Queensland Government

Northshore Transitional Developments

16-268 – Preliminary Hazard Assessment

Prepared for: EDQ

icubed consulting

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1.0	Initial revision for client review
2.0	Inclusion of wider development area

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STATEMENT OF LIMITATION

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1 Introduction

icubed consulting have been commissioned by Economic Development Queensland (EDQ) to prepare a Site Risk Assessment report for the development of s series of transitional facilities including "Blockyards Shed", "Blockyards Workshop", "Flip Side" and "Blockyards Spaces" to the Eat Street Market precinct at MacArthur Avenue, Eagle Farm, QLD. As a condition of approval EDQ are required to submit a Safety and Risk Report for the proposed development that considers the following neighbouring activities:

- Fuel Storage Facilities
- Asphalt and Concrete Batching Plants
- Chrome Plating Facilities
- Marine Industry Activities
- Aircraft operations

The purpose of the report is to assess and demonstrate that the risk posed by existing neighbouring industries will not adversely affect the proposed development and that any risk of operations from the proposed EDQ facility will not adversely impact on neighbouring industrial operations in accordance with the general principles from the Queensland State Planning Policy—*State Interest Guideline - Emissions and Hazardous Activities.*

Existing operations in the area that could potentially impact on the proposed EDQ development include asphalt and concrete batching plants, the Puma fuel storage and distribution site, the BP-Mobil Whinstanes fuel terminal, a chrome plating industrial facility, and Mobil lubricants storage facility.

The approach taken by this report will be to identify the potential adverse impacts (hazards) from existing operations and to assess the likely frequency and consequences of these hazards to determine the overall level of risk. The hazards identified will be broadly classed into environmental, safety and operational/financial risks.

The risk assessment approach taken will be semi-quantitative in that where published frequencies and consequences for the identified hazard scenarios are available then quantitative estimates will be made. It is noted that making estimates of the external risks that may impinge on a site can be difficult.

2 Site Description

The proposed EDQ developments are at MacArthur Avenue in Eagle Farm being part of Lots 302 on SP257483 and Lot 1201 on SP160055, broadly classified as the "Eat Street" precinct for the purposes of this report. For the purposes of this study the area under review is shown in Figure 1. The final lot and boundary configurations and designations may alter.

The site is bounded to the south by the Brisbane River and to the west by the now disused and decommissioned GrainCorp Liquid Terminals Eagle Farm Site and the old Omega sulfuric acid storage facility. To the east of the site is currently vacant land for overflow car parking and on the northern side the site is bounded by a coach storage facility, pipe storage facility, long term car parking facilities and a chrome plating business[1].

Previous studies have assessed that developments on lots 1202 and 1302 as shown in Figure 4 are also suitable and not subject to unreasonable hazards.

[1] The business advises it is not operating as a hard chroming site.

Figure 1: Site Study Area and Immediate Surrounds

The general area is predominantly industrial in nature being previously part of the Port of Brisbane with residential and commercial developments to the east and west of the facility. The site is part of the Northshore development area with master planning showing this area to be redeveloped into commercial and residential area.

Some higher impact industries such as fuel and oil storage and bitumen plants are in the general neighbourhood of the proposed development as shown in Figure 2.

