EG Funds Management Pty Ltd

Proposed Mixed Use Redevelopment
2 – 32 Smith Street, Summer Hill
Concept Plan Application
MP10-0155

Drainage / Water Management / Flooding / Utilities

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Job 2377

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Executive Summary

The Summer Hill Flour Mill site is bounded by Longport Street and Old Canterbury Road to the north and south respectively and Edward/Smith Streets to the west and the former Rozelle goods railway line corridor to the east (refer Figure1).

EG Funds Management Pty Ltd proposes to redevelop the site for a mixed use development incorporating residential, commercial and retail land uses. It will form the western side of an important transport orientated development supporting the proposed Lewisham West station as part of the Sydney Light Rail Extension along the former goods railway corridor. On the eastern side, the McGill Street Precinct Masterplan, as adopted by Marrickville Council, contemplates a similar mixed use development to support the Lewisham West Station.

The proposed redevelopment of the Flour Mill site was declared a major project and this report supports a Concept Plan application (MP10_0155) for this site. Director General Requirements (DGRs) were issued on the 16 December 2010 and a copy is attached at Appendix A. This report addresses key issues 11 and 18 for the Concept Plan and the Stormwater Concept Plan and Flooding Report in Issue 6 of Attachment 2.

The DGRs require the cumulative assessment of impacts on the flooding and utilities from the major redevelopment proposals in the area including Sydney Light Rail Extension, the McGill Street Precinct Masterplan area and MP 08_0195.

The proposed development of the Flour Mill site is presented in Figure 2 and the building numbers are depicted on Figure 3. The proposed minimum residential/retail floor levels and basement entry crest levels are presented in Figure 2. The significant heritage buildings (2A, 2B, 3C and 5A) will be retained and refurbished for a combination of residential, retail and commercial uses.

The cumulative demand for utilities in the area has been estimated and there is adequate capacity in the region to service the cumulative development proposals. The existing water and sewer mains have capacity as well as the Dulwich Hill electricity zone substation. Three to four 11 kVA high voltage feeders need to be provided between the zone substation and the cumulative development area. The redevelopment on the Flour Mill site will require one or two of those feeders. There is significant gas infrastructure adjacent to the site however the service authority will decide if it is commercially viable to supply gas to the redevelopment. Telstra will provide upgraded services to the site to match the redevelopment rate.

The design of the proposed development has responded to the flooding conditions on the site such that it conforms to the NSW Floodplain Development Manual by minimising risk to flood damages and personal safety. The adopted residential and commercial floor levels and driveway entry crest to basement car parking provide freeboards above the 100yr ARI flood levels which are considered appropriate and readily exceed the requirements.

Sensitively testing has been undertaken to review the robust nature of the redevelopment design with respect to the potential impacts of climate change on rainfall intensity and possible blockage of the Longport Street overpass culvert. Again, the freeboards to residential and commercial floor levels and basement driveway crests are considered adequate to manage the risk of damage and personal safety.

The estimated 100yr ARI flood levels for the subject site are:-

- Existing conditions - RL 9.73m AHD
- With 15% climate change induced increase in rainfall intensity - RL 10.46m AHD
- With 15% climate change increase and 10% blockage of Longport Street culvert - RL 10.83m AHD

There are a number of proposed small retail land uses on the site which out of necessity, in terms of urban amenity and outcomes, will have floor levels below the 100 yr ARI flood level. Some of the retail areas have been located in significant heritage buildings in which floor levels cannot be changed. These will include the significant heritage buildings 2A/2B (Mungo Scott Building), 5E (Amenities Building) and 2C (former EA substation) as well as the new building 1C. The other new retail areas in buildings 4A, 5A and 5E will have reduced freeboards in the sensitivity testing conditions. These retail areas would be floodproofed to minimise flood damages and would have ready access to vertical evacuation to ensure personal safety. This combination of controls along with implementation of an emergency flood response management plan is considered to provide an appropriate balance between flood management and the desired public amenity outcomes in this development which have considerable wider benefits to the broader inner city community.

While the NSW Development Manual recommends the 100yr ARI flood as the flood standard for planning of appropriate floor levels, it also recommends a merit based assessment considering a broader range of social, economic and environmental issues to ensure against the unnecessary sterilisation of urban sites. As such, it is considered that the adoption of the proposed retail floor levels is appropriate given the broader community and heritage benefits along with the commitment to flood proofing and availability of safe evacuation options.

The NSW Floodplain Development Manual also requires consideration of extreme floods above the 100yr ARI flood up to the PMF to appropriately manage personal safety. In accordance with the NSW Floodplain Development Manual, an emergency flood response plan would be implemented for each building on the site to adequately manage risk to personal safety in floods up to the PMF level. In this plan, there will be vertical evacuation available in each building to levels above the PMF and also access available to surrounding streets rising to levels above the PMF level if necessary. This plan would incorporate a warning alarm in case of a flood, flood response education and training, dedication of flood wardens and annual flood response drills.

The proposed development on the subject site would not adversely impact on flood levels in adjacent areas. The flooding on the subject site is mainly controlled by the Longport Street

overpass and culvert and development on the rail corridor and McGill Street Precinct Masterplan site would not affect flooding of the subject site. The Sydney Light Rail Extension project has the potential to influence flood levels in the McGill Street Precinct Masterplan area as these flood levels are influenced by the crest level of the rail corridor. Similarly the proposed station structure or access ramps should not concentrate flood flows from the rail corridor onto the subject site. These flows should maintain their wide distributed flow onto the subject site from the rail corridor.

A stormwater concept plan has been formulated for the development which adopts an integrated water sensitive urban design (WSUD) approach to reduce potable water use through roof rainwater harvesting, reduce pollutant loads in runoff below existing conditions, not increasing peak flow from the site (onsite detention not required), provide a stormwater pipe system and safe overland flow paths to the canal.

The NSW Office of Water has requested consideration of rehabilitation of the Hawthorne Canal to enhance the flora/fauna connectivity value. The ability to rehabilitate the canal is restricted by the heritage nomination of the SWC section of the canal, the disruptions to the canal corridor due to extensive areas of covered sections and numerous road/rail crossings and the need to retain the limited flood flow capacity. Also on the subject site, there is only a small section of the eastern bank in the site ownership. The potential for rehabilitation also has to be balanced against the conflicting greater overall community benefit of achieving a high value urban amenity associated with this proposed transport orientated development adjacent to the proposed Lewisham West light rail station. In contrast to this limited opportunity to rehabilitate the canal, there is a tremendous opportunity to enhance local flora/fauna connectivity via the proposed Greenway aspect of the Sydney Light Rail Extension Project. The Greenway has the ability to provide significant benefits and resources should be concentrated on this proposal to enhance connectivity rather than rehabilitation of Hawthorne Canal through the subject site. The Flour Mill redevelopment has the potential to contribute to the Greenway.

