breakfast accommodation; boarding houses; community facilities; dwelling houses; group homes; multi dwelling housing; places of public worship; recreation areas; residential flat buildings; and semi-detached dwellings.</p> <p>Home occupations are permitted without consent in the R2 and R3 zones.</p> <p>Child care centres, health consulting rooms, hospitals and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) and neighbourhood shops and office premises (viz. Defined as ‘commercial uses’ in HIPAP No. 4) are also permissible with consent in the R2 and/or R3 zones.</p> <p><b>RE1 - Public Recreation</b></p> <p>The RE1 zoning in this Area is primarily for recreational uses (viz. Defined as ‘open space’ uses in HIPAP No. 4). However, child care centres and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) are also permissible with consent.</p> <p>Environmental works are permitted without consent. These works are not expected to introduce large populations and a higher LSIFR criterion would typically apply (viz. equivalent to an industrial use as defined in HIPAP No. 4) than for the other permissible uses.</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 1$ pmpy at this Area (principally to the west of Nilson Avenue). The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, residential populations are expected to always be present and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities & old age housing)	Permitted with consent	Prohibited *	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area (principally to the west of Nilson Avenue). The cumulative acute toxic injury risk is $\geq 10$ pmpy and/or the cumulative acute toxic irritation risk is $\geq 50$ pmpy, at this Area. * The eastern boundary of this Area is difficult to determine from the available risk assessments (This area of uncertainty is indicated by the row of ‘?’ symbols on Figure 25).
<b>RESIDENTIAL</b> (Residential developments & places of continuous occupancy, such as hotels & tourist resorts)	Permitted with consent	Prohibited *	The cumulative LSIFR is $\geq 1$ pmpy at this Area (principally to the west of Nilson Avenue). The cumulative acute toxic injury risk is $\geq 10$ pmpy and/or the cumulative acute toxic irritation risk is $\geq 50$ pmpy, at this Area. * The eastern boundary of this Area is difficult to determine from the available risk assessments (This area of uncertainty is indicated by the row of ‘?’ symbols on Figure 25).
<b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants & entertainment centres)	Permitted with consent	Permitted with consent	The cumulative LSIFR is $\leq 5$ pmpy at this Area. There are no existing commercial developments; however, these developments may be permitted in the future. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<b>OPEN SPACE</b> (Sporting complexes & active open space areas)	Permitted with consent	Permitted with consent	The cumulative LSIFR is ≤10 pmpy at this Area. There are existing open space uses in this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<b>INDUSTRIAL</b>	Prohibited	Prohibited	This Area is not zoned for industrial uses. There are no existing industrial uses and future industrial uses are prohibited.

\* Note: 'Industrial', 'residential', etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area Q – Low and Medium Residential Zone in Hillsdale Precinct