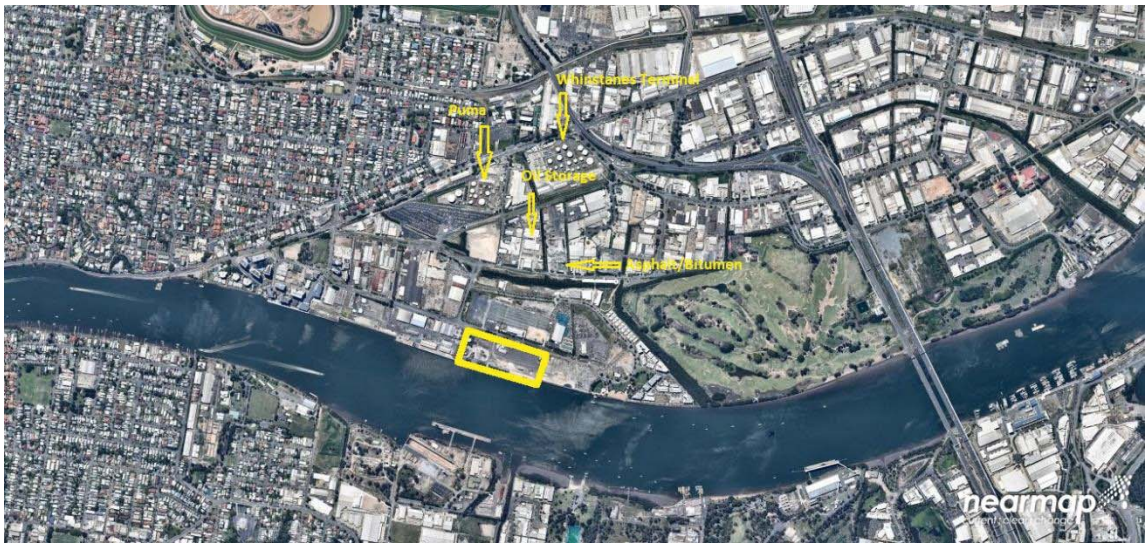

Figure 2: Neighbourhood Area of the Site

The GrainCorp Liquid Terminals site ceased operation in mid 2016 and is currently being demolished, the old Omega sulfuric acid storage tank is still in position. This site is under the control of EDQ and will no longer be used for chemical storage. The tank is currently empty and scheduled for removal. The disused tank poses no residual risk of concern to occupants in the immediate vicinity of the tank. Note that marine activities are no longer occurring adjacent to the site.

2.1 Proposed Development

The proposed development will consist a series of transitional developments including a circus training facility – Flipside - (located within the Factories area). The structures will be predominantly lightweight and temporary in nature and will make use of recycling old shipping containers (repurposing) to provide useful structures. Figures 3 and 4 show development plans. The facilities will be used on a regular basis. For the purposes of this assessment it will be assumed that the operations are continuous and operate in the hours from 5.00 am until midnight, seven days a week. Noting the location is suitable due to its distance from residential facilities for long hours of operation.

It will be assumed that there is a high density of people on the site at these times due to the nature of the proposed operations and popularity of the existing operations.

Figure 3: The Factories and The Shed Locations #1

Figure 4: Think St Location

3 Risk Assessment Methodology and Assessment Criteria

The approach taken in this risk assessment has been to establish the nature and type of the existing industries to identify potential hazards that could impact on the proposed development. After hazards have been identified a series of scenarios were brainstormed and then reviewed to identify a list of credible scenarios. On the basis of the selection of these scenarios the likelihood and potential consequences of these scenarios was assessed based on published information in order to assess the overall risk.

The identified credible scenarios were categorised as either environmental/miscellaneous/financial or health and safety related. The frequency of these events has been estimated and an overall assessment of risk has been made using one of the two risk assessment matrices below (Table 1 & Table 2) (depending on the type of consequences).

Note that this assessment does not consider any hazards that may originate from the proposed EDQ development, an initial review indicates that any impacts or events that could occur on the site are very unlikely to have significant short or long terms impacts onto neighbouring properties.

Table 1: Health & Safety Risk Assessment Matrix

Likelihood	Near Miss	Minor Injury	First Aid Injury	Medical Treatment Injury	Lost Time Injury	Serious/ Permanent Injury	Fatality/ Multiple Fatalities
Highly Improbable (once Every 100,000 years)	0.000001	0.00001	0.0001	0.001	0.01	0.1	1
Very Improbable (once every 10,000 years)	0.00001	0.0001	0.001	0.01	0.1	1	10
Very Rare (once every 1,000 years)	0.0001	0.001	0.01	0.1	1	10	100
Rare (once every 100 years	0.001	0.01	0.1	1	10	100	1000
Unlikely (every 10 years)	0.01	0.1	1	10	100	1000	10000
Likely (once a year)	0.1	1	10	100	1000	10000	100000
Frequent (every month)	1	10	100	1000	10000	100000	1000000

