Douglas PARTNERS

GROUNDED EXPERTISE

Emerging Preferred Scenario Report Package D Land Capability and Contamination

Housing the Hunter: A plan for renewal at Broadmeadow

Broadmeadow Regionally Significant Growth Area

Prepared for Department of Planning, Housing and Infrastructure (DPHI)

Project 203522.01

2 May 2024

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Revision 1	Andrew Golden – Department of Planning Housing and Infrastructure (NSW)

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature	Date
Author	2 May 2024
Reviewer	2 May 2024

FS604853

Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

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1. Introduction

Douglas Partners Pty Ltd (DP) has been engaged by the NSW Department of Planning, Housing and Infrastructure (DPHI) to deliver technical studies for Package D (Land Capability & Contamination) which will inform structure planning for *Housing the Hunter: A plan for renewal at Broadmeadow*. The subject site comprises an irregular shaped area containing multiple lots known as the Broadmeadow Regionally Significant Growth Area (the Precinct) and is shown on Drawing 1, Appendix D.

The project is focused on developing a Place Strategy to improve efficient use of land, guide future growth, and deliver residential and employment benefits within the precinct.

The purpose of this report was to capture the findings of the baseline analysis undertaken by DP in relation to Land Capability and Contamination (DP, 2023) for the emerging preferred scenario and, specifically, the first-move state-led rezoning on government-owned land. The findings will inform structure planning to support the Place Strategy.

This report must be read in conjunction with all appendices including the notes provided in Appendix A.

The assessment was undertaken with reference to DP's proposal 203522.01.P.001.Rev0 dated 10 February 2023.

1.1 Background and Objectives

EbD workshops for the Place Strategy were held on 3 and 4 May, and 11 and 12 October 2023. Through the workshops and stakeholder engagement an emerging preferred scenario was developed with the following key elements:

- Mixed use centre and employment generating uses;
- Housing density, diversity and tenure;
- Multipurpose arena and leisure centre;
- Transport network and open space.

The emerging preferred scenario was presented by Cox in the April 2024 Reimagining Broadmeadow plans (Cox, 2024). The emerging preferred scenario plans are reproduced in Appendix B and listed below:

- Structure;
- Land Uses;

- First Moves;

Possible staging of development for the emerging preferred scenario was provided in the overall staging plan by Cox, together with plans for Stage 1, Stage 2 and Stage 3, as shown in Appendix C.

It is understood that the initial development stage will comprise "first-move state-led rezoning for a minimum of 2,000 homes on government-owned land" within the precinct. The following four areas within the precinct have been identified for the first-move state-led rezoning:

- Locomotive Depot (Transport and Holding Entity of NSW [TAHE] land);
- Basketball Stadium and PCYC sites;
- Newcastle Showground;
- Go-Karts and Stadium Forecourt.

The four first-move state-led rezoning areas have been provided in Appendix C.

It is understood that Schools Infrastructure NSW (SINSW) will conduct a service needs analysis to assess the preferred option to meet demands for school infrastructure generated by both existing projected demand and the needs generated by the structure plan. The possible requirement and location of additional schools will be subject to detailed analysis and design.

It is understood that flood mitigation measures are also being considered within and adjacent to the precinct. The mitigation measures include flood storage within various open spaces. Excavations from 1 m to 4 m below existing ground levels are being considered for flood storage as shown in the Rhelm – Proposed Flood Mitigation plan in Appendix D.

The purpose of this report was to capture the findings of the DP baseline analysis (DP, 2023) relating to Package D – Land Capability and Contamination for structure planning for the first-move state-led rezoning. The report has been prepared to identify opportunities and constraints for the emerging preferred scenario from a geotechnical and potential contamination perspective.

1.2 Scope of Work

The scope of work for the assessment comprised the following:

- Review of DP Baseline Land Capability and Contamination Assessment report (DP, 2023);
- Review of Cox Emerging Preferred Scenario plans (Cox, 2024);
- Consideration of proposed staging of development and possible flood mitigation measures;
- Consideration of possible geotechnical opportunities and constraints to future development and proposed land uses for the emerging preferred scenario;
- Consideration of possible opportunities and constraints to future development and land uses for the emerging preferred scenario relating to potential Precinct contamination;
- Consideration of inputs from various participants and stakeholders through the EbD workshops;

- Preparation of a SWOT (Strengths, Weakness, Opportunities and Threats) analysis of potential infrastructure and planning considerations for the emerging preferred scenario; and
- Preparation of this report.

2. SWOT Analysis and Infrastructure Needs

2.1 Review of Background Information

The DP Baseline Land Capability and Contamination Assessment report (DP, 2023) identified areas of known and potential contamination sources within the precinct.

A qualitative assessment of the contamination risk across the precinct was undertaken based on the data compiled in the baseline review. The potential contamination risk rankings within the precinct are shown on Drawing 16 in Appendix D. Preliminary geotechnical information from the baseline report is also provided in Drawing 10 in Appendix D. Geotechnical opportunities and constraints to development were discussed in the baseline report. Refer to (DP, 2023) for details.

The baseline information was utilised in the SWOT analysis of potential infrastructure and planning considerations for the emerging preferred scenario as presented in Cox (2024).

To assist with the assessment of the emerging preferred scenario, the following sub-precincts were adopted for discussion, as shown in Figure 1 below:

- Hamilton North – North of Griffiths Road;
- Hunter Park - Between Griffiths Road to the north and Lambton Road to the south;
- South – South of Lambton Road; and
- Belford/Tudor – Spur east of the Broadmeadow rail line.

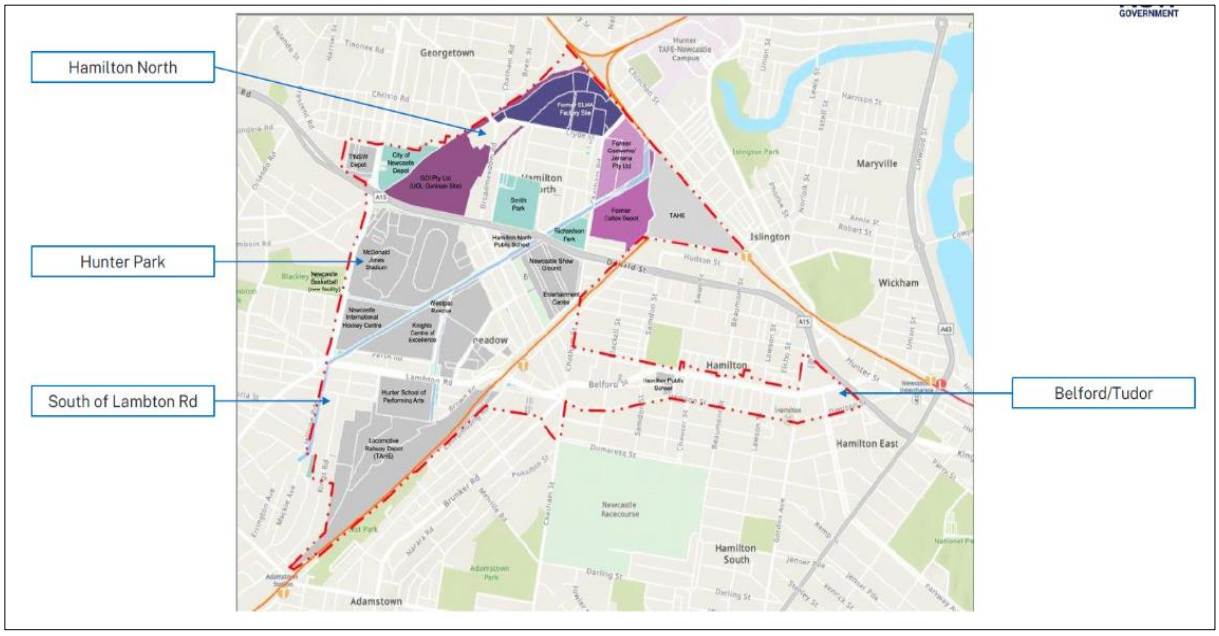

Figure 1: Adopted Sub-Precincts for discussion (provided by Cox (2023))

2.2 SWOT Analysis

A SWOT analysis relating to Land Capability and Contamination was conducted for the potential infrastructure and planning considerations for the emerging preferred scenario as presented in (Cox, 2024).

The SWOT analysis for the emerging preferred scenario was prepared for each sub-precinct (refer to Figure 1 above) and is presented in Table E1 in Appendix E. The results of the SWOT analysis for the emerging preferred scenario are discussed in Section 3.

The major site locations/properties within the precinct are presented in Figure E1 together with Table E1 in Appendix E to assist with SWOT analyses for the emerging preferred scenario.

2.3 Infrastructure Considerations

Potential infrastructure requirements and planning considerations for the emerging preferred scenario relating to Land Capability and Contamination are presented in Table F1 in Appendix F.

3. General Comments - Land Capability and Contamination

3.1 Major Elements in the Emerging Preferred Scenario

The following major elements are proposed in the Emerging Preferred Scenario:

- The industrial lands in the north (ie ELMA, Gasworks and Shell site) are to be retained for employment/urban services with new opportunities for startups and creative maker spaces building on the present-day condition;
- The former Goninan and NCC Depot sites are identified as an opportunity for potential residential development;
- Hunter Park broadly has provision for a leisure centre, an arena and complementary commercial and mixed use;
- Locomotive Depot land (former Broadmeadow railyards) located in the south-west (owned by Transport Asset Holding Entity of New South Wales [TAHE]) to support a mix of residential and open space;
- Styx Creek is transformed into a linear park with flood mitigating features, assisted by publicly accessible wetlands and retention basins integrated within parkland (naturalising waterways and reinstating wetlands);
- Opportunities exist for the Hamilton Railway Junction to support additional reinstated native habitat as biodiversity offset, but not publicly accessible lands;
- Road Network upgrades;
- Naturalising waterways;
- Harness Racing track relocated off site;

- Westpac Rescue Helicopter maintenance facility relocated off site; and
- Flood mitigation measures both within and outside the precinct.

Various sites were identified as high potential contamination risk areas in the baseline assessment as shown on Drawing 16 in Appendix D. Preliminary geotechnical information is also provided in Drawing 10 in Appendix D.

Remediation is likely to be required where the proposed land use is more sensitive than the existing land use. Remediation may also be required for sites that are retained for their existing land use depending on the contamination status of the site.

More sensitive land uses were proposed for the following sites:

Proposed Residential:

- Former Goninan site;
- NCC Depot;
- Locomotive Depot;
- Newcastle Entertainment Centre and NE and SE of the showground arena; and
- Broadmeadow Road between Jackson Street and Griffiths Road.

Proposed Open Space:

- Westpac Rescue Helicopter site;
- Newcastle Showground;
- South and South East of Harness Racing.
- Locomotive Depot;
- TAHE land (north-east site area).

Reference should be made to Table E1 in Appendix E for details of the SWOT analysis for the Emerging Preferred Scenario.

Staging – First-move State-led Rezoning

It is understood that the following first-move state-led rezoning sites are proposed for the Broadmeadow precinct, as shown in the first-moves plan in Figure 2 below and in Appendix B.

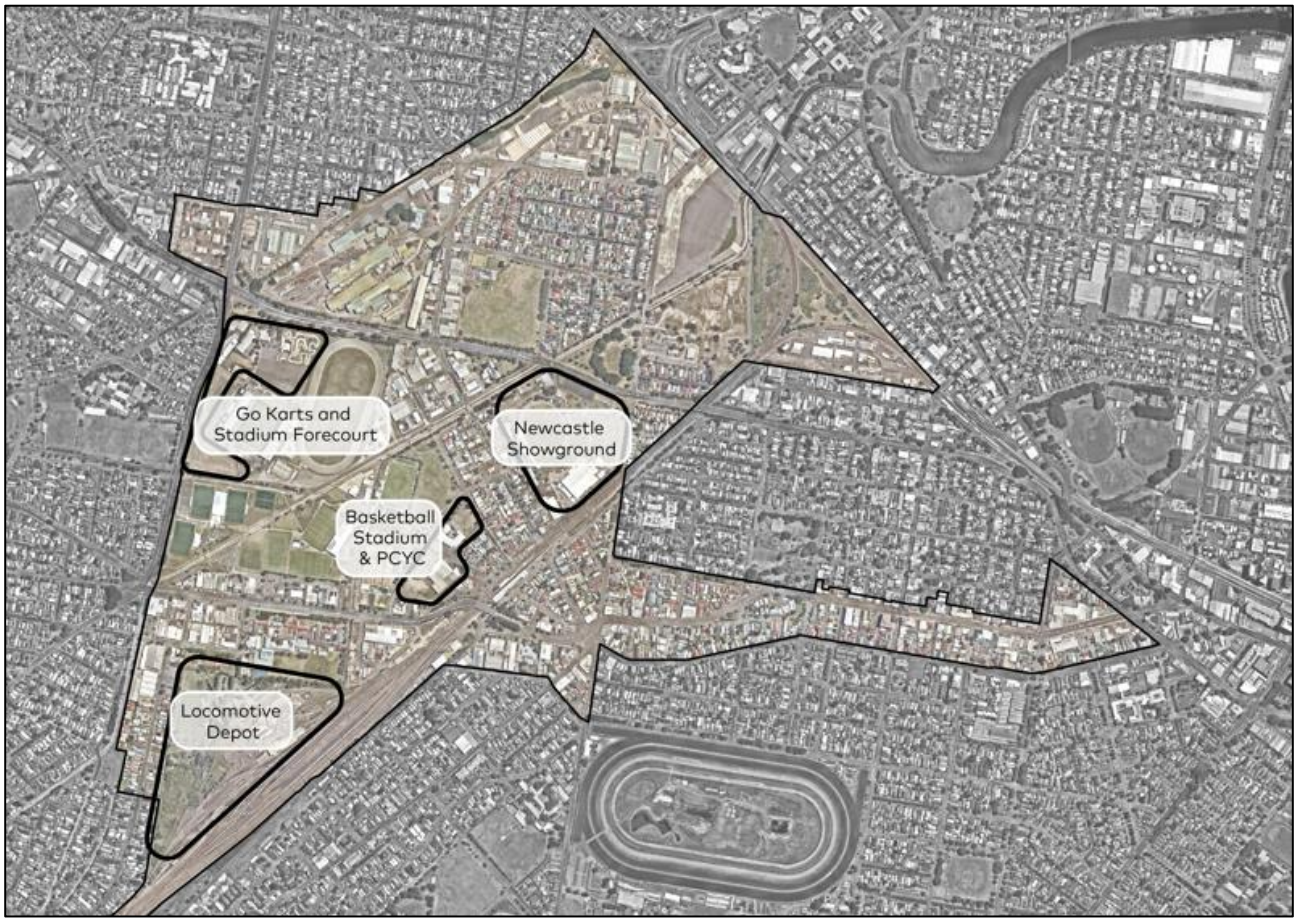

Figure 2: First Moves (provided by Cox (2024))