<b>Description</b>	Lot/s in Hillsdale Precinct bounded by Denison Street and Rhodes Street (Principally the ‘consultation zone from the 2001 LUSS).
<b>Zoning</b>	<p>The zoning in this Area includes low and medium density residential and small open spaces for public recreation.</p> <p><b>R2 – Low Density Residential / R3 – Medium Density Residential</b></p> <p>The R2 and R3 zoning in this Area is primarily for low and medium residential uses and places of continuous occupancy (as defined in HIPAP No. 4), including: attached dwellings; bed and breakfast accommodation; boarding houses; community facilities; dwelling houses; group homes; multi dwelling housing; places of public worship; recreation areas; residential flat buildings; and semi-detached dwellings.</p> <p>Home occupations are permitted without consent in the R2 and R3 zones.</p> <p>Child care centres, health consulting rooms, hospitals and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) and neighbourhood shops and office premises (viz. Defined as ‘commercial uses’ in HIPAP No. 4) are also permissible with consent in the R2 and/or R3 zones.</p> <p><b>RE1 - Public Recreation</b></p> <p>The RE1 zoning in this Area is primarily for recreational uses (viz. Defined as ‘open space’ uses in HIPAP No. 4). However, child care centres and respite day care centres (viz. Defined as ‘sensitive uses’ in HIPAP No. 4) are also permissible with consent.</p> <p>Environmental works are permitted without consent. These works are not expected to introduce large populations and a higher LSIFR criterion would typically apply (viz. equivalent to an industrial use as defined in HIPAP No. 4) than for the other permissible uses.</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 1$ pmpy at this Area (principally to the west of Nilson Avenue), with a maximum LSIFR of c. 5 pmpy in the SW corner near the intersection of Beauchamp Road and Denison Street. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, residential populations are expected to always be present and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<b>SENSITIVE USES</b> (Hospitals, schools, child-care facilities & old age housing)	Permitted with consent	<b>Prohibited</b>	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area (principally to the west of Nilson Avenue). The cumulative acute toxic injury risk is $\geq 10$ pmpy and the cumulative acute toxic irritation risk is $\geq 50$ pmpy, at this Area.
<b>RESIDENTIAL</b> (Residential developments & places of continuous occupancy, such as hotels & tourist resorts)	Permitted with consent	<b>Prohibited</b>	The cumulative LSIFR is $\geq 1$ pmpy at this Area (principally to the west of Nilson Avenue). The cumulative acute toxic injury risk is $\geq 10$ pmpy and the cumulative acute toxic irritation risk is $\geq 50$ pmpy, at this Area.
<b>COMMERCIAL</b> (Including offices, retail centres, warehouses with showrooms, restaurants & entertainment centres)	Permitted with consent	Permitted with consent	The cumulative LSIFR is $\leq 5$ pmpy for most of this Area (Note: Commercial development is unlikely to be permitted in the SW corner of this Area where the LSIFR is $\geq 5$ pmpy). There are no existing commercial developments; however, these developments may be permitted in the future. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<b>OPEN SPACE</b> (Sporting complexes & active open space areas)	Permitted with consent	Permitted with consent	The cumulative LSIFR is ≤10 pmpy at this Area. There are existing open space uses in this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.
<b>INDUSTRIAL</b>	Prohibited	Prohibited	This Area is not zoned for industrial uses. There are no existing industrial uses and future industrial uses are prohibited.

\* Note: 'Industrial', 'residential', etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area R – Land Covered by Three Ports SEPP (Botany Industrial Park)

<b>Description</b>	Lot/s to the west of Denison Street covered by the Three Ports SEPP (Principally BIP).
<b>Zoning</b>	<p><b>IN1 – General Industrial</b></p> <p>The zoning for this Area is primarily for port-related general industrial uses (viz. Defined as ‘commercial’ or ‘industrial’ uses in HIPAP No. 4), including: boat building and repair facilities; business premises; depots; food and drink premises; freight transport facilities; general industries; jetties; light industries; neighbourhood shops; office premises; signage; truck depots; vehicle body repair workshops; vehicle repair stations; warehouse or distribution centres; waste or resource management facilities.</p> <p>It would not be appropriate to rezone this Area for residential or sensitive uses based on the cumulative LSIFR and acute toxic irritation risk (See below).</p>
<b>Individual Risk</b>	<p>The maximum cumulative LSIFR is <math>\geq 50</math> pmpy at this Area. The cumulative LSIFR is typically between 1 and 5 pmpy at the boundary of this Area (In some areas these risk levels are reached beyond the boundary of this Area).</p> <p>The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours extend to most of this Area. Other injury and property damage contours are also located within the boundary of this Area (Refer to Section 5.3).</p>
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, relatively high populations may be present during operating hours and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b></p> <p>(Hospitals, schools, child-care facilities &amp; old age housing)</p>	Prohibited	Prohibited	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area.
<p><b>RESIDENTIAL</b></p> <p>(Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Prohibited	Prohibited	The cumulative LSIFR is $\geq 1$ pmpy at this Area.
<p><b>COMMERCIAL</b></p> <p>(Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Prohibited *	Prohibited *	<p>The cumulative LSIFR is <math>\geq 5</math> pmpy for the majority of this Area.</p> <p>* Office premises, shops, etc. are only permissible in this area if they are associated with, or ancillary to, a port-related industrial use (See below). Other commercial uses are prohibited.</p>
<p><b>OPEN SPACE</b></p> <p>(Sporting complexes &amp; active open space areas)</p>	Prohibited	Prohibited	<p>This Area is not zoned for open space uses.</p> <p>There are no existing open space uses and future open space uses are prohibited.</p>
<p><b>INDUSTRIAL</b></p>	Permitted with consent	Permitted with consent	<p>The cumulative LSIFR is <math>\geq 50</math> pmpy at this Area and this is primarily from the existing potentially hazardous industries in the BIP.</p> <p>A new potentially hazardous industrial development, or modifications to the existing BIP facilities, is potentially permissible with consent in accordance with SEPP No. 33.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