In summary, it is considered that the proposed redevelopment on the former Flour Mill site could be serviced and would adequately address and manage the flood risk. It would also provide an integrated WSUD outcome for the drainage concept contributing to the long term improvement in water quality in Hawthorne Canal.

1. Introduction

EG Funds Management Pty Ltd proposes to redevelop the former Allied Mills Flour Mill site in Smith and Edward Streets Summer Hill for a mixed use residential, retail and commercial development. The location of the site is presented on Figure 1 and layout of the proposed development is presented in Figure 2.

The project has been designated as a major project and Director General Requirements (DGRs) were issued on the 16 December 2010 (refer to Appendix A).

This report deals with the Concept Plan application key issues 11 and 18 as listed in the DGRs and the Stormwater Concept Plan and Flooding Report as listed in Attachment 2 under Plans and Documents, Concept Plan Application Point 6. We have reviewed the documents in Attachment 3 of the DGRs where relevant to flooding, drainage and utilities issues.

The DGRs require consideration of the potential cumulative impacts of the following development proposals:-

- Summer Hill Flour Mill Site;
- Sydney Light Rail Extension;
- McGill Street Precinct Masterplan; and
- Concept Plan application for 78-90 Old Canterbury Road, Lewisham (MP08-0195).

2. Existing Site Description

2.1. General

The site is bounded by Smith Street, Edward Street, Longport Street, Old Canterbury Road and the former goods rail line corridor (refer to Figure 1).

2.2. Drainage

Upstream of the subject site, Hawthorne Canal flows under the Old Canterbury Road overpass of the goods railway on the eastern side of the railway and extends to the goods railway line as an open channel. It then passes under the railway and existing buildings on the subject site as a covered channel. It is an open channel through the northern end of the subject site before passing under the Longport Street overpass in a 3.8m diameter culvert.

The Smith Street drainage system enters from the west and joins to the main Hawthorne Canal channel at the northern end of the site. The McGill Street Precinct Masterplan area is generally drained by 1200mm diameter pipe extending under the railway line and joining with main Hawthorne Canal channel immediately downstream of the Longport Street crossing.

The approximate catchment area of Hawthorne Canal is 300ha upstream of Longport Street.

The canal is owned by Sydney Water and it is listed as a heritage item. The top of the concrete walls in the channel on the subject site generally vary from RL 5.7m AHD adjacent to the railway to RL 4m AHD at the Longport Street embankment. In the northern section of the site, steep banks rise from these walls to levels of RL 8.5 to 9m AHD on the western side and to levels around RL 10 -11m AHD on the eastern side.

The Smith Street Branch of the Hawthorne Canal system has limited pipe capacity (around a 5 yr ARI) with overland flow ponding in the low point in Smith Street opposite the site driveway and Energy Australia substation. It overflows the kerb and flows into the site down the tree corridor to the open section of the canal.

2.3. Site Topography

The site topography levels are presented on Figure 2. The site ground levels generally rise away from the low point adjacent to where the Hawthorne Canal emerges on the site from the railway corridor.

The Edward Street frontage varies in level from RL 15m AHD at the southern end to generally RL 11m AHD at the northern end. Smith Street rises from approximately RL 9.7m AHD at its low point to RL 10.6m AHD at the intersection with Edward Street and continues to rise to the north as do other streets extending southwards from Edward Street.

The Longport Street crossing has levels generally between RL 14.5 and 15.m AHD.

The heritage buildings on the site have the following approximate ground/base levels:-

- Mungo Building – RL 9.05m AHD;
- Storage Silos 6 – RL 11m AHD; and
- Storage Silos 4 – RL 11.5m AHD.

The railway corridor forms a crest between the subject site and the McGill Street Precinct Masterplan area. This crest level varies from around RL 12m AHD at the Old Canterbury Road overpass to approximately RL 9.6m AHD at the Longport Street overpass.

The site topography in the McGill Street Precinct Masterplan area generally falls to the north western corner from Old Canterbury Road. The general ranges of levels are:-

- Old Canterbury Road - RL 12 to 15m AHD;
- Brown Street – RL 9.9 to 13m AHD;
- William Street – RL 10.5 to 13m AHD;
- Hudson Street – RL 11 to 13m AHD; and
- McGill Street – RL 12.5 to 15m AHD.

2.4. Flooding

The flooding and drainage assessment has been undertaken by Civil Certification and the report is at Appendix B.

2.4.1. 20yr ARI Flood

The 20yr ARI flood flow exceeds the capacity of the Hawthorne Canal under the goods railway on the McGill Street Precinct Masterplan side causing overland flows along the rail corridor. These overland flows discharge from the goods railway to the open channel canal on the subject site immediately downstream of the buildings located over the canal.

The 20yr ARI flows on the subject site are contained fully within the Hawthorne Canal channel and banks.

2.4.2. 100yr ARI

The flood behaviour upstream of the Hawthorne Canal open channel on the site is similar to the 20yr ARI flows. The 3.8m diameter culvert under the Longport Street overpass has a significant flow capacity (80m³/s) but is slightly below the estimated peak 100yr ARI flow rate of approximately 100m³/s. Flows therefore pond upstream of the overpass on the subject site until ponded levels reach the goods railway level at the Longport Street Overpass. This allows excess floodwaters to pass through this railway opening.

The estimated 100yr ARI flood levels on or adjacent to the subject site are:-

- RL 9.73m AHD downstream to goods railway (chainage 380-400); and
- RL 9.23m AHD at the Longport Street overpass (Chainage 270).

The chainages on the subject site used for the flood modelling are depicted on Figure 3.

3. Proposed Development

The proposed development is presented on Figure 2. The mixed use development will form a transport orientated node with the Lewisham West Light Rail station located on the former goods railway line adjacent to the middle of the development. It will encourage pedestrian movements from Smith Street through the corridor which incorporates the existing significant trees and provides a visual connection to the light rail station. The same objectives are proposed on the eastern side of the railway line in the McGill Street Precinct Masterplan area redevelopment. It is important that this redevelopment incorporate retail and commercial use opportunities along with residential development.

Retention of significant heritage buildings is also an important objective of the development. This also includes retention of the significant tree corridor between Smith Street and Hawthorne Canal. The buildings to be retained and reused will be (the locations of the buildings are depicted on Figure 3):-

- Mungo Building (2A and 2B)
  - Uses will include retail on the ground floor, commercial on the first and second floors and residential above;
  - Ground floor will have a level of approximately RL 9.05m AHD with a first floor level of approximately 13.9m AHD;
- Storage Silos – 4 units (3C)
  - Uses will include residential over 13 floors;
  - Ground floor level of approximately RL 11.5m AHD;
- Storage Silos – 6 units (5A)
  - Uses will include retail and residential over 11 floors ;
  - Ground floor levels will be approximately RL 10.7 in AHD for retail and approximately RL 11.5m AHD for residential;
- Amenities Block (5E)
  - Uses will include retail and community uses;
  - Ground floor level – RL 11.3m AHD;
  - First floor level – RL 14.3m AHD.