Consequences

Table 2: Environmental/Financial Risk Assessment Matrix

Likelihood	Internal Repair/ Management only	Minor Property Damage/$1	Property Damage $10	Significant Cost/Clean Up/Damage ~$100	Major Damage ~ $1,000	Business Critical ~$10,000	Major Community Damage $100,000+
Highly Improbable (once Every 100,000 years)	0.000001	0.00001	0.0001	0.001	0.01	0.1	1
Very Improbable (once every 10,000 years)	0.00001	0.0001	0.001	0.01	0.1	1	10
Very Rare (once every 1,000 years)	0.0001	0.001	0.01	0.1	1	10	100
Rare (once every 100 years	0.001	0.01	0.1	1	10	100	1000
Unlikely (every 10 years)	0.01	0.1	1	10	100	1000	10000
Likely (once a year)	0.1	1	10	100	1000	10000	100000
Frequent (every month)	1	10	100	1000	10000	100000	1000000
Consequences							

Risks are rated as acceptable in the green area, requiring attention or further action in the orange section and unacceptable in the red zone

3.1 Hazard Identification

The Northshore Hamilton UDA Development Scheme has a series of hazard map overlays that detail the expected areas of impacts from existing facilities in the area.

With regard to the Northshore Hamilton UDA Development Scheme maps the proposed development site lies outside the identified impact areas from the fuel and oil storage facilities (Map 8), is not impacted from an environmental perspective from asphalt or concrete batching plants as the development height will not exceed 40m. Marine operations at the wharf immediately adjacent to the site and at the GrainCorp wharf site have ceased.

C.P. Plating have formally advised EDQ (Appendix A) that they are do not operate a hard chrome electroplating process on their site and are operating as a zinc electroplating business and powder plant. A review of emission and operations from that site by AED[2] also indicates that electroplating has ceased on site and that operations have no air quality impact on the proposed development site. Thus, the environmental hazard identified in the development scheme policy is not relevant. Zinc electroplating does not pose significant off-site hazard impacts. The development site is potentially impacted by Noise from Brisbane Airport and is within the 110-115m OLS Approach and Departure Limitation for Brisbane Airport. As there will be no structures that would interfere at this level the proposed development poses no hazard to airport operations. An environmental assessment of the development site by Environmental Management and Remediation[3] assessed the site as suitable for any use and no further hazards were identified in this study.

[2] Northshore Hamilton Urban Development Area – Air Quality Constraints Assessment – AED – October 2012
[3] Site Investigation of Lot Y RP000000, Northshore Hamilton - Environmental Management and Remediation 2016 (Draft)

Accordingly, the main neighbourhood hazards identified include bulk fuels stored at the Puma and Whinstanes terminals, oils stored at the Mobil facility, asphalt and concrete batching operations and neighbouring industrial operations. Given the age of the Northshore Hamilton UDA Development Scheme these hazards will be reviewed again as a part of this work

3.2 Assessment Criteria

The Queensland Government has published a State Planning Code (State Code 21) that provides a reference source for determining acceptable levels of risk for Hazardous Goods Facilities such as Large Dangerous Goods locations and Major Hazard Facilities (MHFs).

In this instance we are considering the impacts of neighbouring Large Dangerous Goods Locations (LDGLs) on the proposed site at 221 Macarthur St.

Table 3: Dangerous Dose Risk Criteria from State Code 21

Land Use	Dangerous Dose for Fire and Explosion Events (risk in a million per year)
Vulnerable and sensitive land uses : Health care service hospital, schools, child-care facilities, retirement facility, residential	4.7 kW/m^2 thermal radiation 7 kPa overpressure
Commercial or community activity use land zone retail centres, shops, offices, entertainment buildings, market, showroom, convention centres, sporting stadiums, tourist attraction, nightclub, building for religious worship, community hall, theatres and art galleries Commercial developments including retail centres, offices and entertainment centres	4.7 kW/m^2 thermal radiation 7 kPa overpressure
Industrial Land Use Zones	12.6 kW/m^2 thermal radiation 14 kPa overpressure

Table 4: Individual Fatality Risk Criteria from State Code 21

Land Use	Individual Fatality for Fire and Explosion Events (risk in a million per year)
Vulnerable and sensitive land uses Health care service hospital, schools, child-care facilities, retirement facility, residential	0.5
Commercial or community activity use land zone retail centres, shops, offices, entertainment buildings, market, showroom, convention centres, sporting stadiums, tourist attraction, nightclub, building for religious worship, community hall, theatres and art galleries Commercial developments including retail centres, offices and entertainment centres	5
Parks, sporting fields and active open space[4]	10
Industrial Land Use Zones	50

As the proposed use is primarily industrial in nature the injury risk criteria will only be used as a guide in this instance.