### Area S – Land Covered by Three Ports SEPP (West of Denison Street)

<b>Description</b>	Lot/s to the west of Denison Street (North of BIP Gate 3) covered by the Three Ports SEPP.
<b>Zoning</b>	<p><b>IN1 – General Industrial</b></p> <p>The zoning for this Area is primarily for port-related general industrial uses (viz. Defined as ‘commercial’ or ‘industrial’ uses in HIPAP No. 4), including: boat building and repair facilities; business premises; depots; food and drink premises; freight transport facilities; general industries; jetties; light industries; neighbourhood shops; office premises; signage; truck depots; vehicle body repair workshops; vehicle repair stations; warehouse or distribution centres; waste or resource management facilities.</p> <p>It would not be appropriate to rezone this Area for residential or sensitive uses based on the cumulative LSIFR (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 0.5$ pmpy at most of this Area. The maximum cumulative LSIFR is $\leq 5$ pmpy. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours do not extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, relatively high populations may be present during operating hours and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b></p> <p>(Hospitals, schools, child-care facilities &amp; old age housing)</p>	Prohibited	Prohibited	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area.
<p><b>RESIDENTIAL</b></p> <p>(Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Prohibited	Prohibited	The cumulative LSIFR is $\geq 1$ pmpy at this Area.
<p><b>COMMERCIAL</b></p> <p>(Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Prohibited *	Prohibited *	<p>The cumulative LSIFR is <math>\leq 5</math> pmpy at this Area.</p> <p>* Office premises, shops, etc. are only permissible in this area if they are associated with, or ancillary to, a port-related industrial use (See below). Other commercial uses are prohibited.</p>
<p><b>OPEN SPACE</b></p> <p>(Sporting complexes &amp; active open space areas)</p>	Prohibited	Prohibited	<p>This Area is not zoned for open space uses.</p> <p>There are no existing open space uses and future open space uses are prohibited.</p>
<p><b>INDUSTRIAL</b></p>	Permitted with consent	Permitted with consent *	<p>The cumulative LSIFR is <math>\leq 50</math> pmpy at this Area.</p> <p>* Lower risk general and light industries that will not increase the cumulative risk in the Study Area would be the preferred type of development in this Area.</p> <p>Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.</p>