The relevant details of the proposed new buildings are:

- Building (1A) – 5 to 10 storeys
  - Minimum residential floor level approximately RL 11.5m AHD;
  - Basement driveway entry crest level of approximately RL 10.8m AHD;
  - First floor level of RL 14m AHD; and
  - Pedestrian bridge connection from first floor level of approximately RL 14m AHD to Longport Street at RL 14.5m AHD.
- Building 1C – 1 storey
  - One level retail with elevated floor at level of approximately RL 9.05m AHD;
  - Ready access to Building 2A for evacuation.

- Building 2A – 6 storeys
  - Heritage building to be retained and refurbished with existing floor levels;
  - Ground floor level at approximately RL 9.05m AHD with retail use and internal stair access to first floor at approximately RL 13.9 AHD;
  - Commercial uses in floors 1 and 2;
  - Residential uses in floors above;
  - Covered walkway connection between Buildings 2A and 3A at first floor level approximately (RL 13.9 AHD);
  - Provides flood free access to basement of Building 3A via walkway connection.
- Building 2B – 2 Storeys
  - Heritage building to be retained and refurbished with existing floor levels;
  - Ground floor at approximately RL 9.05m AHD with retail use;
  - First floor at approximately RL 13.9m AHD with retail use;
  - Has ready access to Buildings 2A and 3A for severe floods.
- Building 2C – 1 Storey
  - Energy Australia electrical substation is a heritage building to be retained;
  - Floor level at approximately RL 9.7 AHD to be refurbished for retail use.
- Building 3 – 1-13 Storeys
  - Uses
    - 3A – residential over 9 storeys – ground floor approximately RL 11.5m AHD;
    - 3B – retail 1 storey – ground floor approximately RL 12.0m AHD;
    - 3C – residential over 13 storeys – Ground Floor approximately RL 12.0m AHD;
    - 3D – residential over 6 storeys – Ground Floor approximately RL12m AHD.
  - Basement entry crest level – approximately RL 13m AHD
- Building 4 – 2-6 Storeys
  - Uses
    - 4A – retail – ground floor level approximately RL 10.4m AHD;
    - 4A - residential over 4 storeys – ground floor approximately RL 11.5m AHD;
    - 4B – residential over 6 storeys – ground floor approximately RL 11.5m AHD;
    - 4C – residential over 2 to 3 storeys – ground floor approximately RL 11.5m – 12.7m AHD;
  - Basement entry crest level approximately RL 11.5m AHD.
- Building 5 – 2 - 6 Storeys
  - Uses
    - 5A – retail – ground floor approximately RL 10.7m AHD;
    - 5A – residential in silos over 11 storeys – ground floor approximately RL 11.5m AHD;
    - 5B – residential over 6 storeys – ground floor approximately RL 11.9m AHD;
    - 5C – residential over 2 to 3 storeys – ground floor approximately RL 13.9m – 14.2m AHD;
    - 5D – residential over 4 to 6 storeys – ground floor approximately RL 11.8 – 12.8m AHD;
    - 5E – retail over 2 storeys ground floor approximately RL 11.3m AHD and first floor at approximately RL 14.3m AHD.
  - Basement entry driveway crest level approximately RL 13m AH.

4. Utilities

4.1. Demand – Predicted Development Yield

The proposed yield has been estimated for the Flour Mill Site as well as for the McGill Street Precinct Masterplan and Project application MP08-0195 (over part of the McGill Street Precinct Masterplan site). The DGR's requested consideration of the proposed impact on the Flour Mill site in conjunction with the proposed redevelopment of the land immediately east of the goods railway line including the McGill Street Precinct Masterplan and Major Project MP08_0195 sites. The Major Project Proposal (MP08_0195) has a development yield beyond that adopted for the McGill Street Precinct Masterplan. As such, the estimated development yields are presented separately for the Flour Mill site and McGill Street Precinct Masterplan site along with a separate estimate of the yield for the Major Project site plus the remainder for the McGill Street Precinct Masterplan site. A total maximum yield is presented in Table 1 as the addition of the Flour Mill site, MP08_0195 site and the remainder of the McGill Street Precinct Masterplan using the upper end yield where there was a range of yields estimated.

Table 1: Predicted Development Yields

Development Type	Flour Mill	McGill Street Precinct Masterplan	MP08_0195 and McGill Street	Total (max)
Residential	280 - 300 dwellings	463 dwellings	660 dwellings	960 dwellings
Retail	2500-2800m²	2942m²	8324m²	11,124m²
Commercial	3500-4000m²	6409m²	5439m²	9439m²

The total maximum development yields were used to estimate demand for services in the area.

4.2. Sewerage

There are three main sewerage systems within the vicinity of the site.
The system which runs north along Chapman Street serves the area west of Edward Street and the residential properties on the eastern side of Edward Street along with areas south of Old Canterbury Road. A major sewer carrier in this system runs along the rear boundary of the residential properties on the eastern side of Edward Street. This carrier is located in the subject site and the proposed development needs to accommodate this carrier or relocate it to suit the development layout.

The remainder of the subject site is serviced by a sewer system which runs north along Smith Street and passes under Longport Street on the western side of the Hawthorne Canal. Connections to this system are available on both the eastern and western sides of the Hawthorne Canal. There is a sewer, as part of this system, which runs along the eastern side of the canal on the subject site which also services about 70% of the McGill Street Precinct Masterplan site. Parts of this sewer system on the subject site east of the canal may need to be relocated to accommodate the proposed development.

Sydney Water has indicated that the existing sewerage systems have capacity to accommodate the entire development east and west of the goods rail corridor.

The third sewerage system runs north along Old Canterbury Road and joins a major carrier near the intersection with Railway Terrace. This carrier runs eastwards. This system services the area of the McGill Street Precinct Masterplan bounded by McGill Street, Hudson Street, and Old Canterbury Road. This system would not be impacted by the proposed development.

4.3. Water

The subject site has ready access to significant water supply pipelines in the streets fronting the proposed development. There are twin 500 mm diameter water mains in Edward Street. In Smith Street, there are twin 500 mm diameter water mains, as well as a local supply 150mm diameter main.

The proposed development would be readily supplied by the existing water mains in Edward and Smith Streets.

The McGill Street Precinct Masterplan area is served from the 300mm diameter main extending from Smith Street along Longport Street to Brown Street.