[4] Criteria taken from NSW HIPAP 4 guidelines.

3.3 Review of Major Incidents

A review of major incidents reported in media and publicly available databases including fire and explosions from fuel storage facilities, underground fuel storage lines and asphalt plants was undertaken.

For asphalt plants (from a dataset of primarily United States facilities) 132 significant incidents or events have been recorded over a 10 year period. A review of these events showed that there was mix of fires and explosions. The majority of the data indicated that the consequences of these events were localised and mainly confined to the affected site. No significant off-site impacts were reported from asphalt plant incidents. The hazards posed by asphalt plant would appear to be limited to heat flux radiation from a fire and minor offsite overpressure from boiler ruptures on site. The separation of the proposed development from the asphalt plant and a lack of direct line of site mean that these impacts would be minimal at the EDQ development.

Major loss of containment and subsequent fire scenarios from fuel storage facilities are regarded as credible events. The potential off site impacts from such events are typically limited to heat fluxes from fires and explosion over pressures from vapour cloud explosions. A recent Quantitative Risk Assessment report by Daesim (Daesim, 2012) for GrainCorp Liquid Terminals new fuel storage facility at Pinkenba investigated the consequences from such events for significantly larger storage tanks than are present in the Whinstanes Terminal.

3.4 Credible Incident Scenarios

The following credible major incident scenarios were identified:

1. A major pool fire from either a petrol or diesel spill at the Puma or Whinstanes Terminal with potential for smoke impacts on the development site.
2. A tank top fire from either a petrol or diesel spill at the Puma or Whinstanes terminal with potential for smoke impacts on the development site.
3. Fires at the neighbouring Mobil Lube Site or the nearby Asphalt plant.
4. Impingement of toxic smoke plumes on the site.
5. Sundry fires or warehouse fires from nearby sites.

3.5 Likelihood & Frequency Data

Estimating the likelihood of events occurring at sites not controlled by the proponent is difficult; in this instance published data and failure rates have been used to provide likelihood estimates. It is assumed that good management practices are observed at high hazard industries and that in general the likelihood of major incidents from these establishments is lower than less regulated industries.

3.5.1 Bulk Fuel Storage

In recent years there have been 2 notable large fires and explosions from fuel storage locations, the Buncefield explosion and fire in 2005 and the Coode Island Fire. The Buncefield fire and explosion was notable in that the over pressures from the explosive ignition of a fuel leak significantly exceeded those previously experienced from an unconfined vapour explosion. Both these events had off-site impacts. The Coode Island fire was responsible for a potentially toxic smoke plume. Of note, impacts from the smoke plume were not in the immediate vicinity of the fire but many kilometres away when the buoyant smoke plume began to fall.

The fuel storage facilities will be complying with the regulatory requirements where off site impacts meet the HIPAP 4 Criteria detailed in Tables 1 and 2. For the purposes of this report the off-site fatality consequence from the neighbouring fuel storages is estimated as 50 x 10^{-6}/yr and the offsite irritation/minor injury from heat flux or a toxic smoke plume frequency is estimated at 50 x 10^{-6}/yr.

Both the BP-Mobil Whinstanes terminal and the Puma Energy Storage facility have recently undergone upgrades to improve safety and performance of the sites. On this basis, the facilities are regarded as well managed and maintained would not be expected to pose a risk greater than average for a facility of this nature.

(Daesim, 2012) and references therein summarised the frequency of major tank loss of containment events and a full bund fire as being between 6 – 9 x 10^{-5} per tank per year indicating that such an event is indeed rare.