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

## Area T – Land Covered by Three Ports SEPP (West of Denison Street)

<b>Description</b>	Lot/s to the west of Denison Street (Near BIP Gate 3) covered by the Three Ports SEPP.
<b>Zoning</b>	<p><b>IN1 – General Industrial</b></p> <p>The zoning for this Area is primarily for port-related general industrial uses (viz. Defined as ‘commercial’ or ‘industrial’ uses in HIPAP No. 4), including: boat building and repair facilities; business premises; depots; food and drink premises; freight transport facilities; general industries; jetties; light industries; neighbourhood shops; office premises; signage; truck depots; vehicle body repair workshops; vehicle repair stations; warehouse or distribution centres; waste or resource management facilities.</p> <p>It would not be appropriate to rezone this Area for commercial, residential or sensitive uses based on the cumulative LSIFR and acute toxic irritation risk (See below).</p>
<b>Individual Risk</b>	The cumulative LSIFR is $\geq 5$ pmpy at this Area and is c. 10 pmpy near the BIP Gate 3 entrance on Denison Street. The cumulative acute toxic injury (10 pmpy) and irritation (50 pmpy) contours extend to this Area.
<b>Societal Risk</b>	It is not possible to determine the contribution to the cumulative societal risk (‘FN Curve’) for the population at this specific Area based on the available risk assessments. However, relatively high populations may be present during operating hours and this will contribute to the cumulative societal risk (‘FN Curve’) for the Study Area.

Category of Development for Land Use Safety Planning *	Current Control	Proposed New Development or Modification to Existing Development	
		Proposed Control	Basis
<p><b>SENSITIVE USES</b></p> <p>(Hospitals, schools, child-care facilities &amp; old age housing)</p>	Prohibited	Prohibited	The cumulative LSIFR is $\geq 0.5$ pmpy at this Area. The cumulative acute toxic injury risk is $\geq 10$ pmpy, and the cumulative acute toxic irritation risk is $\geq 50$ pmpy, at this Area.
<p><b>RESIDENTIAL</b></p> <p>(Residential developments &amp; places of continuous occupancy, such as hotels &amp; tourist resorts)</p>	Prohibited	Prohibited	The cumulative LSIFR is $\geq 1$ pmpy at this Area. The cumulative acute toxic injury risk is $\geq 10$ pmpy, and the cumulative acute toxic irritation risk is $\geq 50$ pmpy, at this Area.
<p><b>COMMERCIAL</b></p> <p>(Including offices, retail centres, warehouses with showrooms, restaurants &amp; entertainment centres)</p>	Prohibited *	Prohibited *	The cumulative LSIFR is $\geq 5$ pmpy at this Area. * Office premises, shops, etc. are only permissible in this area if they are associated with, or ancillary to, a port-related industrial use (See below). Other commercial uses are prohibited.
<p><b>OPEN SPACE</b></p> <p>(Sporting complexes &amp; active open space areas)</p>	Prohibited	Prohibited	This Area is not zoned for open space uses. There are no existing open space uses and future open space uses are prohibited.
<p><b>INDUSTRIAL</b></p>	Permitted with consent	Permitted with consent *	The cumulative LSIFR is $\leq 50$ pmpy at this Area. * Lower risk general and light industries that will not increase the cumulative risk in the Study Area would be the preferred type of development in this Area. Any proposed population intensification will require a societal risk assessment. Consent must not be based on complying with individual risk criteria alone.

\* Note: ‘Industrial’, ‘residential’, etc. uses, as defined in HIPAP No. 4, may not align with zones defined in the LEP (e.g. IN1, etc.).

### 7.3 Summary of Key Points

The risk-related planning controls in the current BBDCP2013:

- Are included in Part 6 ('Employment Zones') and Part 8 ('Character Zones'). Part 6 only covers the industrial land in the Study Area (i.e. Banksmeadow Industrial Precinct), however, there are also provisions in Part 8 to apply the risk-related planning controls from Part 6 in adjacent areas (This approach is consistent with the recommendations from the Botany Randwick LUSS [Ref. 9]). The inclusion of risk-related planning controls in multiple Parts of the BBDCP2013 (Including in multiple sections in Part 8) is potentially confusing and increases the likelihood of inconsistencies.
- Do not specifically address the land within the Study Area that is covered by the Three Ports SEPP (Refer to Section 7.1.4).
- Include a summary of the previous LUSSs and QRAs (Note: The BBDCP2013 does not specifically refer to the Transport QRA Addendum). This information is included to provide a historical basis for the risk-related planning controls, but is not required to apply the risk-related planning controls. It is suggested that the historical information be removed from next revision of the BBDCP.
- Sometimes refer to superseded versions of the HIPAPs.
- Include a definition of 'residential intensification' and 'sensitive use intensification'. The definition of 'residential intensification' includes: "an increase in the number of rooms providing temporary or permanent accommodation". If the maximum floor space ratios for a dwelling house are met (As already specified in Clause 4.4 of the LEP), then increasing the number of rooms within a single dwelling should not be considered residential intensification.
- Require that industrial development fronting Denison Street have their commercial offices (or other non-industrial activity) fronting the road/street. All industrial activities are to be undertaken behind the commercial building buffer.
- Require a Transport Risk Assessment Report to be lodged with Council if a site fronts Denison Street. However, a site that does not front Denison Street could increase the movement of DGs along Denison Street. Applications that potentially affect DG traffic along Denison Street (Directly or indirectly) should require a Transport Risk Assessment Report to be lodged with Council.

The proposed risk-related planning controls:

- Identify specific areas within the Study Area where new development, or a modification to an existing development (Including intensification of population), should be prohibited or may potentially be permitted with consent.
- Require a risk assessment to be submitted with a development application for any use that may potentially be permitted with consent.
- Do not supersede any other development approval requirements (e.g. under the EP&A Act, SEPP No. 33, existing conditions of development consent, etc.) that may apply for development of a new potentially hazardous industry, or modification to an existing potentially hazardous industry, in the Study Area.
- Should replace all of the risk-related planning controls in Part 6 ('Employment Zones') and Part 8 ('Character Zones') of the BBDCP2013 and do not need to include a summary of the

previous LUSSs and QRAs. It is suggested that these be included in a new Part of the next revision of the BBDCP (With cross-referencing in Part 6 and 8 as required).

- Include a revised definition for 'intensification of population', which is applicable for all types of development (i.e. not only residential and sensitive uses).
- Require a Transport Risk Assessment report to be submitted for all future development applications with the potential to affect DG traffic along Denison Street. For example, this could include developments outside the Study Area that might significantly increase non-DG traffic along Denison Street, and therefore have the potential to affect the predicted accident rate for DG traffic.

## 8 RECOMMENDATIONS

The following recommendations are included to assist BBCC in making informed land use safety decisions for existing and future development in the Study Area:

1. BBCC should implement the proposed risk-based planning controls, as outlined in Section 7.2, as soon as practicable. Exactly how this is achieved will need to be determined by BBCC as some of the proposed controls will only apply to some parts of the Study Area and should not be applied to all other similarly zoned areas defined within the BBLEP2013.
2. BBCC should require a risk assessment to be submitted with a development application for any use that is categorised as 'permitted with consent' where the development may potentially significantly increase the population density in the Study Area (As per Recommendation No. 7 above). Approval should be contingent on the proponent demonstrating compliance with relevant risk guidelines.
3. BBCC should require a Transport Risk Assessment report to be submitted for all future development applications with the potential to affect DG traffic along Denison Street. For example, this could include developments outside the Study Area that might significantly increase non-DG traffic along Denison Street, and therefore have the potential to affect the predicted accident rate for DG traffic. Approval should be contingent on the proponent demonstrating compliance with relevant risk guidelines, including evaluation of possible alternative routes.

Note: For DG traffic, the screening threshold criteria in the NSW DP&E's *Applying SEPP 33* guidelines [Ref. 6 (Table 2)] would be appropriate. For non-DG traffic, an increase in total vehicle movements of >50% is likely to be significant.