The general information available for each of the first moves is summarised below:

- Locomotive Depot – Proposed Residential and open space use:
    - Soil and groundwater at the site has been contaminated by historic operations at the property;
    - Fill was noted during previous investigations to a depth of 4.9 to 5.0 m bgl. Anthropogenic wastes were noted in the fill included building rubble, concrete, bricks, glass, coke, ash, slag and asbestos containing materials (ACM);
    - Soil had been impacted with heavy metals, hydrocarbons (TRH/PAH), pesticides and asbestos;
    - Shallow (0.0 – 1.5 m bgl) and deep (3.0 – 6.0 m bgl) groundwater aquifers are present at the site. Shallow groundwater discharges into open channels around the site;
    - Shallow and deep groundwater aquifers had been impacted with lead, copper, zinc, TRH and PAH;
    - Previous investigations indicated that remediation would be required for redevelopment of the site to a more sensitive land use;

  - A former remediation action plan (RAP) was prepared for the site for various land uses. The predominant proposed remediation methodology for the site was on-site management (ie via capping);
  - The site was assessed to be suitable for proposed future development subject to appropriate remediation and validation;
  - A site specific RAP would be required for the proposed "first-move" development.
- Basketball Stadium and PCYC – Proposed mixed use:
  - Limited information was available for the Basketball Stadium and PCYC sites;
  - Historic fill materials (of unknown origin) or fill impacted by demolition wastes may be present based on experience with similar sites (ie potential for contamination within fill materials at the site);
  - Detailed site investigation will be required to characterise site conditions and confirm remediation requirements (if any);
  - Where required, site remediation should be conducted in accordance with a site specific RAP;
  - Site remediation (where required) is likely to be achieved through conventional methods to render the site suitable for the intended use.
- Newcastle Showground – Proposed residential and open space use.
  - Limited information was available for the Showground site;
  - Historic fill materials (of unknown origin) or fill impacted by demolition wastes may be present based on experience with similar sites;
  - Detailed site investigation will be required to characterise site conditions and confirm remediation requirements (if any);
  - Where required, site remediation should be conducted in accordance with a site specific RAP;
  - Site remediation (where required) is likely to be achieved through conventional methods to render the site suitable for the intended use.
- Go-Karts & Stadium Forecourt – Proposed special use and commercial to support activities within the Sport and Recreation precinct.
  - Limited information was available for the Go-Karts and Stadium Forecourt site;
  - Historic fill materials (of unknown origin) or fill impacted by demolition wastes may be present based on experience with similar sites;
  - Detailed site investigation will be required to characterise site conditions and confirm remediation requirements (if any);
  - Where required, site remediation should be conducted in accordance with a site specific RAP;
  - Site remediation (where required) is likely to be achieved through conventional methods to render the site suitable for the intended use.

Possible first moves and staging of development should consider the constraints and opportunities associated with land capability and contamination. Detailed investigation, remediation and validation (where required) should be conducted to render the sites suitable for their respective proposed uses.

Potential infrastructure requirements and planning considerations for the emerging preferred scenario relating to Land Capability and Contamination are presented in Table F1 in Appendix F. The infrastructure needs for first moves and staging of development should consider land capability and contamination requirements.

Schools

It is understood that the possible requirement and location of additional schools within the precinct will be subject to detailed analysis and design. SINSW will conduct a service needs analysis to assess the preferred option to meet demands for school infrastructure generated by both existing projected demand and the needs generated by the structure plan.

We understand that School infrastructure and transport initiatives are indicative only and subject to detailed design, analysis, feasibility review, funding commitments etc.

Flood Mitigation Measures

It is understood that flood mitigation measures are being considered within the precinct at the following areas:

- Smith Park;
- Magic Park;
- Westpac Rescue Helicopter site;
- Biodiversity area (NE);
- Proposed commercial area – west of McDonald Jones Stadium;
- Knights Centre of Excellence;
- Cattle yards north of the Showground arena.

The following off-site areas are also being considered for flood mitigation:

- Myer Park (Adamstown Park);
- Alder Park;
- Arthur Edden Oval;
- Kentish Oval.

The Broadmeadow Racecourse (also off-site) may also be considered for flood mitigation measures.

The mitigation measures include flood storage within various open spaces. Excavations from 1 m to 4 m below existing ground levels are proposed for flood storage as shown in the Rhelm – Proposed Flood Mitigation plan in Appendix D.

It is noted that upper fill materials within proposed flood mitigation areas may contain contamination (ie identified and potential high risk areas). Underlying natural soils may also comprise acid sulfate soils (ASS). Materials excavated for flood mitigation will require appropriate investigation, management, disposal and possible treatment where required, based on the contamination and ASS status of the materials. Opportunities to reuse/manage excess excavated materials on-site should be considered to minimise costs.

Excavations for flood mitigation can be managed through appropriate investigation, classification, handling, treatment (if required), reuse and disposal as required.

3.2 **General Comments**

The following general comments are provided in relation to development over contaminated land within the site.

The available contaminated land information established that widespread soil and groundwater contamination exists within the Precinct. Sources of contamination were predominantly associated with current and historic land uses (i.e., commercial/industrial land use and associated potentially contaminating activities), together with fill of unknown origin containing industrial wastes (including ash, tar, slag) and hazardous building materials including asbestos. Contaminant concentrations and types with the Precinct are likely to vary depending on the source of contamination and site activities. Typical contaminants identified within the Precinct included hydrocarbons (petroleum and chlorinated), metals, PFAS, hazardous building materials (HBM) including asbestos, and possible hazardous ground gases.

Future development and land use will need to consider the suitability of individual sites for the intended or proposed future use. Sites that contain contamination that exceed regulatory guidelines or pose a risk to human health or the environment will require some form of remediation and/or management. The methodology, degree and extent of remediation/management will depend on the sensitivity of the land use, the proposed development, and risks to the relevant receptors. Subject to appropriate investigation, remediation and validation, contaminated land can be made suitable for the intended use.

Various sites were identified as high potential contamination risk areas in the baseline assessment as shown on Drawing 16 in Appendix D.

Remediation of contaminated land is likely to be required where the proposed land use is more sensitive than the existing land use. Remediation may also be required for sites that are retained for their existing land use depending on the contamination status of the site.

The preferred hierarchy for the remediation of contamination is on-site treatment to destroy or reduce the associated risk to an acceptable level. The NCC Contaminated Land Management - Technical Manual indicates that “no contaminated soil shall be encapsulated or capped on the site that contains concentrations of contaminants that are above the soil investigation levels for urban development sites in NSW for the range of landuses permissible on the subject site”.

If treatment is not practical, approval could be sought from Council for consolidation and isolation of the contamination on-site by containment (ie on-site management via capping). Approval for capping of contamination on-site will be subject to Council approval via the development application process. Council is likely to impose site specific remediation requirements and conditions to ensure that there are no unacceptable ongoing contamination management requirements.

As indicated in the Council Contaminated Land Policy - Remediation should ensure that any development of contaminated land will not result in unacceptable levels of risk to human health or the environment. In addition, the community should not be unduly disadvantaged by increased health and environmental risks or increased management costs when accepting the dedication of public assets due to contamination. Selected remediation technologies should promote minimal disturbance and support the principle of waste minimisation.

Although some sites are proposed to retain existing land uses, this does not necessarily mean that site remediation will not be required. Sites such as the former Hamilton Gasworks and ELMA sites are significantly contaminated, and although they are currently deemed suitable for commercial / industrial use (with conditions), future development will trigger additional investigations that may recommend additional remediation/management measures (i.e. vapour barriers, additional capping or barriers etc) and will be subject to regulatory approvals. Future development of existing industrial land for a modern industrial subdivision may require an EPA accredited site Audit, additional capping and vapour barrier, even though some of these sites are currently being utilised for industrial purposes.

Retaining current landuse does not mean there won't be remediation costs if these sites are developed for the same, more sensitive or less sensitive landuse. Remediation requirements and costs will depend on the presence, extent and implications of site contamination.

The significance of contamination on many sites will also be influenced by the proposed development (i.e. low rise vs high rise, shallow foundations vs deep foundations, open space vs structures etc). Development over significantly contaminated land may result in additional conditions to development. Development over land that requires capping / on-going management of contaminated soils and groundwater will be subject to regulatory approval. Development may also be limited to strata development in order to facilitate appropriate management of contamination across the greater site area. Development approval by the regulator will be assessed on a site by site basis considering the contamination status of the site and requirements for remediation and on-going management of contamination.

Sites within the Precinct that require remediation/management could be considered collectively so that remediation can be integrated with Precinct staging where feasible (ie naturalisation of Styx creek and immediately adjacent properties).

Geotechnical conditions such as foundations, presence and depth of rock, groundwater, acid sulfate soils and mine subsidence should be considered for future use and development of the Precinct. The eastern finger of the project area lies within the Newcastle Mine Subsidence District (limited to the area along Tudor Street), Based on experience, targeted grouting of mine workings is likely to be required for >3 storey buildings within the mine subsidence area. For < 3 storey buildings, grouting may not be required if deep workings with an appropriate pillar factor of safety are determined. This will be subject to lot specific desktop assessment, analysis and likely site investigation drilling to determine the depth and condition of the mine workings. The

geotechnical considerations can be managed with appropriate engineering design and development for the ground conditions. It is noted that limited geotechnical information was generally available within the Precinct. Further investigations will be required for detailed design and construction purposes for individual sites.

Acid sulphate soils (ASS) mapping indicated that the majority of the Precinct is located within a Class 4 risk area. ASS is likely to be found below two metres of the natural ground surface. ASS (if disturbed) will require specific handling, treatment and/or management during proposed development. The presence of ASS does not necessarily preclude the proposed development. Many developments within the Precinct and the greater Newcastle area have been conducted within ASS, including major excavations for basements or the installation of deep services.. The risk of significant adverse environmental impacts from the proposed use of the land in relation to ASS is considered to be low provided the works are conducted with reference to the relevant Acid Sulfate Soils Planning Guidelines.

In many cases, limited information was available regarding geotechnical and contamination conditions across the site. Additional investigations would be required to confirm geotechnical conditions and the contamination status (i.e. presence, extent and significance of contamination) and requirements for remediation (if any). Additional assessment would also be required to determine the feasibility of various development options due to the complex site conditions and limited information in many areas of the site.

It is noted that the contamination status may not necessarily preclude development over contaminated sites, however, remediation, validation and management requirements could impact on the feasibility of a particular development. Any proposed changes to landuse or development will require appropriate statutory and regulatory approval.

An important consideration is community engagement to avoid negative community perception of the health risk from redevelopment and reuse of high risk contaminated areas, especially where there is a proposed transition to a more sensitive landuse.

Reference should be made to the details provided in the SWOT analysis for the emerging preferred scenario, together with the infrastructure considerations in Table F1 in relation to land capability and contamination.

4. References

Cox. (2024). *Reimagining Broadmeadow, Scenarios Report - April 2024*. Cox Architecture.

DP. (2023). *Baseline Report - Package D, Land Capability and Contamination Assessment, Reimagining Broadmeadow, Broadmeadow Regionally Significant Growth Area*. Document No. 203522.01.R.001.Rev0: Douglas Partners Pty Ltd.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land*. Contaminated Land Guidelines: NSW Environment Protection Authority.

5. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report located the Broadmeadow Regionally Significant Growth Area in accordance with DP's proposal dated 10 February 2023 and acceptance received from Lee McCourt dated 15 February 2023. The work was carried out under Purchase Order (PO) No 45422295, dated 15 February 2023). This report is provided for the exclusive use of Department of Planning, Housing and Infrastructure (NSW) for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

DP accepts no responsibility and makes no representation as to the accuracy or completeness of the information provided for this baseline assessment.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical and environmental components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

We understand that School infrastructure and transport initiatives are indicative only and subject to detailed design, analysis, feasibility review, funding commitments etc.

Appendix A

About this Report

About this Report

November 2023

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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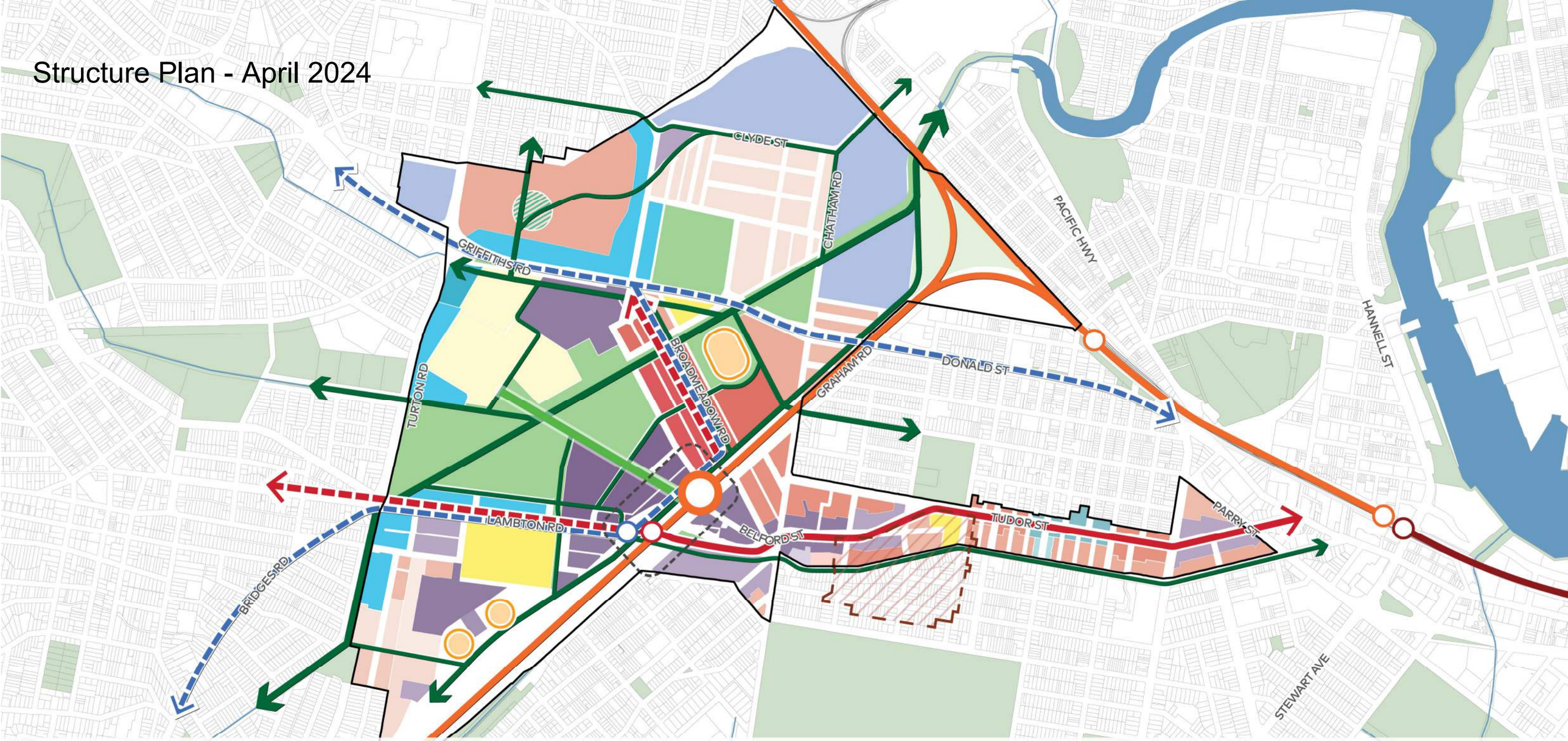
Appendix B