Sydney Water has advised that there would be sufficient water main infrastructure in the area to adequately service the proposed redevelopment on the subject site, the McGill Street Precinct Masterplan area and Major Project 08_0195.

4.4. Power

Energy Australia has advised that there is sufficient high voltage supply to the Dulwich Hill Zone Substation to service the proposed redevelopment on the Flour Mill Site, McGill Street Precinct Masterplan and the Major Projects 08_0195.

Approximately three to four 11kVA feeders will need to be provided from this zone substation to the development at the expense of the proposed development.

Internal to the site, a number of kiosk substations will be required to transform the high voltage supply to the low voltage supply. These substations capacities and their locations would be considered at the detailed design stage of the redevelopment.

The Flour Mill site would require approximately one or two of these 11kVA feeders to service the redevelopment proposed on this site.

4.5. Gas

There is a primary and a local gas main in Edward Street north of Wellesley Street. In addition to these mains, there is also a secoundary gas main in Edward Street south of Wellesley Street. These significant supply mains would have significant capacity to service the proposed development. However, the servicing of the development would be a decision made by Jemena/AGL depending on their consideration of the commercial viability of this supply.

4.6. Telecom

Telecom would provide adequate services to the site to match the redevelopment rate.

5. Flooding

The flood modelling assessment for this report has been undertaken by Civil Certification and the report is presented in Appendix B.

5.1. NSW Floodplain Development Manual

This Manual presents a merit based assessment process which has the objectives of appropriate management of the risk of flood drainages and flood related risk to personal safety while not adversely impacting on flood levels for adjacent development. This flood report has been prepared in accordance with the Manual as well as undertaking sensitively testing for the potential impacts of climate change and reduction in flow capacity of the Hawthorne Canal culvert under the Longport Street overpass. Also, as required by the DGRs, the cumulative impact of the Sydney Light Rail, McGill Street Precinct Masterplan and Major Project 08-0195 developments on the flood behaviour on the subject site has also been considered in this flood report.

5.2. Council Flood Policies

The local government boundary between Ashfield and Marrickville Councils runs along the Hawthorne Canal. As such, the proposed building in the north eastern corner of the site (Building 1A) is located in Marrickville Council while the remainder of the development is located in Ashfield Council.

The Council flood policies conform to the NSW Floodplain Development Manual in that they are merit based policies with objectives which conform to the Manual. Ashfield Council recommend a freeboard of 0.3m for residential floors while Marrickville Council recommends 0.5m freeboard.

5.3. Flood Behaviour

The flood behaviour affecting the subject site can be summarised into three separate areas being the light rail corridor, open channel downstream of rail corridor and the Smith Street branch. These areas can be defined in terms of chainages used in the flood model and as presented in Figure 4. The overview of the flood behaviour in each of these areas is as follows:-

1. Rail Corridor (Chainages 400-480);

- The Hawthorne Canal is covered by the rail corridor and the culvert has a capacity less than the 20yr ARI flow;
- Flood flows pond above the open channel in the McGill Street Precinct Masterplan area and gradually overtop and flow north down the rail corridor;
- The predicted flood levels in this area are at the crest of the rail corridor and are applicable to the McGill Street Precinct Masterplan area; and
- Floodwaters would flow in a shallow depth over the rail crest and along the western side of the rail corridor.

2. Open Channel (Change 270 to 400)

- Flows from the railway corridor enter the open channel on the subject site around chainage 400;
- The channel is deep and readily accommodates the 20yr ARI flow;
- The 100yr ARI flows exceed the capacity of the canal culvert under the Longport Street overpass;
- Floodwaters gradually pond and inundate low areas of the subject site until they cross the rail line and exit through the rail tunnel under the Longport Street overpass; and
- As floodwaters continue to pond in say the probable maximum flood (PMF), floodwaters escape around the Longport Street overpass.

3. Smith Street Branch

- This branch services the catchment to the west along Smith Street;
- Smith Street rises to the west from a trapped low point along the frontage to the subject site;
- The system has limited capacity and a significant portion of the flows arrive at the site as overland flow on the road;
- The pipe system for this branch is aligned along the southern side of Smith Street at the subject site and joins with the main Hawthorne Canal in the subject site;
- Overland flows pond in Smith Street adjacent the site until they overtop the boundary and flow along the alignment of the established tree corridor on the site to the open channel of Hawthorne Canal; and
- In the 100yr ARI flood, the flood waters ponding on the site would extend onto Smith Street and as such flows down Smith Street would discharge into this pond of floodwaters on the site.

The proposed development would not change this flood behaviour and would maintain the existing peak flood flow rates so that there would be no change in flood levels compared with existing conditions.

5.4. Predicted Flood Levels

The predicted flood levels on the subject site are presented in Table 2 for the 20yr and 100yr ARI flood. The chainages are presented in Figure 4 to identify the location on the subject site.

Table 2: Predicted Flood Levels (mAHD)

Chainage	20yr ARI Flood	100yr ARI Flood
270	6.95	9.23
300	7.19	9.60
380	7.02	9.73
400	8.14	9.72
420	10.94	11.02
480	11.68	11.69

The applicable 100yr ARI flood level for the subject site is RL 9.73m AHD as this level would pond into the lower southern parts of the site from the open channel. The flood flows in the rail corridor would continue to flow along the corridor into the open channel on the subject site. This would replicate the existing flood behaviour.

5.5. Flood Risk Management

The impact of the predicted 100yr ARI on the proposed buildings is summarised in Table 3.

Table 3: Impact of Flood Levels on Proposed Buildings

Building		Freeboard (m)	
	Predicted 100yr ARI Flood Level m AHD	Ground Floor	Basement Entry Crest
1A	Floor 9.23 – 9.73 Basement 9.6	1.77 – 2.27	1.2
1C retail	9.73	-0.68	No basement
2A – 2B	9.73	-0.68	No basement
2C retail	9.73	0	No basement
3A, 3B, 3C	9.73	1.77	3.27
3D	9.73	2.27	3.27
4A, 4B, 4C residential	9.73	1.77	1.77
4A retail	9.73	0.67	1.77
4C	9.73	1.77	1.77
5A retail	9.73	0.97	3.27
5A residential	9.73	1.77	3.27
5B	9.73	2.17	3.27
5C	9.73	4.17	3.27
5D	9.73	2.07	3.27
5E retail	9.73	1.57	3.27

All the residential buildings have appropriate freeboards to habitable floor levels and to basement driveway entry crest levels to provide acceptable levels of risk for flood damage and personal safety. Personal safety issues are dealt with in more detail in Section 5.7.