4. BBCC should consider adopting the proposed risk-related planning controls to replace all of the risk-related planning controls in Part 6 ('Employment Zones') and Part 8 ('Character Zones') of the BBDCP2013. It is suggested that these be included in a new Part of the next revision of the BBDCP (With cross-referencing in Part 6 and 8 as required), which should also include land covered by the Three Ports SEPP. It may also be appropriate to consolidate the risk-related planning controls for other relevant areas in the Botany Bay district (e.g. along Stephen Road) in this new Part of the DCP.
5. The summary of the previous LUSSs and QRAs included in the BBDCP2013 be removed from next revision of the BBDCP.
6. A revised definition for 'intensification of population', as outlined in Section 7.2, should be included in the next revision of the BBDCP. This is applicable for all types of development (i.e. not only residential and sensitive uses).
7. BBCC should review the risk-based planning controls for the Study Area every 5 years (at a minimum) to ensure they are still appropriate based on the most recent available risk assessments for the Study Area (Including for the fixed industrial facilities and transport of DGs).
8. BBCC should review DG transport in the Study Area every 5 years (at a minimum) and update the Transport QRA if there is a significant change. It may also be appropriate to extend the DG review and Transport QRA to include Wentworth Avenue (up to intersection with Bunnerong Road and the intersection with Banks Avenue).

The review should be timed to coincide with the next update of the BIP QRA (which is also required to be updated every five years) to allow any updated risk results to be considered in

the next periodic review of the risk-based planning controls (As per Recommendation No. 7 above). As the next revision of the BIP QRA is due in c. 2017, it may be appropriate in the first instance to review / update the Transport QRA and risk-based planning controls in c. 2017.

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- 24 Scott-Lister, 2015, *Addendum To Dangerous Goods Transport QRA, Denison St, Hillsdale*.
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- 27 Sherpa Consulting, 25 September 2012, *Quantitative Risk Assessment, Summary Report, Botany Industrial Park*, Document No: 20613-001, Revision: 1.

# Appendices

## Appendix A Land Use Zones

Land use zone descriptions are included in the BBLEP2013 [Ref. 1] and Three Ports SEPP [Ref. 15]. The descriptions for the relevant zones in the Study Area are reproduced below.

### A.1 Local Environmental Plan

#### Zone B3 Commercial Core

##### 1 Objectives of zone

- To provide a wide range of retail, business, office, entertainment, community and other suitable land uses that serve the needs of the local and wider community.
- To encourage appropriate employment opportunities in accessible locations.
- To maximise public transport patronage and encourage walking and cycling.

##### 2 Permitted without consent

Nil

##### 3 Permitted with consent

Commercial premises; Community facilities; Educational establishments; Entertainment facilities; Function centres; Hotel or motel accommodation; Information and education facilities; Medical centres; Passenger transport facilities; Recreation facilities (indoor); Registered clubs; Respite day care centres; Restricted premises; Roads; Any other development not specified in item 2 or 4

##### 4 Prohibited

Advertising structures; Agriculture; Air transport facilities; Airstrips; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Environmental facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Heavy industrial storage establishments; Helipads; Highway service centres; Home-based child care; Home businesses; Home occupations; Home occupations (sex services); Industrial retail outlets; Industrial training facilities; Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Port facilities; Recreation facilities (major); Recreation facilities (outdoor); Research stations; Residential accommodation; Resource recovery facilities; Rural industries; Sewage treatment plants; Sex services premises; Storage premises; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Warehouse or distribution centres; Waste disposal facilities; Water recreation structures; Water recycling facilities; Water supply systems; Wharf or boating facilities; Wholesale supplies

#### Zone B4 Mixed Use

##### 1 Objectives of zone

- To provide a mixture of compatible land uses.
- To integrate suitable business, office, residential, retail and other development in accessible locations so as to maximise public transport patronage and encourage walking and cycling.

##### 2 Permitted without consent

Home occupations.

### 3 Permitted with consent

Boarding houses; Child care centres; Commercial premises; Community facilities; Dwelling houses; Educational establishments; Entertainment facilities; Function centres; Hotel or motel accommodation; Information and education facilities; Light industries; Medical centres; Passenger transport facilities; Recreation facilities (indoor); Registered clubs; Residential flat buildings; Respite day care centres; Restricted premises; Roads; Seniors housing; Shop top housing; Any other development not specified in item 2 or 4.