Emerging Preferred Scenario Plans:

(Cox, April 2024)

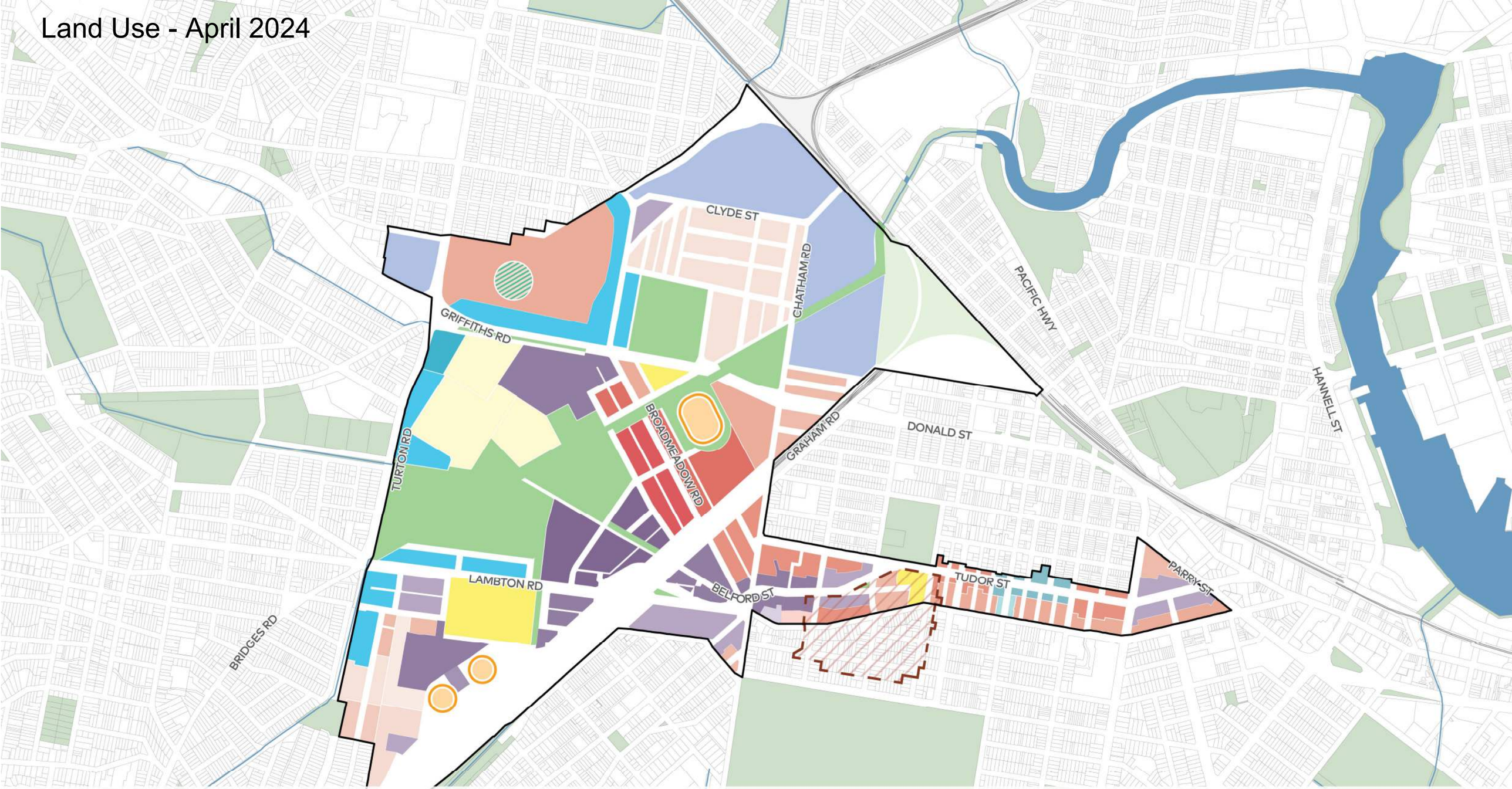
- Structure
- Land Uses
- First Moves

Structure Plan - April 2024



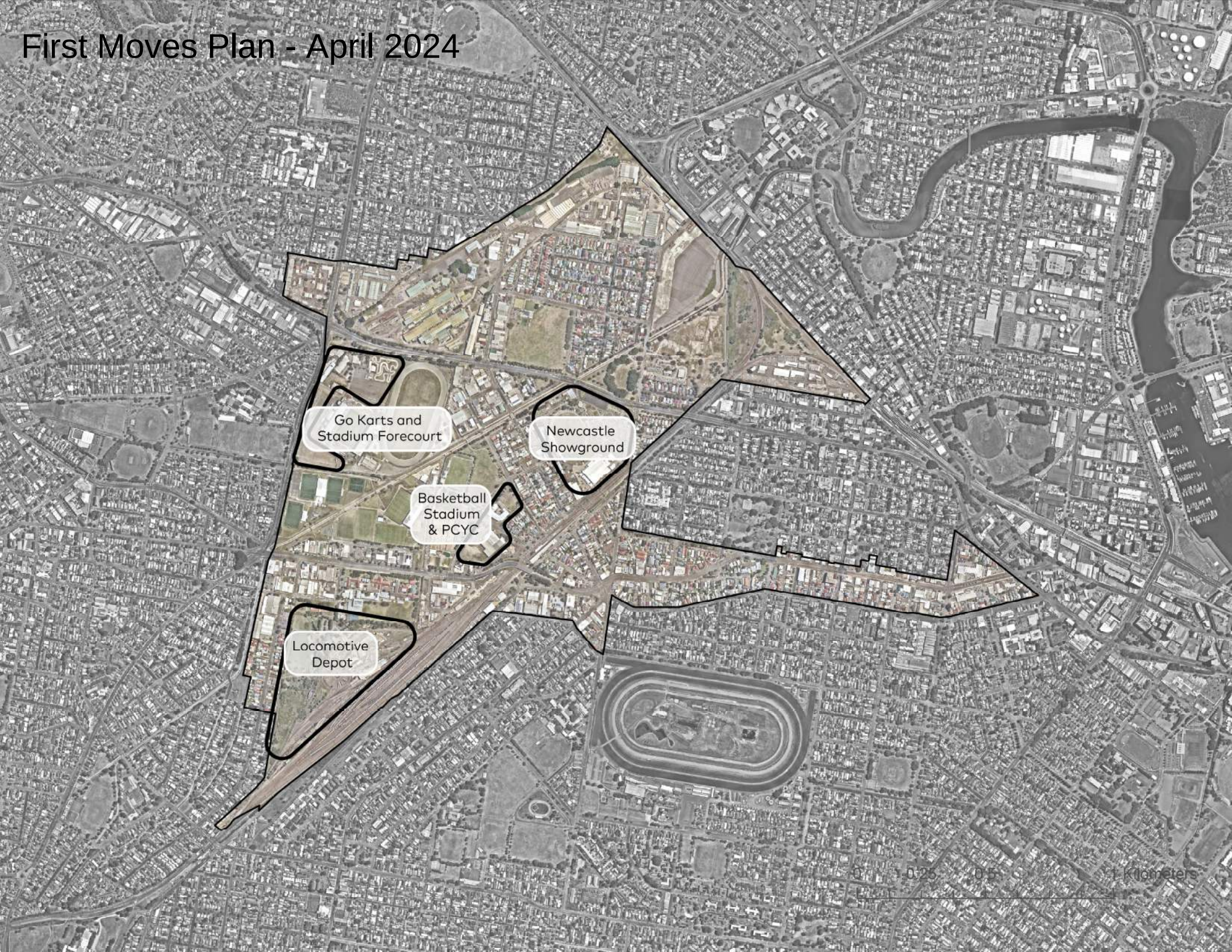
Precinct boundary	Higher-density residential	Medium-density local centre	Investigation area for heritage conservation	Proposed light rail
Green space	Higher-density mixed use	Lower-density local centre	Active connection	Potential light rail extension options
Indicative open space	Medium-density mixed use	Urban services	Green boulevard	Existing railway line
Woodville Junction green space	Lower-density mixed use	Recreation	Proposed rapid bus	Existing railway station
Lower-density residential	Commercial	School	Existing light rail	Proposed interchange
Medium-density residential	Higher-density commercial	Heritage protection	Proposed rapid bus	

Land Use - April 2024



Precinct boundary	Lower-density residential	Medium-density mixed use	Medium-density local centre	School
Green space	Medium-density residential	Lower-density mixed use	Lower-density local centre	Heritage protection
Indicative open space	Higher-density residential	Commercial	Urban services	Investigation area for heritage conservation
Woodville Junction green space	Higher-density mixed use	Higher-density commercial	Recreation	