The significant heritage buildings to be retained on site are buildings 2A/2B/2C, 3C, 5A and 5E. Buildings 3C and 5A are the storage silos and the lowest residential floors have been set at RL 11.5m AHD which provides adequate freeboard to the 100yr ARI flood level. These buildings will have access to a basement car park which will serve the entire footprint of Buildings 3 and 5 and provide flood free access to a level of RL 13m AHD at the driveway entry.

The proposed retail areas are very important to the success of this transport orientated development to service residents in the development but more importantly to attract people to the light rail station and provide amenity for the community and light rail users. These retail

areas need to be accessible to the main pedestrian pathways to the station and present well to adjacent open space to maximise the amenities for users. These retail areas will include specialty activities such as cafés, newsagencies, corner shops etc.

The Mungo Scott Building (2A/2B) has a ground floor level of approximately RL 9.05m AHD and first floor level of approximately RL 13.9m AHD. The ground floor would be flood proofed to minimise flood damages and internal stairs would be provided for evacuation to the first floor level which would have a commercial use. A gantry bridge connection would be made from this first floor level to Building 3A which would provide flood free access to the basement of Building 3 in case of an emergency. In this way, the use of Building 2A/2B is considered appropriate in terms of the flood risks.

Building 1C would be a light framed building with a floor elevated (at RL 9.05m AHD) above existing ground levels with speciality retail uses. This building will serve as the main convenience retail service to the community and light rail users. It would be flood proofed to minimise flood damages and would have ready access to Building 2A/2B for access to higher levels or to the basement of Building 3 in case of an emergency. In this way, the use of Building 1C is considered appropriate in terms of the flood risk especially given its important role in the success of this area as a transport orientated node and the broader benefit to the community from this type of development.

Building 2C is the electrical substation building which would be retained. Its existing floor level is at the footpath level. This building would have a retail use to attract pedestrians to the light rail station and other specialty retail. The building would be flood proofed and users would have ready access to higher levels in Building 4 and to the basement in this building in case of an emergency. In this way, the retail use of Building 2C is considered appropriate in terms of the flood risks.

Building 5E is the former amenities building which would be retained and refurbished for retail and community uses. The retail use on the ground floor would have an approximate level of RL 11.3m AHD. This provides readily appropriate levels of freeboard and users would have ready access to higher refuge levels on the first floor (RL 14.3m AHD) or in Building 5D.

5.6. Sensitivity Testing – Climate Change and Blockage

5.6.1. Climate Change

5.6.1.1. Rainfall Intensity

Climate change has the potential to change rainfall patterns in Sydney with possible increases in rainfall intensity. There is limited data available to provide accurate predictions of likely extents of any changes however the latest advice is up to a 15% increase in rainfall intensity due to climate change effects. The DoP has recommended that sensitivity testing be undertaken up to a 30% increase to understand the possible impacts of lower or higher increases in rainfall intensity. Sensitivity testing has been undertaken with increases in rainfall

intensity of 10%, 15% and 30%. The predicted 100yr ARI flood levels for these increases in rainfall intensity are compared with the flood levels for existing conditions in Table 4.

Table 4: Climate Change Sensitivity Testing – 100yr ARI Flood Levels (RL m AHD)

Existing Conditions	Rainfall Intensity Increase		
	10%	15%	30%
9.73	10.25	10.46	11.21

It is considered appropriate, given the information available, to adopt a 15% increase in rainfall intensity for estimation of likely future 100yr ARI flood levels on the subject site. This increases the predicted flood level on the site by 0.73m from RL 9.73 AHD to RL 10.46m AHD for the 100yr ARI flood level.

The impact of this level of RL 10.46m AHD on the proposal development is:-

- Residential floor levels;
  - A minimum floor level of RL 11.5m AHD still provides over a metre freeboard which is readily acceptable;
  - Even with a 30% increase in rainfall intensity , the predicted flood level would be below the residential floor levels (300mm freeboard);
- Basement entry crests;
  - The flood level at the Building 1A basement entry would be RL 10.31m AHD for 15% increase in rainfall which would provide an acceptable freeboard of 0.5m to the crest;
  - All other basement entry crests are significantly higher than for Building 1A and hence acceptable.

5.6.1.2. Sea Level Rise

It is predicted that sea level will rise by up to 0.91m by 2100. This will increase the mean sea level to approximately RL 0.9m AHD with a mean high tide level around RL 1.5 AHD. The invert of the Hawthorne Canal at the Longport Street overpass culvert is approximately RL 2m AHD which is above the more common high tide levels in the harbour.

Also, the peak flood level on the site for the 100yr ARI flood is controlled by the level of the rail tunnel through the Longport Street overpass which has no connection to the tidal levels in the canal. The combination of these two factors means that the predicted sea level sea level rise by 2100 would not have a significant impact on flood levels on the subject site.

5.6.2. Blockage

The Hawthorne Canal culvert through the Longport Street overpass is a 3.8m diameter tunnel which has an invert level of approximately RL 2.3m AHD at its upstream end on the subject site. The potential for blockage of this culvert is very low due to a number of factors:-

- Its large diameter readily exceeds the size of most materials likely to cause blockages;
- Characteristics of the upstream catchment; and
- During a severe flood there will be over 7m of head driving water through this large culvert.

The size of the culvert would accommodate large items of potential debris and the slopes and narrow channel flows would tend to align any debris along the channel further reducing the potential for blockage.

The potential source of debris from upstream sections of the channel would be severely hindered by the covering of the channel by the rail corridor. The culvert under the rail corridor is significantly smaller than the Longport Street overpass culvert allowing debris to be trapped upstream of the rail corridor. Also, further debris would be trapped by the railway corridor crest as flood waters pond behind the crest and only a shallow depth of flow passes over the railway crest.

The other potential source of debris for blockage is the Smith Street branch however this is a heavily developed urban catchment which minimises the potential for debris. Also, the majority of flows would be along the roadways with a ponding location opposite the site in Smith Street. This ponding would trap the majority of large debris.

The head of water above the culvert is considerable and will drive flow through the culvert minimising the potential for debris to block the culvert.

Given the above, a blockage factor of 10% was adopted for sensitively testing of the potential flood levels on the site. This blockage factor was combined with a 15% climate change induced increase in rainfall intensity to test the sensitivity to the proposed development. The predicted 100yr ARI flood with 10% blockage and 15% increase in rainfall intensity would be:-

- Chainage 270 – RL 10.57m AHD
- Chainage 300 – RL 10.73m AHD
- Chainage 380 – RL 10.83m AHD
- Chainage 400 – RL 10.81m AHD

At these levels, the minimum residential floor levels at RL 11.5m AHD would still have a freeboard of 0.67m which is more than appropriate.