### 4 Prohibited

Advertising structures; Agriculture; Air transport facilities; Airstrips; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Environmental facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Heavy industrial storage establishments; Helipads; Highway service centres; Home occupations (sex services); Industrial training facilities; Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Port facilities; Recreation facilities (major); Research stations; Residential accommodation; Resource recovery facilities; Rural industries; Sewage treatment plants; Sex services premises; Storage premises; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Warehouse or distribution centres; Waste disposal facilities; Water recreation structures; Water recycling facilities; Water supply systems; Wharf or boating facilities; Wholesale supplies.

## Zone B5 Business Development

### 1 Objectives of zone

- To enable a mix of business and warehouse uses, and bulky goods premises that require a large floor area, in locations that are close to, and that support the viability of, centres.

### 2 Permitted without consent

Nil.

### 3 Permitted with consent

Bulky goods premises; Child care centres; Food and drink premises; Garden centres; Hardware and building supplies; High technology industries; Landscaping material supplies; Neighbourhood shops; Passenger transport facilities; Respite day care centres; Roads; Vehicle sales or hire premises; Warehouse or distribution centres; Any other development not specified in item 2 or 4.

### 4 Prohibited

Agriculture; Air transport facilities; Airstrips; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Environmental facilities; Environmental protection works; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Heavy industrial storage establishments; Helipads; Highway service centres; Home-based child care; Home businesses; Home occupations; Home occupations (sex services); Industrial retail outlets; Industrial training facilities; Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Port facilities; Recreation facilities (major); Recreation facilities (outdoor); Research stations; Residential accommodation; Resource

recovery facilities; Restricted premises; Retail premises; Rural industries; Sewage treatment plants; Sex services premises; Storage premises; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Veterinary hospitals; Waste disposal facilities; Water recreation structures; Water recycling facilities; Water supply systems; Wharf or boating facilities; Wholesale supplies.

### **Zone B7 Business Park**

#### **1 Objectives of zone**

- To provide a range of office and light industrial uses.
- To encourage employment opportunities.
- To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area.
- To encourage uses in the arts, technology, production and design sectors.

#### **2 Permitted without consent**

Home occupations.

#### **3 Permitted with consent**

Child care centres; Dwelling houses; Food and drink premises; Home industries; Light industries; Neighbourhood shops; Office premises; Passenger transport facilities; Respite day care centres; Roads; Vehicle sales or hire premises; Warehouse or distribution centres; Any other development not specified in item 2 or 4.

#### **4 Prohibited**

Advertising structures; Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Biosolids treatment facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Entertainment facilities; Environmental facilities; Environmental protection works; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Heavy industrial storage establishments; Helipads; Highway service centres; Home-based child care; Home occupations (sex services); Industrial training facilities; Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Port facilities; Recreation facilities (major); Recreation facilities (outdoor); Registered clubs; Research stations; Residential accommodation; Resource recovery facilities; Restricted premises; Retail premises; Rural industries; Sewage treatment plants; Sex services premises; Tourist and visitor accommodation; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Waste disposal facilities; Water recreation structures; Water recycling facilities; Water supply systems; Wharf or boating facilities.

### **Zone R2 Low Density Residential**

#### **1 Objectives of zone**

- To provide for the housing needs of the community within a low density residential environment.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents.

- To encourage development that promotes walking and cycling.

## **2 Permitted without consent**

Home occupations

## **3 Permitted with consent**

Attached dwellings; Bed and breakfast accommodation; Boarding houses; Building identification signs; Business identification signs; Child care centres; Community facilities; Dwelling houses; Environmental protection works; Flood mitigation works; Group homes; Health consulting rooms; Hospitals; Multi dwelling housing; Neighbourhood shops; Office premises; Places of public worship; Recreation areas; Residential flat buildings; Respite day care centres; Roads; Semi-detached dwellings

## **4 Prohibited**

Any development not specified in item 2 or 3

### **Zone R3 Medium Density Residential**

#### **1 Objectives of zone**

- To provide for the housing needs of the community within a medium density residential environment.
- To provide a variety of housing types within a medium density residential environment.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents.
- To encourage development that promotes walking and cycling.