First Moves Plan - April 2024

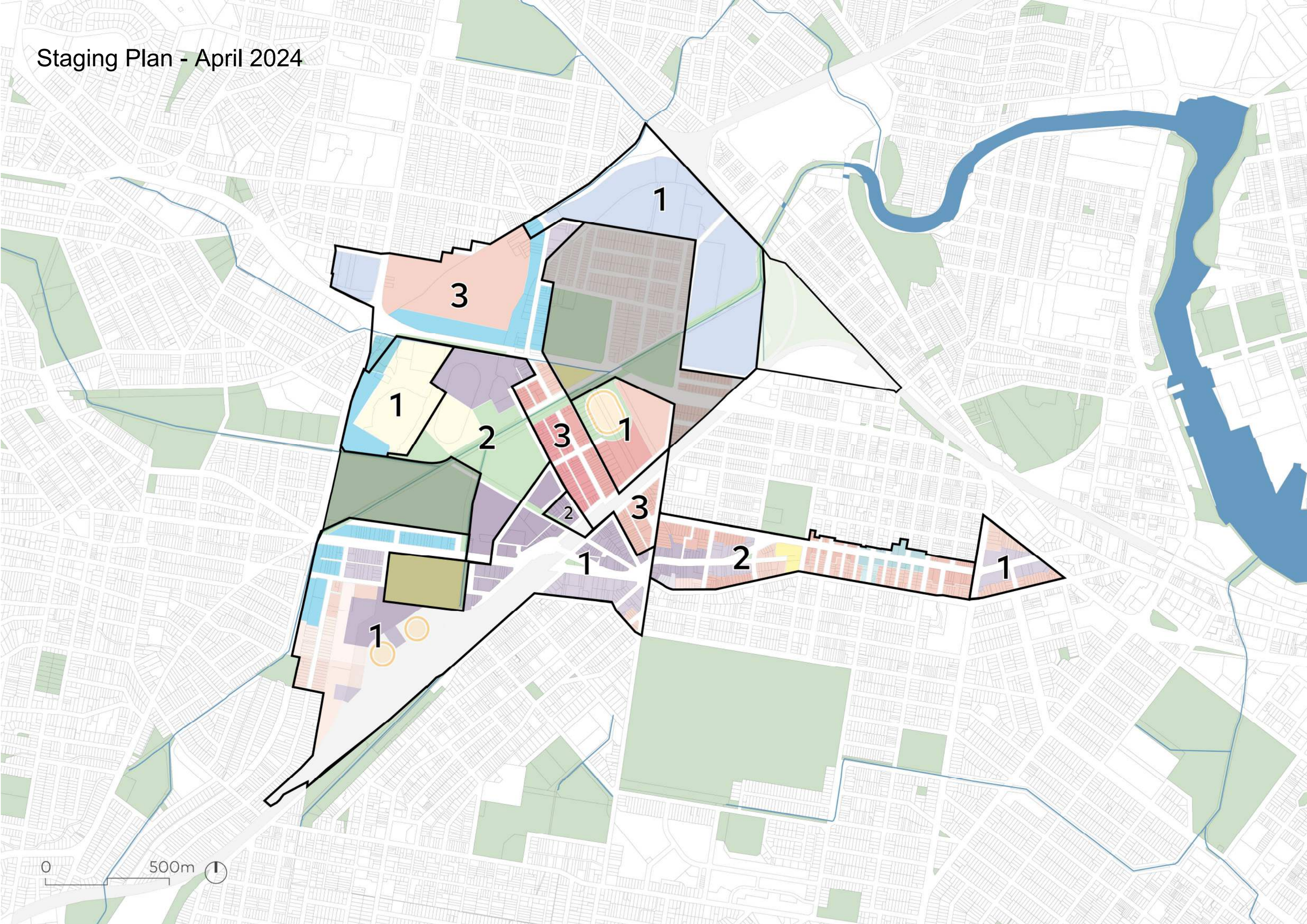


Appendix C

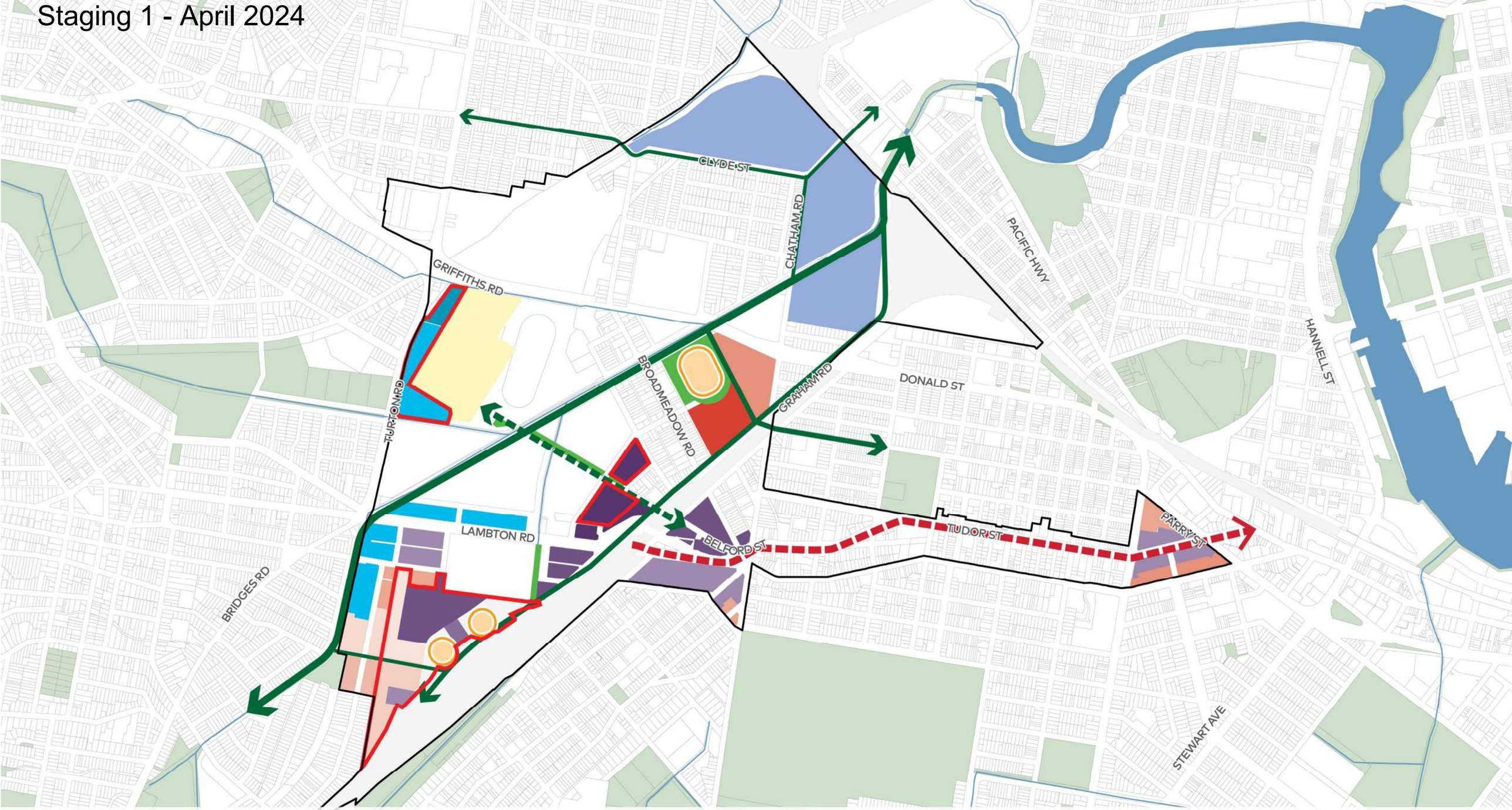
Staging – Emerging Preferred Scenario (Cox, April 2024):

- Overall Staging Plan
- Stage 1 Plan
- Stage 2 Plan
- Stage 3 Plan

Staging Plan - April 2024



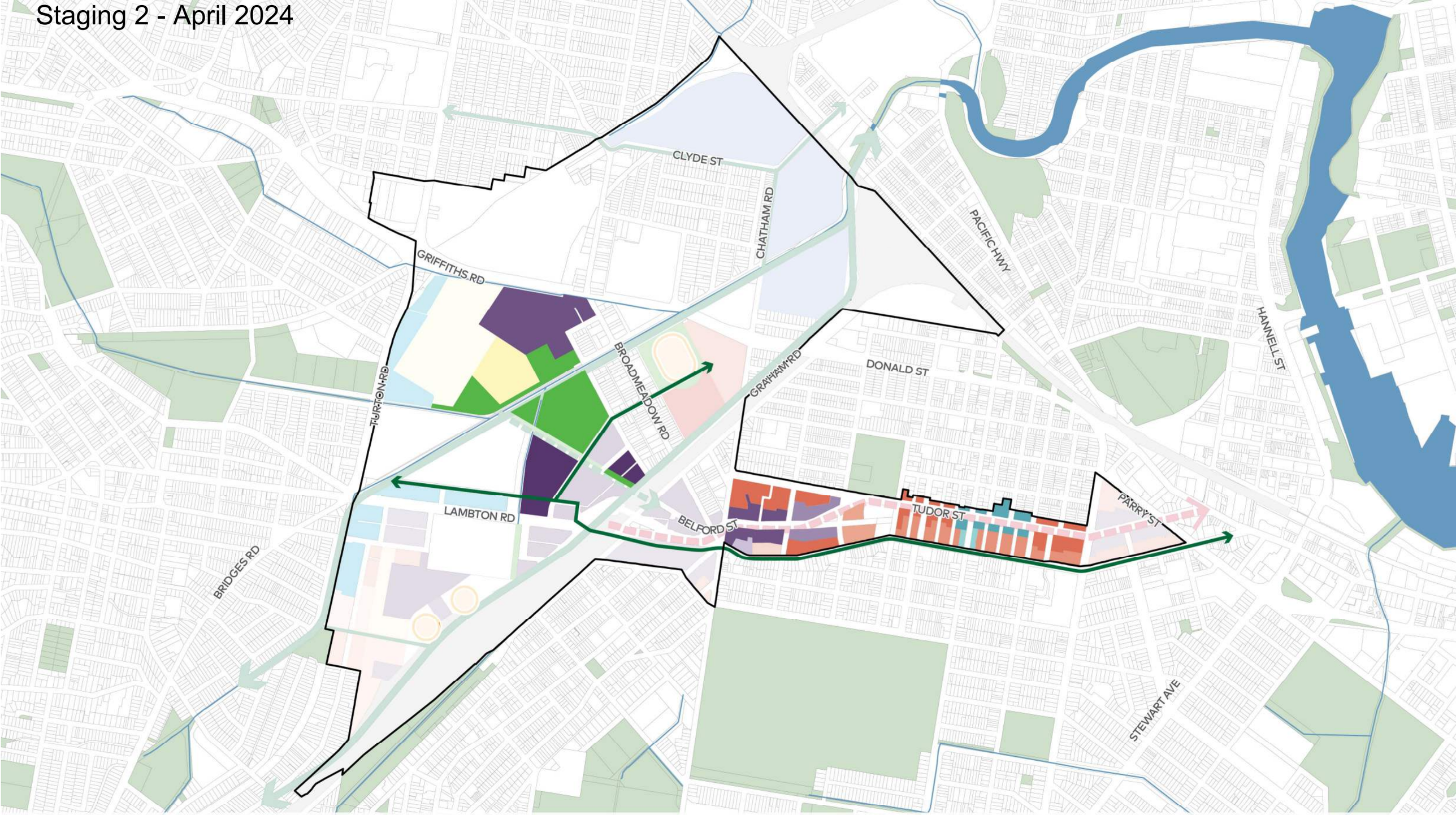
Staging 1 - April 2024



0 500m

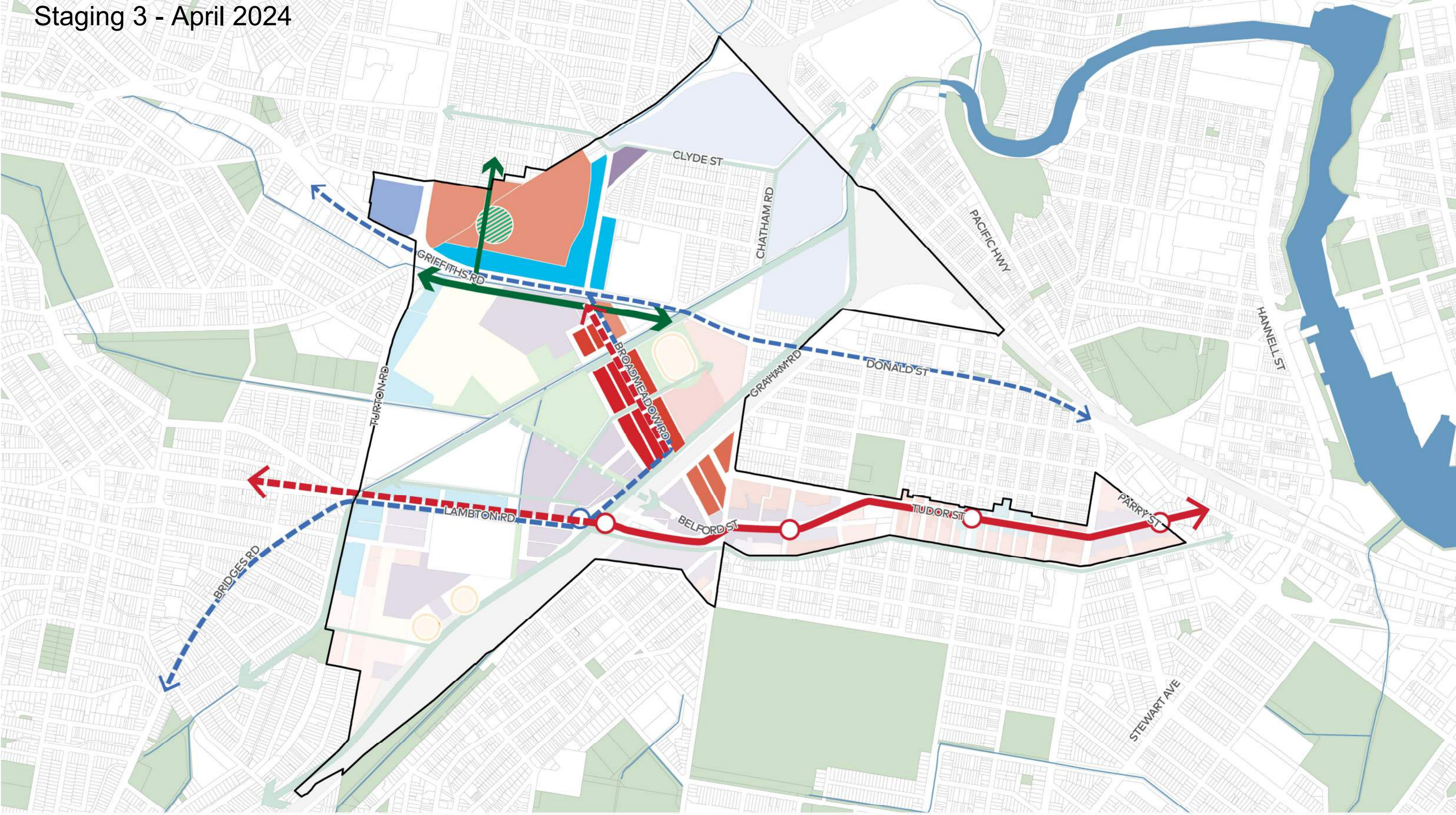
Precinct boundary	Medium-density residential	Commercial	Active connection
Government moves	Lower-density residential	Higher-density commercial	Green link
Green space	Higher-density mixed use	Urban services	Proposed light rail
Indicative open space	Lower-density mixed use	Recreation	Heritage protection

Staging 2 - April 2024



Precinct boundary	Medium-density residential	Higher-density mixed use	Medium-density local centre
Green space	Lower-density residential	Higher-density mixed use	Lower-density local centre
Indoor recreation	→ Active connection	Medium-density mixed use	

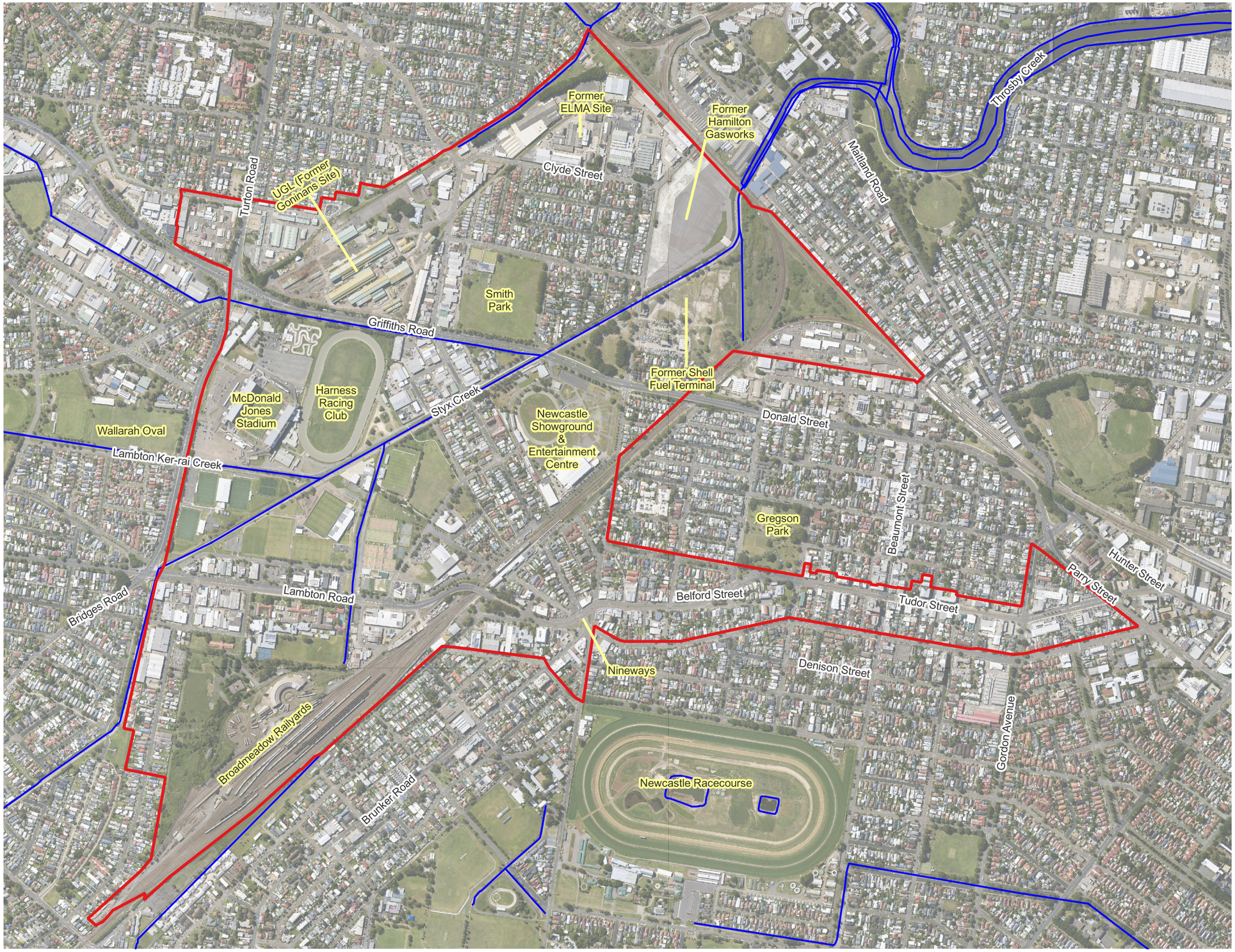
Staging 3 - April 2024

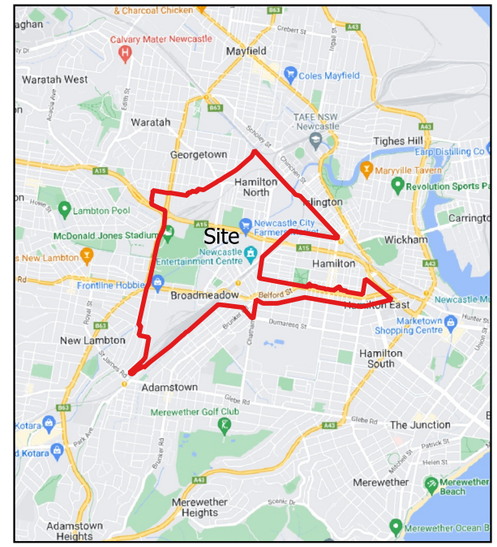


Precinct boundary	Higher-density residential	Medium-density mixed use	Commercial
Indicative open space	Medium-density residential	Medium-density local centre	Proposed rapid bus
Active connection	Proposed light rail	Potential light rail extension options	