The lowest basement entry crest level is for Building 1A at RL 10.8m AHD. The applicable predicted flood level at this location would be RL 10.73m AHD. As such, this driveway entry crest would not be overtopped even with the climate change and blockage factors included for the 100yr ARI flood.

The other basement entry crests at RL 11.5m and 13m AHD would have freeboards of 0.67m and 2.17m respectively which are considered readily adequate for the 100yr ARI event with a 15% climate change induced increase in rainfall intensity and 10% blockage.

5.7. Emergency Flood Response Plan

An emergency flood response plan has been formulated for the site to cater for the flood risk for floods between the 100yr ARI and PMF floods. While the 100yr ARI flood is the adopted flood standard for establishing floor levels, an emergency flood response plan is required to appropriately manage the risk to personal safety during more severe floods up to the PMF event.

The proposed emergency flood response plan for the development consists of:-

- Vertical evacuation to higher floor levels above the flood levels to make the plan self-sufficient;
- An alarm sounds when floodwaters on the site reach RL 10.8m AHD requiring residents and workers to move to higher floors above the PMF level;
- Requirement for each body corporate to be responsible for the plan including nomination of people to be wardens in the building, training of all residents/workers and instigating annual drills to practice the plan requirements;
- Provision of signs and lighting to inform people of the evacuation route; and
- Access for emergency services if required during a flood.

The predicted PMF levels on the subject site for existing conditions and the sensitivity testing scenarios do not vary greatly because of the physical features providing overland flow escape for relatively high levels of ponding. The levels vary between approximately RL 13.7 and RL 13.8m AHD.

All residential buildings have floor levels above the PMF level so vertical evacuation provides flood free refuge for all floods. Residents of Buildings 2,3,4 and 5 would also have access to flood free land by walking west along Wellesley Street.

Similarly residents of Building 1A would have access to refuge above the PMF level within the building or via pedestrian access from the first floor level at RL 14m AHD to the Longport Street overpass.

The small retail buildings 1C and 2C have ready access to adjacent tall buildings providing refuge above PMF levels.

The retail ground floor of Buildings 2A and 2B would have access to the first levels at RL 13.9m AHD which is above the PMF level. Higher floors in Building 2A provide further refuge as there would be a connection between Buildings 2A and 2B at the first floor level. In case of emergency requiring say medical attention, access would be provided by covered gantry from Building 2A to 3A and then to the combined basement under Buildings 3 and 5. Emergency vehicles could obtain access to the basement up to flood levels of RL 13m AHD.

The ground floor retail in the one storey Building 3B has a floor level of RL 12m AHD and has ready access to flood refuge floors in Building 3A.

The ground floor retail at the northern end of Building 4A has a floor level of RL 10.4m AHD with ready access to flood refuge floors in the same building.

The retail and community uses in the two storey Building 5E has internal access to the first floor level at RL 14.3m AHD above the PMF level or ready access to higher levels in the adjacent Building 5D.

The ground floor retail in the 11 storey Building 5A, has a floor level of RL 10.7mAHD and ready access to floors above the PMF level in the same building.

5.8. Cumulative Impacts

5.8.1. Sydney Light Rail Extension

The rail corridor forms a crest between the subject site and the McGill Street Precinct Masterplan area and hence has a major influence on severe flood levels in the McGill Street Precinct Masterplan area. Also, flood flows re-enter the open channel of Hawthorne Canal around the proposed location of the Lewisham West station. As such, the design of the Light Rail Extension has to ensure the existing levels of the rail corridor are maintained. Also, any station structures need to be at grade or be elevated and light weight structures so as not to impede or concentrate flood flows onto the subject site.

5.8.2. McGill Street Precinct Masterplan

The development proposed in the McGill Street Precinct Masterplan drains via the existing pipe drainage system which joins the Hawthorne Canal downstream of the Longport Street overpass. This pipe flow has been incorporated into the flood model in the estimation of flood levels on the subject site.

The estimation of flood flows for the Hawthorne Canal and the subject site incorporated the McGill Street Precinct Masterplan development and as such, predicted flood levels on the subject site allow for this development.

5.8.3. MP 08_0195

This project is over a part of the McGill Street Precinct Masterplan area and while the yield is above that envisaged by the Masterplan it would not significantly change the runoff generated from this area. Therefore, the allowances made for the McGill Street Precinct Masterplan in the flood assessment on the subject site include appropriate allowances also for MP 08_195.

6. Stormwater Concept Plan

The stormwater modelling has been undertaken by Civil Certification and the details are contained in Appendix B.

6.1. Overall Management

The proposed stormwater management system will adopt a water sensitive urban design (WSUD) approach in order to reduce potable water use through harvesting roof runoff for non-potable water uses, reduce pollutant loads in runoff to below existing conditions with onsite treatment, provision of stormwater pipe collection system and safe overland flow paths for runoff. This will be achieved as an integrated solution with the site landscape plan.

6.2. Stormwater Concept Plan

The stormwater concept plan is depicted on Figure 5. The plan incorporates a pipe drainage system with a 20yr ARI capacity connected to the open channel of the Hawthorne Canal on the site. Flows in excess of this capacity will be incorporated in overland flow paths safe for pedestrian access. Runoff will be treated in a series of bioretention swales, grass buffer areas, permeable paving and gross pollutant traps to reduce pollutant loads to target levels. This will be aided by roof stormwater harvesting which will reduce the volume of runoff. Stormwater detention would not be provided as the site discharges directly into the Hawthorne Canal and given the sites location at the upper end of a large catchment, the provision of onsite detention has the ability to adversely affect downstream flood levels.

6.3. Runoff Water Quality

The target adopted for the proposed development is that the average pollutant load would be reduced by 80% for suspended sediments, 60% for total phosphorus and 40% for total nitrogen. This would reduce the pollutant loads in runoff to well below the case for the existing site and therefore contribute to the long term improvement in water quality in the Hawthorne Canal.

MUSIC modelling has been undertaken to verify the size of WSUD features required in the development to achieve these targets.

The WSUD features proposed in the development to meet these targets are depicted on the Stormwater Concept Plan (Figure 5) and consist of:-

- Bioretention Swales — 3 swales – surface area 315m²;
- Permeable paving — surface area 450m²;
- Rainwater harvesting — rainwater tank volume – 900kl;
- Gross pollutant traps — 2 off;
- Grass buffer area — 4000m².

6.4. Runoff Peak Flows

The subject site drains directly into the Hawthorne Canal and does not rely upon any Council drainage infrastructure. As such, no detention storage is required to cater for under capacity Council drainage infrastructure.

The target for the stormwater system is to ensure no change in the runoff peak flow rate from the site compared with existing conditions for all flood flows up to the 100yr ARI event. This will ensure no adverse impacts on flood levels for adjacent sites.