## **2 Permitted without consent**

Home occupations

## **3 Permitted with consent**

Attached dwellings; Bed and breakfast accommodation; Boarding houses; Child care centres; Community facilities; Dwelling houses; Group homes; Multi dwelling housing; Neighbourhood shops; Office premises; Places of public worship; Residential flat buildings; Respite day care centres; Roads; Semi-detached dwellings; Seniors housing; Any other development not specified in item 2 or 4

## **4 Prohibited**

Advertising structures; Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Car parks; Caravan parks; Cemeteries; Charter and tourism boating facilities; Commercial premises; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Emergency services facilities; Entertainment facilities; Environmental facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Function centres; Heavy industrial storage establishments; Helipads; Highway service centres; Home businesses; Home occupations (sex services); Industrial retail outlets; Industrial training facilities; Industries; Information and education facilities; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Passenger transport facilities; Port facilities; Public administration buildings; Recreation facilities (indoor); Recreation facilities (major);

Recreation facilities (outdoor); Registered clubs; Research stations; Residential accommodation; Restricted premises; Rural industries; Service stations; Sewage treatment plants; Sex services premises; Storage premises; Tourist and visitor accommodation; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Veterinary hospitals; Warehouse or distribution centres; Waste or resource management facilities; Water recreation structures; Water recycling facilities; Water supply systems; Wharf or boating facilities; Wholesale supplies

### **Zone SP1 Special Activities**

#### **1 Objectives of zone**

- To provide for special land uses that are not provided for in other zones.
- To provide for sites with special natural characteristics that are not provided for in other zones.
- To facilitate development that is in keeping with the special characteristics of the site or its existing or intended special use, and that minimises any adverse impacts on surrounding land.

#### **2 Permitted without consent**

Environmental protection works

#### **3 Permitted with consent**

The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose

#### **4 Prohibited**

Any development not specified in item 2 or 3

### **Zone SP2 Infrastructure**

#### **1 Objectives of zone**

- To provide for infrastructure and related uses.
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.

#### **2 Permitted without consent**

Environmental protection works

#### **3 Permitted with consent**

Roads; The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose

#### **4 Prohibited**

Any development not specified in item 2 or 3

### **Zone RE1 Public Recreation**

#### **1 Objectives of zone**

- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.

## **2 Permitted without consent**

Environmental protection works

## **3 Permitted with consent**

Child care centres; Community facilities; Emergency services facilities; Environmental facilities; Flood mitigation works; Information and education facilities; Jetties; Kiosks; Markets; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Respite day care centres; Roads; Signage; Water storage facilities

## **4 Prohibited**

Any development not specified in item 2 or 3

### **A.2 Three Ports SEPP**

#### **Zone IN1 General Industrial**

##### **1 Objectives of zone**

- To provide a wide range of industrial and warehouse land uses.
- To encourage employment opportunities.
- To minimise any adverse effect of industry on other land uses.
- To facilitate and encourage port related industries that will contribute to the growth and diversification of trade through the port.
- To enable development for the purposes of business premises or office premises associated with, and ancillary to, port facilities or industries.
- To encourage ecologically sustainable development.

##### **2 Permitted without consent**

Environmental protection works.

##### **3 Permitted with consent**

Boat building and repair facilities; Business premises; Depots; Food and drink premises; Freight transport facilities; General industries; Jetties; Light industries; Neighbourhood shops; Office premises; Roads; Signage; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Warehouse or distribution centres; Waste or resource management facilities.

##### **4 Prohibited**

Any development not specified in item 2 or 3.