Appendix D: Drawings

- Drawing 1 – Site Boundary
- Drawing 10 – Preliminary Geotechnical Information
- Drawing 16 – Potential Contamination Risk Rating
- Rhelm – Proposed Flood Mitigation – Dec 2023





Site Location

Legend

- Site Boundary
- Watercourse

0 250 500 m

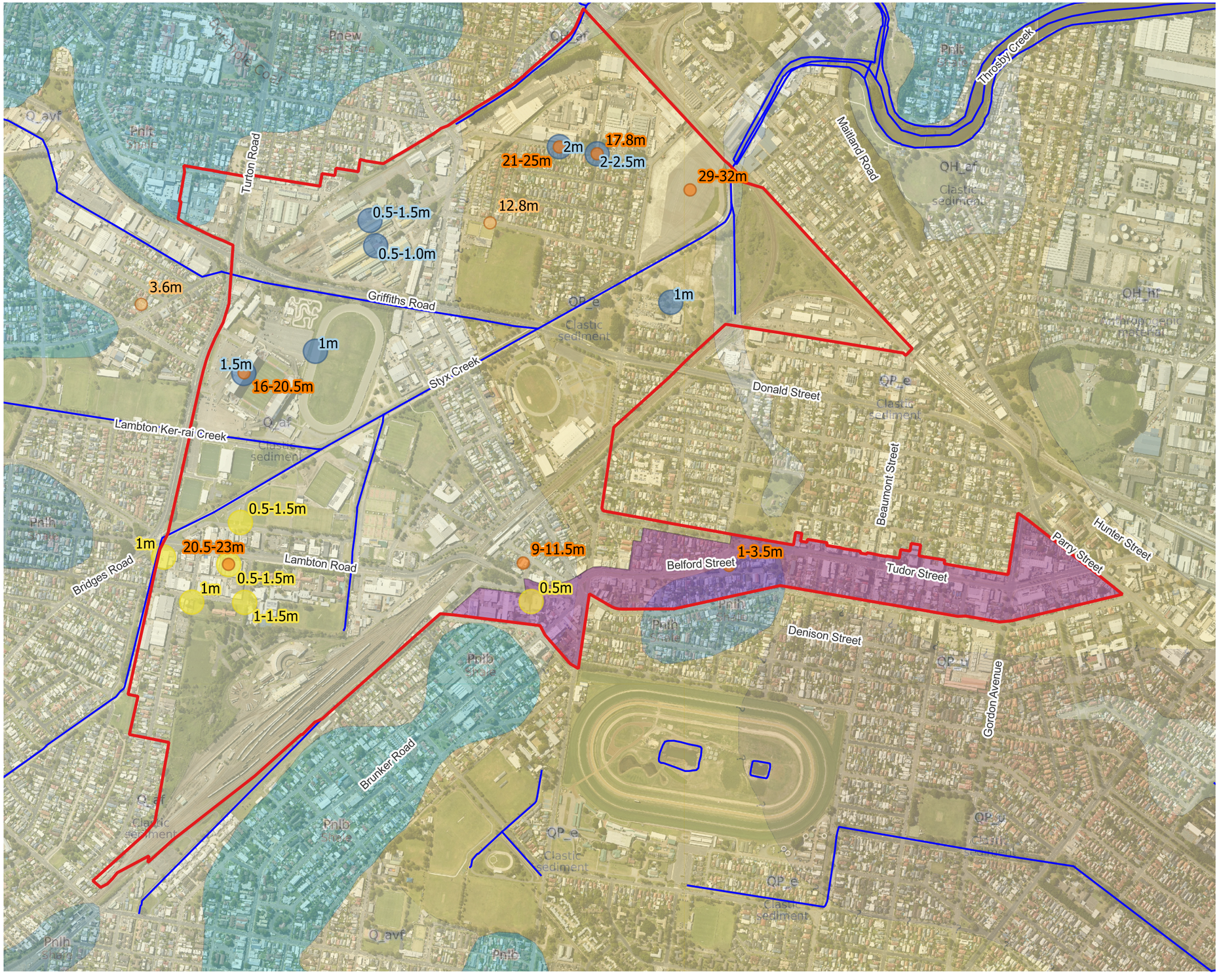
Drawing adapated from Metromap Image dated 18.03.2023

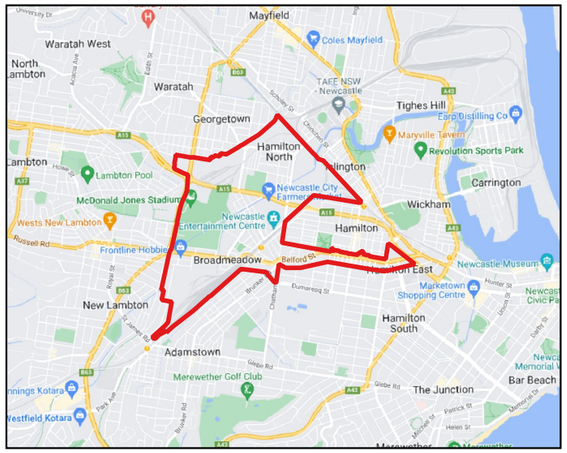
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Department of Planning & Environment		
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: 1:12,000 @ A3	DATE: 8.3.2024	

TITLE: Site Boundary
Housing the Hunter: A plan for renewal at Broadmeadow
Broadmeadow Regionally Significant Growth Area

PROJECT No:	203522.01
DRAWING No:	1
REVISION:	0





Site Location

Legend

- Site Boundary
- Firm Soils
- Rock
- Rock from Wells
- Soft Soils
- Mine Subsidence Within Precinct Area
- Watercourse

Cenozoic	Quaternary	mf	Man-made fill, dredged estuarine sand and mud, demolition rubble, industrial and household waste
		Qa	Gravel and sand
		Qa/mf	Combination of gravel, sand and man-made fill
		Qhb	Beach with coarse-grained quartz sand, shell fragments and gravel
		Qhbr	Beach ridge plain with coarse-grained quartz sand, shell fragments and gravel
		Qhd	Medium- to fine-grained marine sand with podsols
		Qs	Quartz sand
		Qf	Quartz sand, muddy sand, silt and mud
		Ql	Lithic sand
		Qm	Mud, sandy mud
		Qg	Quartz sand, clean to muddy (less than 50% mud)
	Neogene		
	Paleogene	NGs	Saint Marys Formation — Laterised sand and clay with ferricrete bands and silcrete
		GEvf / GEvt	GEvf: Basalt; GEvn: Basalt, teschenite
Mesozoic	Middle Triassic	Rh	Hawkesbury Sandstone — Medium- to very coarse-grained quartz sandstone, minor laminated mudstone and siltstone lenses
			NARRABEEN GROUP
		Rnt	Gosford Subgroup / Terrigal Formation — Interbedded laminite, shale and fine- to coarse-grained quartz- to quartz-lithic sandstone; minor red claystone
		Rnp	Clifton Subgroup / Patonga Claystone — Red–brown claystone and siltstone, light green–grey fine-grained sandstone
	Early Triassic	Rnu	Tuggerah Formation — Grey to green–grey laminite, red–brown claystone and siltstone, interbedded with fine- to medium–grained green–grey sandstone
		Rnm	Munmorah Conglomerate — Conglomerate, pebbly sandstone, grey to green shale
		Rnd	Dooralong Formation — Medium-grained quartz–lithic sandstone, siltstone, claystone, laminate, coal
Paleozoic	Late Permian		NEWCASTLE COAL MEASURES
		Pnm	Moon Island Beach Subgroup — Conglomerate, tuff, siltstone, claystone, black coal
		Pnb	Boolaroo Subgroup — Sandstone, conglomerate, tuff, black coal
		Pna	Adamstown Subgroup — Conglomerate, tuff, sandstone, siltstone, claystone, black coal
		Pnl*	Lambton Subgroup — Sandstone, siltstone, claystone, coal and tuffaceous sandstone
		Pnw*	Waratah Sandstone — Medium-grained lithic sandstone, mostly massive, well sorted; fine-grained in mid-section
			TOMAGO COAL MEASURES
		Pt*	Undifferentiated — Sandstone, siltstone, laminated sandstone/siltstone, carbonaceous claystone, coal and minor tuffaceous sandstone
		Ptk*	Wallis Creek Subgroup / Kulnura Marine Tongue — Siltstone, mudstone and claystone; sporadic fossil, dropstones and glendonites
			MAITLAND GROUP
		Pm*	Undifferentiated — Quartz–lithic sandstone with sporadic marine fossils, conglomerate, grey siltstone, fossiliferous siltstone, minor claystone and chert

SINGLETON SUPERGROUP; SYDNEY BASIN

* in cross-section only
( ) bracketed units on map are underwater

0 250 500 m

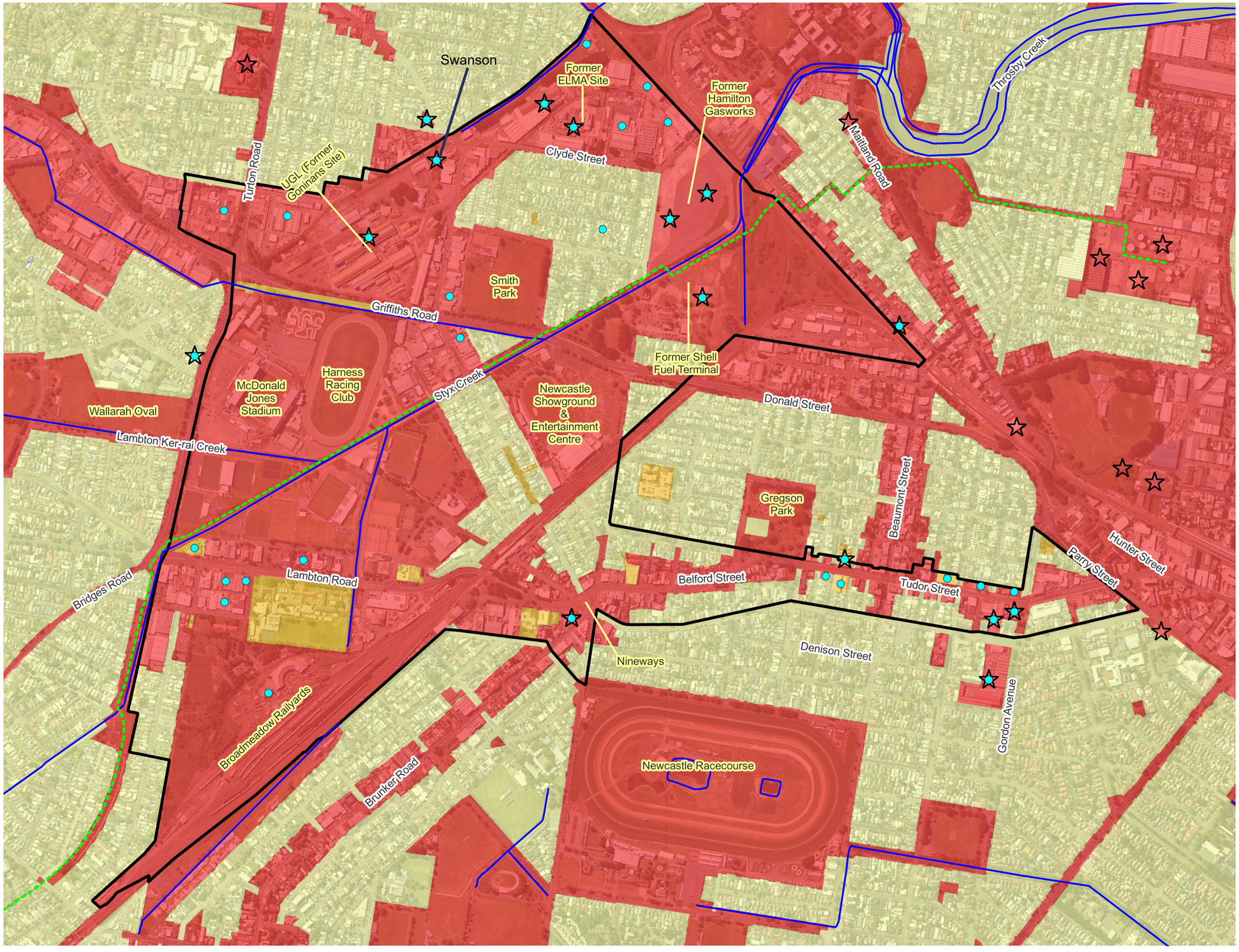
Drawing adapted from Metromap Image dated 18.03.2023, NSW Seamless Geology (no hillside), and NSW Hunter Watercourse Map.