The provision of detention storage to slowdown flows on the site would potentially increase the peak flow from the large upstream catchment in Hawthorne Canal.

The flow modelling at Appendix B demonstrates that detention storage is not required on the site in order to maintain existing peak flow rates.

6.5. Overland Flows

Overland flows on the site need to provide for safe pedestrian access. The main overland flow routes include:-

- Flows from railway corridor into Hawthorne Canal open channel on the subject site;
- Flows from Smith Street to the open channel; and
- Flows from the southern end of the site to the open channel.

The target is to achieve a maximum flow times depth product of 0.4m²/s prior to ponding on the site in the overland flows path. As ponding occurs, people will relocate to the buildings or to higher areas in the surrounding streets.

In the 100yr ARI flood, waters will begin to pond behind the Longport Street overpass and will gradually slow down the flow velocities for overland flow entering the site from Smith Street and the railway corridor. In the 20yr ARI flood, the flows will be fully contained within the open channel on the site resulting in higher flow velocities in the overland flow onto the site.

The overland flows from the southern end of the site will be relatively small and given the new drainage system will have a 20yr ARI capacity, the overland flows will be the difference between the 100 yr and 20yr ARI flows. If necessary, the overland flow would be reduced to a safe level by increasing the capacity of the stormwater pipe system on the site.

The landform and landscaping proposed between Smith Street and the canal and between the rail corridor and the canal will be sculptured to ensure overland flows spread over a wide area. The access road to the Building 1A basement will be an elevated structure to allow overland flows to pass under the road. On Smith Street, it is proposed, if necessary, to construct a long inlet pit along the street frontage of the subject site at the kerb level and at the site boundary in order to maximise the flow captured in a pipe and to minimise the overland flow on the site from

this source. A separate pipe (1350mm diameter) would carry this flow from the new inlets to the open channel of the canal and discharge at a high level so that it is less impacted by existing flows in the canal. It would not interfere with the existing SWC Smith Street drainage infrastructure.

The overland flows from Smith Street in a 100yr ARI flood with this new system would reduce the peak flow rate to 16.35m^3/s. Ignoring the ponding which would occur on the site and slow down overland flows, the flood hazard in this worst case scenario would be safe for pedestrians with an estimated velocity depth product of 0.33m^2/s (i.e. less than 0.4m^2/s).

The overland flow from the rail corridor could be partially captured in a new inlet system along the side boundary with the corridor and the provision of three 900mm diameter drainage pipes directly to the canal. Again, ignoring the ponding which could occur on site and slow down overland flows in the 100yr ARI flood, the flood hazard in this worst case scenario would be safe for pedestrians with an estimated velocity depth product of 0.4m^2/s.

6.6. Rehabilitating Hawthorne Canal

The DGRs require consideration of the NSW Office of Water (NOW) comments regarding the rehabilitation of the Hawthorne Canal on the site to enhance flora/fauna connectivity. The DGRs also require liaison with NOW however they declined to meet for discussions on the issue. Our assessment of this issue is outlined in the following discussion which was also conveyed to NOW with a request for a reply.

The Preliminary Environmental Assessment was supported by a detailed flora and fauna assessment, as well as a targeted bandicoot survey. The assessments concluded that the proposed development of the Flour Mills site can be undertaken without adverse impacts upon native flora and fauna.

It is important that the NOW comments are considered within the overall context of the proposed Greenway along the goods railway corridor as part of the Sydney Light Rail Extension. NOW's call for rehabilitation of the canal and the creation of riparian setbacks and vegetation provision consistent with the Guidelines for Controlled Activities appear to fail to recognise that the Hawthorne Canal in the vicinity of the subject site is largely covered over and "capped" by the goods railway line. As can be seen in the Environmental Assessment for the proposed Sydney Light Rail Extension, the treatment of the light rail and Greenway through this area is an urbanised treatment reflecting that the canal is in an enclosed system and recognises the desirable retention of the current mill buildings on the site. The Greenway will achieve the objectives of a flora and fauna corridor as it will be mostly continuous. The canal cannot provide a significant benefit in this upstream area because it is generally capped. Also, the former goods rail corridor immediately adjacent to the subject site has been identified as a light rail station location which introduces further urban development along with the need for wide and easy pedestrian connections through both the subject site and the McGill St Masterplan area. This will not allow extensive areas of vegetation on the subject site. Also the urban outcome being promoted on this "transport orientated development" and the more

regional benefits from these types of development outweigh the limited benefits of isolated riparian vegetation in small areas.

The small section of the Hawthorne Canal that is an open channel on the site is located on the northern part of the site. The western side of the channel in this area is not in the applicant's ownership. Further it is noted that the options for this section of the canal are highly constrained by the ownership of the canal by Sydney Water, the canal's status as a heritage item and the function the canal performs in its current configuration in conveying flood flows. The canal has a flood capacity of around a 20yr ARI severity storm which is limited and which results in significant flooding in the local area. Any restrictions to this flow with more vegetation on the canal banks or further rehabilitation would cause increased flooding and further adverse impacts on surrounding development. This is not acceptable.

The best opportunity to enhance the flora and fauna attributes of this inner city urban area is vested in the proposed Greenway which will take advantage of the extensive corridor formed by the former goods railway line. This provides a more continuous corridor with less potential adverse impacts on the existing range of purposes and roles played by this corridor.