3.5.2 Asphalt Plants

In order to assess the likelihood of a major incident at an asphalt plant the following assumptions have been made; there are approximately 5 asphalt plants per million people of population. On this basis there have been 132 reported major events over a ten year period in the US – this gives an approximate frequency of occurrence for a major incident of 1 x 10^{-2} /yr.

There are a range of consequences from these major incidents that have resulted in localised injuries and fatalities. As the development site is more than 300m away from the asphalt plant no significant heat fluxes are expected. Potential impacts from toxic smoke plumes cannot be excluded.

3.5.3 Warehouse & Storage Fire

The United Kingdom Health and Safety Executive (UK HSE) stipulates that the average frequency for warehouse fires across all industries is 1 x10^{-2}/yr. It is noted that chemical storage warehouses are usually designed, constructed and operated to a higher standard also resulting in an overall lower frequency of fires. Chemical Warehouses on the nearby Mobil Lubricant and Puma sites are sufficiently separated from the proposed development to pose no significant threat. No other high hazard warehouses have been identified within the vicinity of the development that would impact on the risk posed either to or by the development.

3.6 Consequences

The Consequences of the incident scenarios are discussed below.

3.6.1 Bulk Fuel Storage

The range of consequences from fire or explosion from fuel storage depots are considered to be;

- a minor fire contained to site (no off site impacts)
- a major tank fire or pool fire with possible resultant heat flux effects and potential toxic fume generation
- general vapour cloud explosion
- a jet fire from a product transfer line within the facility

With reference to (Daesim, 2012) the 50 x 10^{-6} /yr (the relevant criterion) individual fatality risk contour for the new GrainCorp Liquid Terminals site was found to extend to a maximum extent of approximately 200m from the edge of the nearest bund wall where an event could occur. This contour summed risk of all reasonably foreseeable events. On this basis a similar impact extent could be assumed for the Whinstanes terminal.

The nearest storage tanks at the Whinstanes and Puma terminals are >200m from the proposed site and there no direct line of site between the terminal and the site; hence any heat fluxes will not impact directly on the site and any explosion overpressures will be reduced by buildings and structures between the terminal and the site. On this basis it is not considered plausible that an event on the Whinstanes terminal could impact on the proposed site.

3.6.2 Asphalt Plants

The range of consequences from an asphalt plant major incident are considered to be;

- a minor fire contained to site with minimal off site impacts
- a major tank fire or pool fire with possible resultant heat flux effects and toxic fume generation
- projectile drum/vessel from a boiler explosion

The asphalt plant is located approximately 200m from the development site and no credible scenarios with the exception of a toxic smoke plume from a fire that could cause minor irritation can be sensibly considered.

3.6.3 Warehouse & Storage Fire

The range of consequences from warehouse fire or explosion are considered to be;

- a minor fire contained to site with minimal off site impacts
- a major fire or pool fire with possible resultant heat flux effects and toxic fume generation
- projectile drum/vessel from a warehouse fire.

A burning pool fire from a warehouse fire plant would be expected to have heat flux radii of approximately 40-60m at the 4.7 kW/m^2 level. This would not impact on the proposed development. The nearest storage identified is on the Mobil Lubricants site; this warehouse is more than 350m from the development and no significant threat is identified from this facility.

3.7 Environmental Impacts

A review of existing environmental hazards was undertaken with the results detailed in Table 5. Of note there were no significant hazards or risks identified.

It is recognised that the neighbouring asphalt plant will emit Volatile Organic Compounds, Sulfur Dioxide (SO_2), Nitrogen Oxides (NO_x) and poly aromatic hydrocarbons (PAH). The great majority of the SO_2 and PAH emissions are from a point source stack and should be emitted and dispersed without resulting in any significant ground level concentrations that would pose a threat to health.

3.8 Risk Assessment

The outcomes from the risk assessment including the hazards identified, likelihood and consequence estimates and final risk ratings are presented in Table 3.

3.9 Existing Controls

The site does not have any specific existing design controls and as the risk posed by neighbouring industries is considered very low no site specific controls are recommended in this instance.