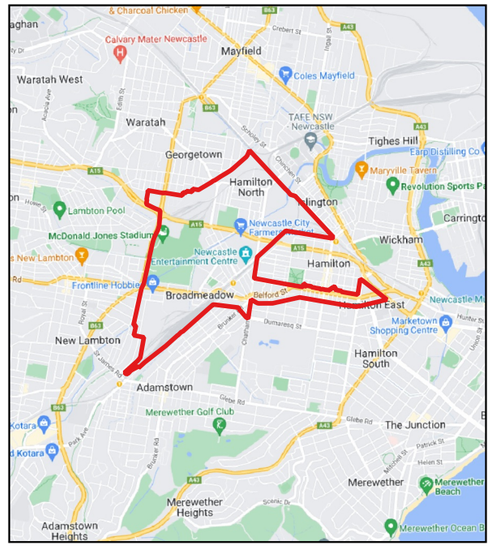
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Department of Planning & Environment		
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: 1:12,530 @ A3	DATE: 8.3.2024	

TITLE: Preliminary Geotechnical Information
Housing the Hunter: A plan for renewal at Broadmeadow
Broadmeadow Regionally Significant Growth Area

PROJECT No:	203522.01
DRAWING No:	10
REVISION:	0





Site Location

Legend

- Site Boundary
- Ampol Fuel Pipeline
- Identified and Likely Groundwater Impacts (Based on Available Information)
- EPA Notified Sites

Potential Contamination Risk Rating

- High
- Medium
- Low
- Watercourse

0 250 500 m

Drawing adapted from Metromap Image dated 18.03.2023.

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Department of Planning & Environment	
OFFICE: Newcastle	DRAWN BY: PLH
SCALE: 1:12,000 @ A3	DATE: 8.3.2024

TITLE: Potential Contamination Risk Rating
Housing the Hunter: A plan for renewal at Broadmeadow
Broadmeadow Regionally Significant Growth Area

PROJECT No:	203522.01
DRAWING No:	16
REVISION:	0


Area = 2.4Ha
Depth = 1.5m
Area = 2.4Ha
Depth = 2m
Area = 2.5Ha
Depth = 2.2m
Area = 4Ha
Depth = 2m
Area = 0.7Ha
Depth = 1m
Area = 3.2Ha
Depth = 3.4m
Area = 2.4Ha
Depth = 3.7m
Area = 4.7Ha
Depth = 3m
Area = 3.6Ha
Depth = 1.9m
Area = 0.4Ha
Depth = 1.3m
Area = 2.8Ha
Depth = 1.7m
Area = 3.3Ha
Depth = 1.4m
0
250
500 m
Aerial Imagery: Six Maps, NSW Spatial Services
RHELM - Proposed Flood MItigation Measures - Dec 2023
Study Area
Cadastre
Proposed Detention/Flood Storage

Appendix E: Emerging Preferred Scenario – SWOT Analysis

- Figure E1 – Land Uses – Emerging Preferred Scenario – Rev 1
- Table E1 – SWOT Analysis – Emerging Preferred Scenario

Figure E1 - Major Site Locations - **Emerging Preferred Scenario** - Rev1

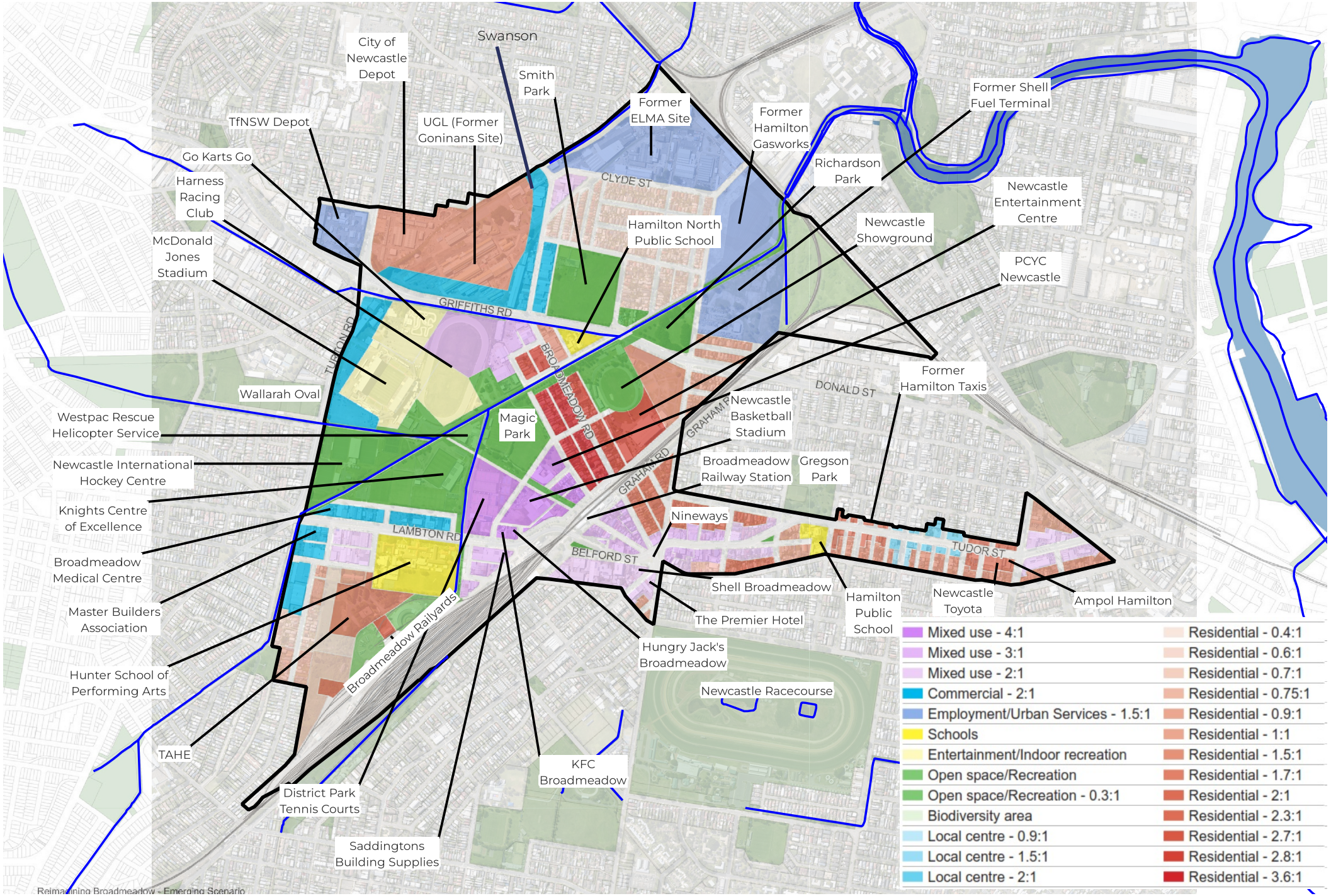


Table E1: SWOT Analysis – PREFERRED SCENARIO 1: South

Strengths	Weakness
Identified high potential contamination risk areas: • Beneficial use of known and potential high risk contaminated land	Commercial use area (Lambton Road, Lang Road, Newton Street, Kings Road): • Includes Master Builders, ARTC etc • Various commercial uses • Some information available indicating potential for contaminating activities and landuses • Identified as high potential contamination risk area • Site remediation and management may be required • Although currently utilised for commercial purpose, may require additional remediation/management to facilitate future proposed commercial uses and developments • Additional remediation requirements are unknown, and will also depend on the proposed design of future works Mixed use area (Lambton Road, Cameron Street, Lang Road, Newton Street): • Immediately west of Hunter School of Performing Arts (HSPA) • Various existing commercial uses • Some information available indicating potential for contaminating activities and landuses (including UST's, dry cleaner etc) • Identified as high potential contamination risk area • Site remediation and management may be required • Although currently utilised for commercial purpose, may require additional remediation/management to facilitate future proposed commercial uses and developments • Additional remediation requirements are unknown, and will also depend on the proposed design of future works Existing Hunter School of Performing Arts (HSPA): • Retain as school • Limited information is available • Potential for impacted fill to be present, may require capping and on-going management • Site remediation and management may be required • Although currently utilised as school site, may require additional remediation/management to facilitate future proposed developments • Additional remediation requirements are unknown, and will also depend on the proposed design of future works Proposed Residential (within TAHE land): • Part of the Locomotive Depot (TAHE land) • Identified as high potential contamination risk area • Site remediation and management is likely to be required due to the change to a more sensitive landuse (i.e. former commercial/industrial to residential) • Current remediation strategy over the TAHE site is to remove impacted materials from nominated areas and place within a containment cell (outside the proposed residential area within landscape area and beneath possible commercial buildings) and will be subject to regulatory approval • A site-specific remediation strategy will be required for the proposed development • Regulatory approval will be required where on-site management of contamination is proposed (i.e. capping). Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area

Strengths	Weakness
	Proposed Public Recreation (TAHE land): • Part of the Locomotive Depot (TAHE land) including heritage area and turntable/roundhouse • Identified as high potential contamination risk area • Site remediation and management is likely to be required due to the change to a more sensitive landuse (i.e. former commercial/industrial to public recreation) • Current remediation strategy over the TAHE site is to remove impacted materials from nominated areas and place within a containment cell (outside the proposed residential area within landscape area and beneath possible commercial buildings) • This area is therefore likely to include a containment cell with requirements for capping and long-term management • A site-specific remediation strategy will be required for the proposed development • Where residential land use is proposed over a site where on-site management of contamination is conducted for site remediation, the regulator is likely to consider residential strata development only (i.e. to facilitate appropriate management of contamination) • The containment cell can also only accept contaminated soils from within the site (and not external sites) • Staging of remediation will therefore be important to ensure lawful placement of contaminated soils form the TAHE site area Retention of Locomotive Depot (TAHE land): • Comprising existing rail lines • Identified as high potential contamination risk area • Likely to contain site contamination • Although currently utilised for rail purpose, may require additional remediation/management to facilitate future proposed uses and developments (if any) Mixed use area east of HSPA: • Existing commercial/industrial uses • Including Saddingtons Building Supplies, mechanic etc • Identified as high potential contamination risk area • Site remediation and management may be required • Although currently utilised for general commercial purpose, may require additional remediation/management to facilitate future proposed uses and developments • Additional remediation requirements are unknown, and will also depend on the proposed design of future works Road network upgrades: • Possible presence of contamination within existing pavements (i.e. former coal tar or slag/ash pavements) • Impact on waste classification of soils and possible increase in constructions costs due to the presence of contaminated materials (i.e. potential landfill disposal requirements for contaminated soils)

Opportunities	Threats
Known or potential high risk contaminated site: • Develop integrated remediation strategies for known high risk areas • Integration of development with site remediation to maximise beneficial use and address requirements for remediation/management • Allow targeted assessment of critical sites to assist with feasibility assessment • Co-ordinate development (via staging) to address contamination risk areas and reduce possible conflicts during redevelopment	Development over Locomotive Depot (TAHE land): • Feasibility of remediation/management for the proposed development (cost of remediation/management) for the proposed use • Limitations/influence on the design due to requirements for remediation and on-site management of contamination (via capping) • Additional costs associated with construction over contaminated sites (management of soil and groundwater contamination and possible vapours) • A site specific remediation strategy will be required for the proposed development based on detailed site investigations and regulatory approvals Various existing commercial land to continue use for mixed use and commercial purposes: • Although currently utilised for commercial/industrial purpose, may require additional remediation/management to facilitate future development due to site contamination conditions • Many of these sites were identified as potential high risk areas, however, many have limited information available Various sites identified as high potential contamination risk areas: • Many sites were identified as potential high risk areas, however, many have limited information available • Additional investigations would be required to confirm the contamination status (presence, extent and significance of contamination) and requirements for remediation (if any) • The significance of contamination on many sites will be influenced by the proposed development (i.e. low rise vs high rise, shallow foundations vs deep foundations etc) • Additional costs are likely for construction over contaminated sites (management of soil and groundwater contamination) • Remediation is more likely where the proposed land use is more sensitive than the existing landuse (i.e. commercial to residential, or commercial to open space) Development over contaminated land or land that requires on-going management of contamination: • Development over significantly contaminated land or land that requires capping/on-going management of contaminated soils and groundwater will require regulatory approval • Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area • Development approval will be assessed on a site by site basis considering the contamination status of the site and requirements for remediation and on-going management of contamination Road network upgrades: • Increased construction costs due to the possible presence of contaminated materials (i.e. potential for former coal tar or slag/ash pavements to be present) Development within areas subject to flooding: • A large part of the precinct is low-lying with a relatively shallow water table and is subject to flooding • Redevelopment and site remediation measures will need to consider implications from flooding (i.e. remediation methods, capping integrity, management of surface water and groundwater migration, management of vapour risks) Geotechnical constraints: • Geotechnical constraints and considerations are anticipated to be managed with appropriate engineering design and appropriate development for the ground conditions • Limited geotechnical information was generally available within the Precinct. Further investigations will be required for detailed design and construction purposes for individual sites Community engagement: • Negative community perception of health risk from redevelopment and reuse of high risk contaminated areas (especially transition to more sensitive landuse)

Table E1: SWOT Analysis – PREFERRED SCENARIO 1: Belford/Tudor

Strengths	Weakness
Identified high potential contamination risk areas: Beneficial use of known and potential high risk contaminated land	Retention of existing landuse over the Belford/Tudor sub-precinct: • Contains various existing commercial, mixed use and residential sites • Landuse generally to be retained, with opportunity for increased density • Many of these sites were identified as potential high risk areas (including Nineways Coles express (Shell), former Hamilton Taxi Service, Newcastle Toyota, former Caltex Hamilton etc) • Many sites have limited information available • Although utilised for current purposes which will be retained, sites may require additional remediation/management to facilitate future proposed development due to site contamination conditions • Additional investigations would be required to confirm the contamination status (presence, extent and significance of contamination) and requirements for remediation (if any) Road network upgrades (via Tudor Street Terminating to Broadmeadow Station): • Possible presence of contamination within existing pavements (i.e. former coal tar or slag/ash pavements) • Impact on waste classification of soils and possible increase in construction costs due to the presence of contaminated materials (i.e. potential landfill disposal requirements of contaminated soils) Mine Subsidence area: • Within eastern portion of the site only (along Tudor Street) • The Borehole Seam has been mined with typically 35 m to 55 m depth of cover to the workings (may be shallower or deeper). Depth to workings generally increases to the east • Requirements for grouting of workings for future development will depend on the depth and condition of workings, and project specific details (i.e. building height, type, extent, basement) • Based on experience, targeted grouting is likely for > 3 storey buildings within the mine subsidence district • For < 3 storey buildings, grouting may not be required if deep workings with an appropriate pillar factor of safety are determined • Grouting requirements will be subject to lot specific desktop assessment, analysis and likely site investigation drilling to determine the depth and condition of workings • Development within mine subsidence areas will be subject to assessment and approval from Subsidence Advisory NSW.