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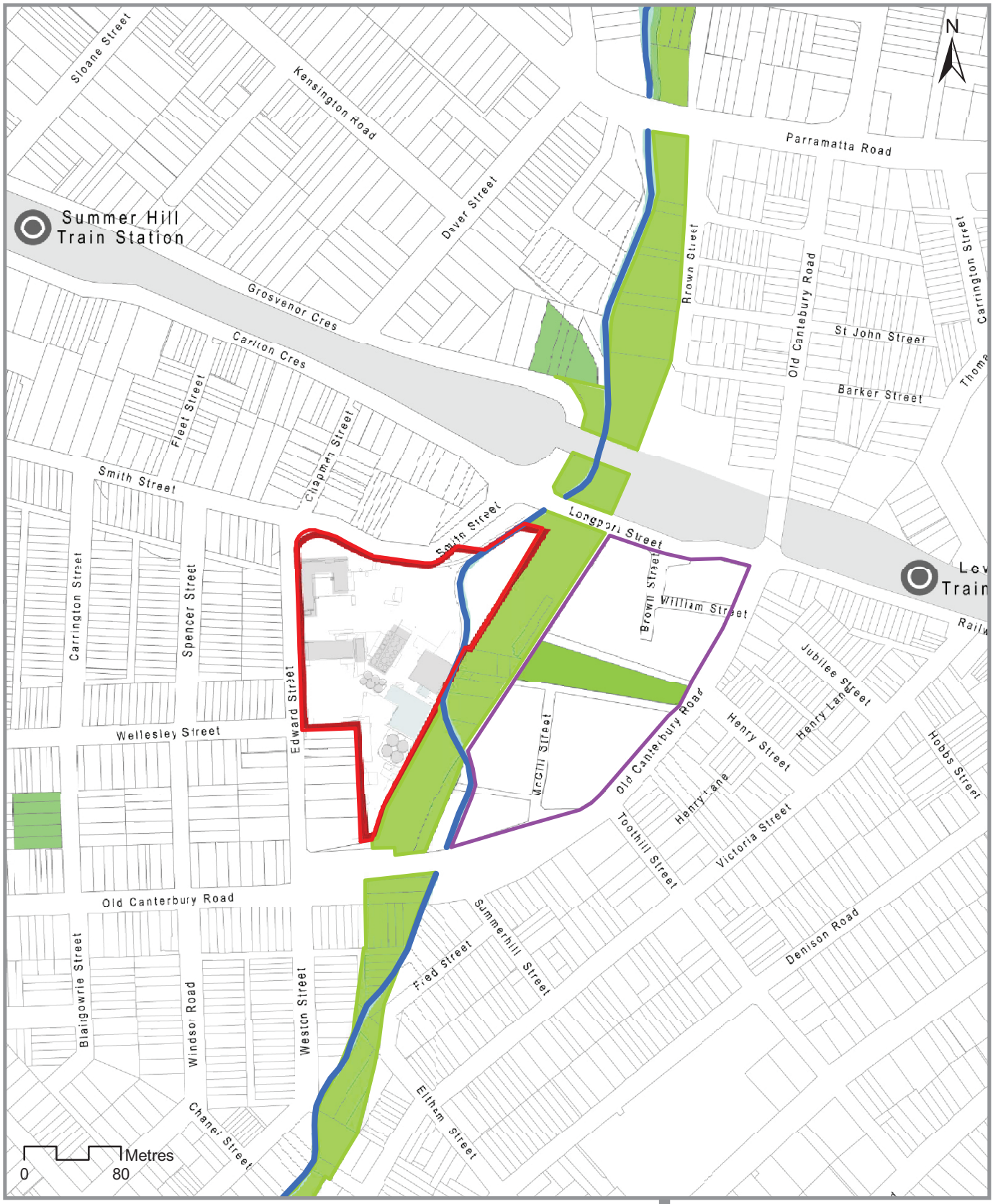
Figure 1 Locality Plan



Legend

- McGill St Masterplan Site
- Flour Mill Site
- Hawthorne Canal
- Sydney Light Rail Extension and Greenway Project

Figure 1 | Locality Plan

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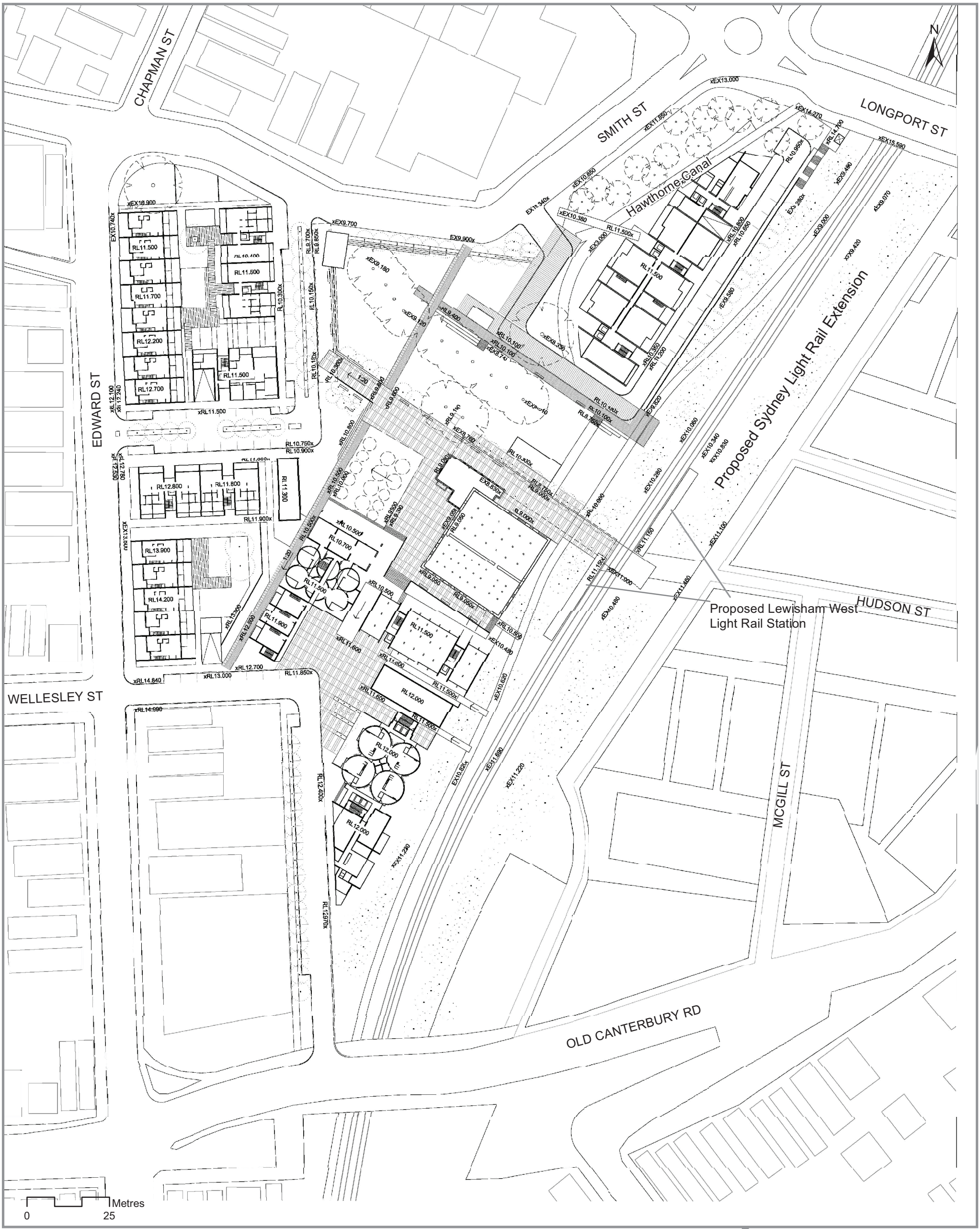
Figure 2 Proposed Development Layout



Legend

x RL10.100 - proposed finished levels
x EX 8.760 - existing ground levels

Figure 2 Proposed Development Layout

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Figure 3 Proposed Building Numbers

Figure 3 Building Identification

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