3.10 Proposed Mitigatory Controls

3.10.1 Emergency Plans and Procedures

It is recommended that Site Emergency Plans and Procedures be developed that include responses to the following scenarios:

1. Off Site fire that generates toxic smoke plume and requires an evacuation procedure, the evacuation of a large number of people via a single carriageway (MacArthur Ave) may be difficult.

Table 5: Off Site Impact Hazard Events for Proposed Development at 221 MacArthur Ave W, Eagle Farm

Hazard/Event	Likelihood (per annum)	Consequences	Risk Rating[5]
Safety			
Minor Fire - neighbour site	0.01	No Impact/minor business interruption	0.001
Office/Admin Fire – neighbouring site	0.01	No Impact/minor business interruption	0.001
Warehouse Drum Store Fire	0.001	Potential for Projectiles with escalation potential - fire - Damage to cars/office - Fire Brigades will be in attendance and should be able to control spot fires	1
Vehicle Rollover-Fire	0.001	No Impact/minor business interruption	0.001
Toxic Smoke from Major Fire (warehouse/asphalt)	0.01	Toxic Plume from incomplete combustion as a result of fire or combustion of toxic materials. - Business Interruption	1
Toxic Smoke from Major Fire (warehouse/asphalt)	0.01	Toxic Plume from incomplete combustion as a result of fire or combustion of toxic materials. - Minor Irritation - potential medical treatment	1
Toxic Smoke from Major Fire Puma/Whinstanes	0.00001	Toxic Plume from incomplete combustion as a result of fire or combustion of toxic materials. - Minor Irritation - potential medical treatment	0.1
Major Fire	0.01	Smoke Impacts from fire, area evacuated - Business Interruption - One week in duration	0.1
Major Fire	0.00005	Heat Flux From adjacent site fire-Whinstanes- will not cause property damage	0.00001
Environmental			
Dust	0.1	Nuisance/minor property damage	0.1
Filter Bag House Leak/Breakthrough	0.1	Nuisance/minor property damage & clean up	0.1
Petroleum/Fuel Odour	1	Nuisance	1
Toxic Gas Plume	0.001	Nuisance/illness possible irritation, medical assessment	0.1
Contaminated Overland Water Flow	0.001	Nuisance/minor property damage & clean up	0.001
Odour	0.1	Nuisance/minor property damage & clean up	0.1
Light	0.1	Nuisance/minor property damage & clean up	0.1
Noise	0.1	Nuisance/minor property damage & clean up	0.1
Groundwater Contamination	0.001	Nuisance/minor property damage & clean up	

[5] See Risk Matrices for Risk Acceptability – generally values less than 1 are considered tolerable.

4 Summary

This report has reviewed the overall risk posed on the proposed development. No significant risks were identified from existing neighbouring industries that would adversely impact on the operations of this site.

The design, location and orientation of the proposed development will assist in minimising any impacts if there was a major event such as a fire or explosion..

No credible hazard scenarios were identified that would adversely affect the proposed development and the development in itself will not impact on existing industries and as such will comply with the general principles from the Queensland State Planning Policy—*State Interest Guideline - Emissions and Hazardous Activities.*

5 References

Daesim. (2012). *Systematic Risk Assessment - Bulk Liquids Storage Facility 200 Tingira St Pinkenba.*
icubed Consulting. (2013). *Pacific Terminals Pipeline PHA.*
Planning, N. S. (2011). *Hazardous Industry Planning Advisory Paper No 4 Risk Criteria for Land Use Safety Planning.*

APPENDIX A

C.P. Plating Letter

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3 September 2015

Wendy Brewster
Property Asset Manager
Economic Development Queensland
Department of State Development, Infrastructure and Planning
GPO Box 2202
Brisbane QLD 4001

RE: **C.P. Plating Pty Ltd, 222a MacArthur Ave, Hamilton**

Dear Ms Brewster

This letter is to confirm that C.P. Plating Pty Ltd has provided surface finishing services at Northshore Hamilton since 1995. Our current primary service is zinc electroplating ferrous articles. We also offer a powder coating service for ferrous and non-ferrous metallic articles.

C.P. Plating Pty Ltd currently do not operate, nor do we have any intention of operating, decorative or hard chrome electroplating processes from our facility.

Yours sincerely

Aaron Raadschelders
General Manager