Opportunities	Threats
Known or potential high risk contaminated site: • Develop integrated remediation strategies for known high risk areas • Integration of development with site remediation to maximise beneficial use and address requirements for remediation/management • Allow targeted assessment of critical sites to assist with feasibility assessment • Co-ordinate development (via staging) to address contamination risk areas and reduce possible conflicts during redevelopment	Various existing commercial, mixed use and residential sites to retain existing uses: • Although currently utilised for various purpose, may require additional remediation/management to facilitate future development due to site contamination conditions • Many of these sites were identified as potential high risk areas, however, many have limited information available • Additional investigations would be required to confirm the contamination status (presence, extent and significance of contamination) and requirements for remediation (if any) • Additional costs are likely for construction over contaminated sites (management of soil and groundwater contamination) Road network upgrades: • Increased construction costs due to the possible presence of contaminated materials (i.e. potential for former coal tar or slag/ash pavements to be present) Mine Subsidence area: • Feasibility for development of building > 3 storeys within the mine subsidence district due to likely grouting requirements (i.e. cost of grouting) • Risk that < 3 storey buildings may also require grouting • Development within mine subsidence areas and requirements for grouting will be subject to specific site investigations and approval from Subsidence Advisory NSW Development within areas subject to flooding: • A large part of the precinct is low-lying with a relatively shallow water table and is subject to flooding • Redevelopment and site remediation measures will need to consider implications from flooding (i.e. remediation methods, capping integrity, management of surface water and groundwater migration, management of vapour risks Geotechnical constraints: • Geotechnical constraints and considerations are anticipated to be managed with appropriate engineering design and appropriate development for the ground conditions • Limited geotechnical information was generally available within the Precinct. Further investigations will be required for detailed design and construction purposes for individual sites Community engagement: • Negative community perception of health risk from redevelopment and reuse of high risk contaminated areas (especially transition to more sensitive landuse)

Table E1: SWOT Analysis – PREFERRED SCENARIO 1: Hamilton North

Strengths	Weakness
Former Gasworks, ELMA, Goninan, Swanson Industries, Shell Fuel Terminal and other identified high potential contamination risk areas: Beneficial use of known and potential high risk contaminated land	Former Gasworks site: • Retained for Employment/Urban Services (commercial/industrial) • Known area of significant soil and groundwater contamination currently managed via constructed temporary capping and groundwater barrier wall • Currently vacant with temporary capping and limited allowable use without further remediation/management • Will require additional remediation/management to facilitate commercial/industrial landuse • Possible requirements for additional capping, vapour barrier system? • Presence of known contamination and obstructions below existing capping will influence design (i.e. location of buildings, pavements, foundation requirements etc) • No basements or excavations/penetration below capping generally recommended • Limitations on excavations will influence design (i.e. foundations and pavements) and provision of infrastructure and underground services • Geotechnical risks relating to differential settlements and foundation conditions (to be considered in design) • Design of foundations influenced by presence of contamination and site capping/management requirements • Additional remediation requirements are unknown, and will also depend on the proposed design of future works • Regulatory approval will be required where on-site management of contamination is proposed (i.e. capping). Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area Former Shell Fuel Terminal site: • Retained for Employment/Urban Services (commercial/industrial) • Known area of significant soil and groundwater contamination, however, managed via capping by existing development (i.e. pavements and building) • Although currently utilised for commercial/industrial purpose, will require additional remediation/management to facilitate future commercial/industrial development • Possible requirements for additional capping, vapour barrier system • No basements or excavations/penetration below capping generally recommended • Limitations on excavations will influence design (i.e. foundations and pavements) and provision of infrastructure and underground services • Geotechnical risks relating to foundation conditions (to be considered in design) • Design of foundations influenced by presence of contamination and site capping/management requirements • Additional remediation requirements are unknown, and will also depend on the proposed design of future works • Regulatory approval will be required where on-site management of contamination is proposed (i.e. capping). Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area Former ELMA site (north of Clyde St): • Retained for Employment/Urban Services (commercial/industrial) • Known area of significant soil and groundwater contamination, however, managed via capping by existing development (i.e. pavements and building) • Although currently utilised for commercial/industrial purpose, will require additional remediation/management to facilitate future commercial/industrial development • Possible requirements for additional capping, vapour barrier system? • No basements or excavations/penetration below capping generally recommended • Limitations on excavations will influence design (i.e. foundation and pavements) and provision of infrastructure and underground services • Geotechnical risks relating to foundation conditions (to be considered in design) • Design of foundations influenced by presence of contamination and site capping/management requirements • Additional remediation requirements are unknown, and will also depend on the proposed design of future works • Regulatory approval will be required where on-site management of contamination is proposed (i.e. capping). Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area

Strengths	Weakness
	Goninan site (UGL) - Proposed residential and open space (sensitive) landuse • Known area of significant soil and some groundwater contamination • Adjacent to a known PFAS contamination site (Swanson Industries to the north east) • Will require additional remediation/management to facilitate residential landuse • Possible requirements for capping, localised vapour barrier system? • Presence of known contamination will influence design (i.e. location of buildings, pavements, foundation requirements etc) • No basements or excavations/penetration below capping generally recommended in areas of groundwater impacts • Limitations on excavations will influence design (i.e. foundation and pavements) and provision of infrastructure and underground services • Geotechnical risks relating to foundation conditions (to be considered in design) • Design of foundations influenced by presence of contamination and site capping/management requirements • Additional remediation requirements are unknown, and will also depend on the proposed design of future works • Regulatory approval will be required if on-site management of contamination is proposed (i.e. capping). Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development for residential use in order to facilitate appropriate management of contamination across the greater site area. In addition, regarding open space - the community should not be unduly disadvantaged by increased health and environmental risks or increased management costs when accepting the dedication of public assets due to contamination Goninan site (UGL) - Proposed commercial landuse (along southern and eastern boundaries – more sensitive landuse compared to existing industrial): • Known area of significant soil and some groundwater contamination • Although currently utilised for industrial purpose, may require additional remediation/management to facilitate future commercial development • Possible requirements for additional capping, localised vapour barrier system? • Presence of known contamination will influence design (i.e. location of buildings, pavements, foundation requirements etc) • No basements or excavations/penetration below capping generally recommended in areas of groundwater impacts • Limitations on excavations will influence design (i.e. foundation and pavements) and provision of infrastructure and underground services • Geotechnical risks relating to foundation conditions (to be considered in design) • Design of foundations influenced by presence of contamination and site capping/management requirements • Additional remediation requirements are unknown, and will also depend on the proposed design of future works Swanson Industries site (PFAS): • Proposed residential (sensitive) / commercial landuse • Known area of significant soil and groundwater contamination • Will require additional remediation/management to facilitate residential/commercial landuse • Possible requirements for capping, localised vapour barrier system? • Presence of known contamination will influence design (i.e. location of buildings, pavements, foundation requirements etc) • No basements or excavations/penetration below capping generally recommended in areas of groundwater impacts • Limitations on excavations will influence design (i.e. foundation and pavements) and provision of infrastructure and underground services • Geotechnical risks relating to foundation conditions (to be considered in design) • Design of foundations influenced by presence of contamination and site capping/management requirements • Additional remediation requirements are unknown, and will also depend on the proposed design of future works • Regulatory approval will be required where on-site management of contamination is proposed (i.e. capping). Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area Council Depot – Proposed residential: • Identified as high potential contamination risk area • Limited information available relating to contamination and geotechnical conditions • Currently utilised for commercial/industrial purpose, likely to require additional remediation/management to facilitate future residential development • Additional remediation requirements are unknown, and will depend on site conditions and the proposed design of future works • Regulatory approval will be required where on-site management of contamination is proposed (i.e. capping). Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area

Strengths	Weakness
	TfNSW Depot (Turton Road): • Retained as Employment/Urban Services (industrial) • Limited information available relating to contamination and geotechnical condition (likely to contain underground fuel storage tanks) • Identified as high potential contamination risk area • Although currently utilised for commercial/industrial purpose, may require additional remediation/management to facilitate future commercial/industrial development • Additional remediation requirements are unknown, and will depend on site conditions and the proposed design of future works Various existing commercial/industrial land (including lots along Broadmeadow Road): • Retained as commercial land • Contain various commercial/industrial landuses, identified as high potential contamination risk areas • Limited information available relating to contamination and geotechnical conditions • Although currently utilised for commercial/industrial purpose, may require additional remediation/management to facilitate future commercial development • Additional remediation requirements are unknown, and will depend on site conditions and the proposed design of future works TAHE land (northeast portion of sub-precinct): • Proposed Biodiversity Offset/green space • Currently comprising rail lands and commercial/industrial use • Identified as high potential contamination risk area • Limited information available • May require remediation/management to facilitate future use subject to site contamination conditions • Possible flood mitigations measures may require excavations and lowering of ground levels; • Excavated material will require appropriate management, disposal, possible treatment where required, based on the contamination and acid sulfate soil (ASS) status of the materials Smith Park and Richardson Park: • Existing open space to be retained as open space/public recreation • Limited information is available • Sites may contain historic impacted fill materials • On-going use will require management of the surface and possible capping, depending on the contamination status of the site • Possible flood mitigations measures may require excavations and lowering of ground levels; • Excavated material will require appropriate management, disposal, possible treatment where required, based on the contamination and ASS status of the materials Styx Creek naturalisation: • Currently concrete lined • Likely to be currently retaining contaminated soils and waters along the alignment where adjacent to potential high risk contaminated sites • Removal of concrete lining/capping may increase the risk of contaminant migration and adverse harm • Creek naturalisation works should attempt to maintain existing capping where possible, or provide supplementary or alternative capping where deemed necessary • Limited information is generally available along the creek alignment, however, there is a high risk of contamination adjacent to sites such as the former Gasworks and Shell Fuel Terminal sites • The Ampol fuel pipeline is also adjacent to the creek alignment • Soils behind existing capping are also likely to contain contamination based on limited information. Removal of such soils may result in significant disposal costs • Restoration costs along parts of Styx Creek may be significant depending on the contamination conditions and requirements (if any) to remove existing concrete lining/capping Road network upgrades: • Possible presence of contamination within existing pavements (i.e. former coal tar or slag/ash pavements) • Impact on waste classification of soils and possible increase in constructions costs due to the presence of contaminated materials (ie potential landfill disposal requirements for contaminated soils)

Opportunities	Threats
Known or potential high risk contaminated site: • Develop integrated remediation strategies for known high risk areas • Integration of development with site remediation to maximise beneficial use and address requirements for remediation/management • Allow targeted assessment of critical sites to assist with feasibility assessment • Co-ordinate development (via staging) to address contamination risk areas and reduce possible conflicts during redevelopment;	Former Gasworks, ELMA and Former Shell Fuel Terminal sites – Retained for Employment/Urban Services (commercial/industrial): • Feasibility of remediation/management for the proposed development (cost of remediation/management) for the proposed use • Limitations/influence on the design due to presence of capping, barrier wall, obstructions, soil and groundwater contamination • Additional costs associated with construction over contaminated sites (management of soil and groundwater contamination and possible vapours) • Limited information on many sites to confirm the contamination status and requirements for remediation (if any) • Risk of impacts to sites adjacent to known or potential areas of significant contamination (i.e. Gasworks, ELMA, Swanson, Goninan, Shell etc) as a result of groundwater migration, and requirements to manage potential groundwater impacts Goninan and Council depot – Proposed residential use: • Feasibility of remediation/management for the proposed residential development (cost of remediation/management) for the proposed use • Limitations/influence on the design due to presence of capping, containment cells, soil and groundwater contamination • Additional costs associated with construction over contaminated sites (management of soil and groundwater contamination and possible vapours) • Risk of impacts to sites adjacent to known or potential areas of significant contamination as a result of groundwater migration, and requirements to manage potential groundwater impacts Various existing commercial/industrial land to continue use for commercial/industrial purposes: • Although currently utilised for commercial/industrial purpose, may require additional remediation/management to facilitate future industrial development due to site contamination conditions • Many of these sites were identified as potential high risk areas, however, many have limited information available Various site identified as high potential contamination risk areas: • Many sites were identified as potential high risk areas, however, many have limited information available • Additional investigations would be required to confirm the contamination status (presence, extent and significance of contamination) and requirements for remediation (if any) • The significance of contamination on many sites will be influenced by the proposed development (i.e. low rise vs high rise, shallow foundations vs deep foundations etc) Development over significantly contaminated land or land that requires on-going management of contamination: • Development over significantly contaminated land or land that requires capping/on-going management of contaminated soils and groundwater will require regulatory approval • Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area • Development approval will be assessed on a site by site basis considering the contamination status of the site and requirements for remediation and on-going management of contamination • The community should not be unduly disadvantaged by increased health and environmental risks or increased management costs when accepting the dedication of public assets due to contamination (ie open space) Styx Creek naturalisation: • Restoration costs along parts of Styx Creek may be significant depending on the contamination conditions and requirements (if any) to remove existing concrete lining/capping Road network upgrades: • Increased constructions costs due to the possible presence of contaminated materials (i.e. potential for former coal tar or slag/ash pavements to be present) Flood mitigation measures: • Smith Park, Richardson Park and biodiversity area - proposed excavation and lowering of site levels • Limited opportunities for reuse of excavated excess materials on other sites – subject to regulatory approvals • Disposal costs of excavated excess materials may be significant depending on contamination and ASS conditions

Opportunities	Threats
	Development within areas subject to flooding: • A large part of the precinct is low-lying with a relatively shallow water table and is subject to flooding • Redevelopment and site remediation measures will need to consider implications from flooding (i.e. remediation methods, capping integrity, management of surface water and groundwater migration, management of vapour risks Geotechnical constraints: • Geotechnical constraints and considerations are anticipated to be managed with appropriate engineering design and appropriate development for the ground conditions • Limited geotechnical information was generally available within the Precinct. Further investigations will be required for detailed design and construction purposes for individual sites Geotechnical considerations within sites containing deep uncontrolled fill (such as the former Gasworks and Shell Fuel Terminal sites): • Additional geotechnical constraints are present where sites contain deep uncontrolled fill or possible obstructions and/or containment cells (such as the Gasworks and Shell Fuel Terminal sites) • There is an additional risk of differential settlements for structures, pavement and services • May need to conduct ground improvement and limit structures to 1 / 2 storey with lightweight construction to reduce the likelihood for piling, or utilise deep (piled) foundation where excessive settlements are anticipated (ie structures over 1 / 2 storey or settlement sensitive structures) • The presence and depth of obstructions or containment cells may also affect the location and design of foundations and services • Further investigations will be required for detailed design and construction purposes for individual sites Community engagement: • Negative community perception of health risk from redevelopment and reuse of high risk contaminated areas (especially transition to more sensitive landuse)

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Table E1: SWOT Analysis – PREFERRED SCENARIO 1: Hunter Park

Strengths	Weakness
Identified high potential contamination risk areas: Beneficial use of known and potential high risk contaminated land	Multi-Purpose Arena and Leisure Centre (Entertainment & Indoor Recreation): • Includes part of McDonald Jones Stadium, Go-Karts-Go, Mini-Golf, southern part of harness racing track • Limited information is available • Identified as high potential contamination risk area • Potential for impacted fill to be present, may require capping and on-going management • Site remediation and management may be required • Although currently utilised for recreation/commercial purpose, may require additional remediation/management to facilitate future proposed uses and developments • Additional remediation requirements are unknown, and will also depend on the proposed design of future works Proposed Commercial Use – NW and SW of McDonald Jones Stadium: • Along Turton Rd • Includes carpark and some existing commercial premises • Limited information is available • Identified as high potential contamination risk area • Site remediation and management may be required • Possible presence of underground fuel storage tanks within some premises? • Likely to require additional remediation/management to facilitate future residential development • Additional remediation requirements are unknown, and will depend on site conditions and the proposed design of future works • Possible flood mitigations measures may require excavations and lowering of ground levels; • Excavated material will require appropriate management, disposal, possible treatment where required, based on the contamination and acid sulfate soil (ASS) status of the materials Northern Part of Harness Racing - Proposed mixed use: • Existing recreation (Harness Racing) and commercial/industrial use (adjacent to Alissa Rd and Denney St) • Limited information is available • Identified as high potential contamination risk area • Site remediation and management may be required • Although currently utilised for general commercial purpose, may require additional remediation/management to facilitate future proposed uses and developments • Additional remediation requirements are unknown, and will also depend on the proposed design of future works Proposed Open Space – South and SE of Harness Racing: • SE area includes existing electrical substation to be retailed and expanded (adjacent to Leisure Centre) • South area is part of the Harness Racing site • Limited information is available • Identified as high potential contamination risk area • Potential for impacted fill to be present, may require capping and on-going management • Site remediation and management may be required • May require additional remediation/management to facilitate future proposed uses and developments • Additional remediation requirements are unknown, and will also depend on the proposed design of future works Broadmeadow Road - Proposed residential between Jackson St and Griffiths Rd: • Existing commercial/industrial land proposed for residential use • Limited information is available • Identified as high potential contamination risk area • Site remediation and management may be required • Possible presence of underground fuel storage tanks within some premises? • Likely to require additional remediation/management to facilitate future residential development (ie sensitive landuse) • Additional remediation requirements are unknown, and will depend on site conditions and the proposed design of future works

Strengths	Weakness
	• Regulatory approval will be required if on-site management of contamination is proposed (i.e. capping). Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area Broadmeadow Road - Proposed residential between Jackson St and Griffiths Rd: • Existing residential land proposed for increased density of residential use • Limited information is available • Identified as low potential contamination risk area • Site remediation and management may be required, subject to site investigations and regulatory requirements Hamilton North Public School: • To be retained • Identified as high potential contamination risk area • Possible presence of impacted fill materials • Site remediation and management may be required (i.e. capping) • Although currently utilised as a school, may require additional remediation/management to facilitate future use • Additional remediation requirements are unknown Commercial use along and north of Lambton Road: • Existing commercial/industrial use Including medical centre, plumbing supplies and Rovert lighting • Limited information is available • Identified as high potential contamination risk area • Former sites identified to contain UST's • Site remediation and management may be required • Although currently utilised for general commercial purpose, may require additional remediation/management to facilitate future proposed uses and developments • Additional remediation requirements are unknown, and will also depend on the proposed design of future works Open Space - Magic Park: • Existing open space and recreational use to be retained • Limited information is available • Identified as high potential contamination risk area • May contain impacted fill • Site remediation and management may be required • Although currently utilised for open space purpose, may require additional remediation/management • Additional remediation requirements are unknown, and will also depend on the proposed design of future works • Possible flood mitigations measures may require excavations and lowering of ground levels • Excavated material will require appropriate management, disposal, possible treatment where required, based on the contamination and ASS status of the materials Hockey Fields & Knights Centre of Excellence: • Retained as public and private open space respectively • Identified as high potential contamination risk area due to risk of impacted fill • Sites are generally capped; • Although currently utilised as open space, may require additional remediation/management to facilitate future development • Additional remediation requirements are unknown • Possible flood mitigations measures within the Knights Centre of Excellence (Venues NSW) may require excavations and lowering of ground levels; • Excavated material will require appropriate management, disposal, possible treatment where required, based on the contamination and ASS status of the materials Westpac Rescue Helicopter site:

Strengths	Weakness
	• Proposed open space • Limited information is available • Identified as high potential contamination risk area • Contains UST's and potentially contaminating activities • Site remediation and management is likely to be required • Extent of remediation requirements are unknown • Possible flood mitigations measures may require excavations and lowering of ground levels; • Excavated material will require appropriate management, disposal, possible treatment where required, based on the contamination and ASS status of the materials Proposed Mixed Use - Tennis courts: • Existing recreational use • Limited information is available • Identified as high potential contamination risk area • May contain impacted fill • Site remediation and management may be required • Although currently utilised for recreational purposes, may require additional remediation/management • Additional remediation requirements are unknown, and will also depend on the proposed design of future works Proposed Mixed Use: • Including Newcastle Basketball Stadium, KFC, Hungry Jacks • Current commercial use • Limited information is available • Identified as high potential contamination risk area • Site remediation and management may be required • Extent of remediation requirements are unknown and will depend on site conditions • Although currently utilised for general commercial purpose, may require additional remediation/management to facilitate future uses and developments • Regulatory approval will be required if on-site management of contamination is proposed (i.e. capping). Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area PCYC and adjacent (southeast) mixed use area: • Proposed for mixed use • Green buffer proposed along frontage with Young Road • Limited information is available • PCYC identified as high potential contamination risk area due to possible fill • Site remediation and management may be required • Extent of remediation requirements are unknown Existing Showground area: • Showground arena and area to the northwest (cattle yards) to be retained as open space • Limited information is available • Identified as high potential contamination risk area • May contain impacted fill • Site remediation and management may be required • Although currently utilised as Showground, may require additional remediation/management for future developments and use • Additional remediation requirements are unknown, and will also depend on the proposed design of future works • Possible flood mitigations measures may require excavations and lowering of ground levels • Excavated material will require appropriate management, disposal, possible treatment where required, based on the contamination and ASS status of the materials

Strengths	Weakness
	Newcastle Entertainment Centre & NE & SE of the Showground arena: • Proposed residential • Limited information is available • Identified as high potential contamination risk area • May contain impacted fill • Likely to require additional remediation/management to facilitate future residential development (ie sensitive landuse) • Additional remediation requirements are unknown, and will depend on site conditions and the proposed design of future works • Regulatory approval will be required if on-site management of contamination is proposed (i.e. capping). Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area Styx Creek naturalisation: • Currently concrete lined • Likely to be currently retaining contaminated soils and waters along the alignment where adjacent to potential high risk contaminated sites • Removal of concrete lining/capping may increase the risk of contaminant migration and adverse harm • Creek naturalisation works should attempt to maintain existing capping where possible, or provide supplementary or alternative capping where deemed necessary • Limited information is generally available along the creek alignment • The Ampol fuel pipeline is also adjacent to the creek alignment • Soils behind existing capping are also likely to contain contamination based on limited information. Removal of such soils may result in significant disposal costs • Restoration costs along parts of Styx Creek may be significant depending on the contamination conditions and requirements (if any) to remove existing concrete lining/capping Road network upgrades: • Possible presence of contamination within existing pavements (i.e. former coal tar or slag/ash pavements); • Impact on waste classification of soils and possible increase in constructions costs due to the presence of contaminated materials (i.e. potential landfill disposal requirements for contaminated soils)

Opportunities	Threats
Known or potential high risk contaminated site: • Develop integrated remediation strategies for known high risk areas • Integration of development with site remediation to maximise beneficial use and address requirements for remediation/management • Allow targeted assessment of critical sites to assist with feasibility assessment • Co-ordinate development (via staging) to address contamination risk areas and reduce possible conflicts during redevelopment	Proposed change to more sensitive residential land use: • Newcastle Entertainment Centre & NE & SE of the Showground arena: • Broadmeadow Road - Proposed residential between Jackson St and Griffiths Rd: • Potential for remediation requirements • Additional costs associated with construction over contaminated sites if required Various existing commercial/industrial land to continue use for commercial/industrial purposes: • Although currently utilised for commercial/industrial purpose, may require additional remediation/management to facilitate future industrial development due to site contamination conditions • Many of these sites were identified as potential high risk areas, however, many have limited information available Various sites identified as high potential contamination risk areas: • Many sites were identified as potential high risk areas, however, many have limited information available • Additional investigations would be required to confirm the contamination status (presence, extent and significance of contamination) and requirements for remediation (if any) • The significance of contamination on many sites will be influenced by the proposed development (i.e. low rise vs high rise, shallow foundations vs deep foundations etc) • Additional costs are likely for construction over contaminated sites (management of soil and groundwater contamination) • Remediation is more likely where the proposed land use is more sensitive than the existing landuse (i.e. commercial to residential, or commercial to open space) Development over contaminated land or land that requires on-going management of contamination: • Development over significantly contaminated land or land that requires capping/on-going management of contaminated soils and groundwater will require regulatory approval • Subject to approval, conditions may be applied to development where on-site management is proposed including a condition of strata development in order to facilitate appropriate management of contamination across the greater site area • Development approval will be assessed on a site by site basis considering the contamination status of the site and requirements for remediation and on-going management of contamination Styx Creek naturalisation: • Restoration costs along parts of Styx Creek may be significant depending on the contamination conditions and requirements (if any) to remove existing concrete lining/capping Road network upgrades: • Increased constructions costs due to the possible presence of contaminated materials (i.e. potential for former coal tar or slag/ash pavements to be present) Flood mitigation measures: • Magic Park, Westpac Helicopter area, Knights Centre of Excellence (private land), West & South of McDonald Jones Stadium (commercial area), Cattle yards northwest of showground - proposed excavation and lowering of site levels • Limited opportunities for reuse of excavated excess materials on other sites – subject to regulatory approvals • Disposal costs of excavated excess materials may be significant depending on the contamination and ASS conditions Development within areas subject to flooding: • A large part of the precinct is low-lying with a relatively shallow water table and is subject to flooding • Redevelopment and site remediation measures will need to consider implications from flooding (i.e. remediation methods, capping integrity, management of surface water and groundwater migration, management of vapour risks Geotechnical constraints: • Geotechnical constraints and considerations are anticipated to be managed with appropriate engineering design and appropriate development for the ground conditions • Limited geotechnical information was generally available within the Precinct. Further investigations will be required for detailed design and construction purposes for individual sites. Community engagement: • Negative community perception of health risk from redevelopment and reuse of high risk contaminated areas (especially transition to more sensitive landuse)

Appendix F – Infrastructure Considerations – Emerging Preferred Scenario

- Table F1 – Infrastructure Considerations – Emerging Preferred Scenario

Table F1: Infrastructure Considerations – Emerging Preferred Scenario (March 2023):

Type of Infrastructure	Consideration
1. Electrical network	Underground Services: • Contaminated soils and waters may be present within the identified potential high risk contaminated site • Consider presence depth and implications of site contamination (i.e. soil, water, and vapour) in the design and installation of underground services and infrastructure • Avoid installation of services through contaminated land where possible • Avoid excavations and disturbance of contaminated soils and waters where possible, or minimise disturbance • Minimise potential expose to contaminants during construction • Place services within overlying clean capping where possible • Design services so they do not intercept contaminated soil or waters where possible • Considerer geotechnical conditions in the design of services and infrastructure (i.e. differential settlement, presence of obstructions/containment cells – i.e. present within the Gasworks and Shell Fuel Terminal sites) • Where the installation of services cannot avoid contaminated soils or waters: - Services should be designed for installation with contaminated materials - Installation methods and procedures should be designed to minimise the risk of adverse human health and environmental impacts (egg directional drilling to minimise spoil generation as an alternative to open trenching) • The design and installation of services and infrastructure should be integrated with site remediation and management for the various developments within potentially contaminated sites
2. Potable water	As for Electrical network – Underground Services
3. Sewer	As for Electrical network – Underground Services
4. Communications	As for Electrical network – Underground Services
5. Stormwater Management	Stormwater management to be conducted with due consideration to contaminated land and waters: • Minimise disturbance of contaminated soils and waters • Minimise and don't exacerbate migration of potential impacts • Provide appropriate capping, cover, gradient/fall, protection against erosion and sedimentation etc • Avoid removal of existing lining/capping to Styx Creek if possible, or provide supplementary or alternative lining/capping where deemed necessary
6. Flood Management	• A large part of the precinct is low-lying with a relatively shallow water table and is subject to flooding • Redevelopment and site remediation measures will need to consider implications from flooding (i.e. remediation methods, capping integrity, management of surface water and groundwater migration, management of vapour risks) • Remediation and management measures should include design elements to minimise possible adverse impacts as a result of flooding within known or potential contaminated site (i.e. redirection of flood waters, erosion and integrity controls for capping, management of odours due to rise in groundwater levels) • Possible flood mitigation measures may require excavations and lowering of ground levels; - Excavated material will require appropriate management, disposal and possible treatment where required, based on the contamination and acid sulfate soil (ASS) status of the materials - Opportunities to reuse/manage excess excavated materials on-site should be considered - There may be limited opportunities for reuse of excavated excess materials on site – subject to regulatory approvals - Disposal costs of excavated excess materials may be significant depending on contamination and ASS conditions
7. Water demand	NA
8. Non-potable water supply	• Due to the presence and risk of contaminated groundwaters in a number of identified areas, beneficial use of groundwater should be avoided without site specific assessment and testing, and regulatory approvals • There are currently restrictions on the use of groundwaters within the Hamilton North residential area due to contamination risks • Groundwater restrictions are also in place within known or regulated contaminated sites such as the Gasworks, ELMA, Shell Fuel Terminal sites
9. Transport	Road network upgrades: • Minimise disturbance of existing pavements (and potentially contaminated materials) where possible • Design pavement upgrades to minimise generation of excess potentially contaminated materials off-site disposal requirements • Minimise construction costs • Minimise potential exposure to contaminants during construction
10. Biodiversity	• Future land use and development over contaminated sites is to be conducted to minimise adverse impacts to the environment and human health • Sites containing contamination that exceed the proposed land use criteria will require remediation/management
11. Air noise and odour	• Future land use and developments should be conducted with due consideration to air, noise and odour impacts • Design and construction methods to minimise adverse impacts should be adopted • Odour will need to me managed during any disturbance of soils or water within significantly contaminated areas (such as the Gasworks and Shell site, and other high risk sites that contain potential volatile contaminants)