Hydraulic Principles for the Proposed Pemulwuy Project

October, 2007

Aboriginal Housing Company

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NCSI Certified Quality System ISO 9001

200735350/PR_3990

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Distribution: PB, Cracknell Lonergan .....

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Executive summary

The proposed Pemulwuy development will require works to be undertaken for the stormwater, water supply and sewerage infrastructure. These works are required to ensure the infrastructure complies with current standards, as well as to provide sufficient capacity for the proposed development.

Stormwater infrastructure for the site is owned by the City of Sydney. The existing stormwater system is deficient for the proposed development. The proposed works consist of a formal collection system within the site, including drainage pits and pipes and an on-site detention storage. These will discharge to the existing drainage pits in Vine Street.

Rainwater will be collected from rooved areas and from paved areas around the buildings and will be stored in tanks. Roof runoff will be used for toilet flushing, and runoff from paved areas will be used for garden watering. Overflows from the rainwater tanks will be directed to the on-site detention storage.

Water supply infrastructure for the site is owned by Sydney Water. A system of old 100mm and 150mm diameter water mains currently service the site, and provide water at relatively low pressure to the area. These mains can be used for domestic water supply, however the 100mm main is undersized and will require enlargement to 150mm in diameter over a length of approximately 160 metres. The mains will be used to service the development in a particular configuration, as required by Sydney Water to minimise reductions in pressure. The pressure available from the existing mains is insufficient for fire fighting water supply. Therefore a booster pump station will be required and will supply a separate ring main feeding the fire hydrants. External fire hydrants will be provided for all buildings.

Sewerage infrastructure for the site is owned by Sydney Water. There are two sewer mains currently servicing the site, and these are adequate to be used to service the proposed development. One of the two mains, however, is currently located within the lot easements and may require deviation, depending on the final configuration of Building E (Art Gallery and ancillary retail and office space).

1. Introduction

Strategies for stormwater management, rainwater collection, sewer collection and water supply are required as part of the concept approval that the AHC (Aboriginal Housing Company) is submitting to the Department of Planning for the Pemulwuy Project.

The Pemulwuy Project is the development of approximately 10,000m^2 of land in Redfern into a mixed-use development including residential units, a gymnasium, an elders spiritual centre, a respite and health centre and some commercial and retail buildings.

The hydraulic principles proposed for the development have been developed as concepts, and are outlined in this report.

2. Stormwater

The area being developed is bound by Lawson Street to the south, Louis Street to the west, Vine Street to the north and a railway corridor to the east. The site slopes down from a ridge along Lawson Street at the southern end, to Vine Street at the northern end, falling a total of eight metres over a distance of approximately 100 metres.

Stormwater currently flows overland from Lawson Street to Vine Street. In Vine Street, the stormwater is collected in drainage pits and pipes owned by the City of Sydney.

The existing drainage infrastructure is not adequate for the proposed development. The proposed drainage system is shown in *Figure 1*, and consists of providing:

- kerb and gutter drainage along Caroline Street, Eveleigh Street, and the east side of Louis Street. The new collection system will discharge to the existing drainage pits in Vine Street.
- a drainage collection system within the site that will discharge to rainwater tanks and an on-site detention storage.
- an on-site detention storage.

The proposed drainage infrastructure will be provided in accordance with City of Sydney requirements, and will incorporate appropriate stormwater management techniques recommended by the *Water Sensitive Planning Guide* (Water Sensitive Urban Design in the Sydney Region, 2002).

2.1 On-site Detention

The paved area within the site (excluding the roads) will be collected and transferred to an on-site detention storage at the low end of the site, located beneath the vegetated area adjacent to Building B (the elders spiritual centre). Overflows from the rainwater tanks will also be transferred to the on-site detention storage. This is shown on *Figure 1*. The storage will be provided either as an underground tank, or as an infiltration basin consisting of a matrix of gravel and sand. The storage will flow to a discharge control pit fitted with an orifice which will discharge to the street drain in Vine Street.

The on-site detention required to cater for all the areas that are to be developed is approximately 200m^3. This calculation is based on the rainfall intensity and time of concentration, which are used to determine peak flow rate and flow patterns for both the 5 year and 100 year rainfall characteristics. The on-site detention storage limits the 100 year ARI (Average Recurrence Interval) post-development site run-off to the pre-development 5 year ARI site run-off (*Stormwater Drainage Connection Information*, City of Sydney 2006). That is, the storage will retain the 100 year post-development event, and will release the 5 year pre-development event as a controlled flow.

3. Rainwater Collection

3.1 Rainwater runoff from rooved areas

Rainwater falling onto the rooves of the proposed buildings will be collected and stored in tanks provided in the basement of each building. These rainwater tanks will be approximately 30,000 Litres in size for each building (a total of 180 kilolitres for all of the residential buildings), and will be sufficient for toilet flushing for approximately 75% of the year, capturing approximately 85% of roof runoff.

The rainwater tanks will be fitted with leaf diverters, a first flush device, an overflow to the paved area drainage system, and a backflow prevention device. A small pump adjacent to each tank will transfer the rainwater to the toilet cisterns via dual reticulation pipes. A solenoid valve will be used to switch between rainwater and mains water (when the rainwater storage is empty or in the event of a pump or power failure).

3.2 Rainwater runoff from paved areas

Rainwater falling onto paved areas around each building will be collected and stored in tanks provided in the basement of the residential buildings (Buildings A1 to A6). These rainwater tanks will provide a total of approximately 45,000 Litres storage, and will be sufficient for garden watering for approximately 85% of the year, capturing approximately 55% of paved area runoff.

3.3 Rainwater tank overflows

Overflow from the rainwater tanks will be directed to the site drainage system, which flows to the on-site detention storage. This is shown in *Figure 1*.

4. Water Supply

The area to be developed is currently serviced by the following water mains owned by Sydney Water:

- a 150mm water main along Lawson Street
- a 150mm water main along Caroline Street
- a 150mm water main along the west side of Eveleigh Street
- a 150mm water main along the east side of Eveleigh Street
- a 100mm water main along Vine Street
- a 100mm water main along Louis Street.

The estimated water demand for the development has been calculated based on the *Water Supply Code of Australia, Sydney Water Edition* (WSA 03-2002, Water Services Association of Australia), and is summarised in *Table 4-1*.

Table 4-1 Estimated Water Supply

Building	Estimated maximum water demand (kL/day)
Buildings A1 to A6 (residential apartment buildings)	60.0
Building B (Elders Spiritual Centre)	1.2
Building C (Health and Fitness Gym)	9.2
Building D (AHC offices and retail space)	2.3
Building E (Art Gallery and commercial and retail space)	4.4
Building F (Health and Respite Centre)	20.0
Total	97.1

The demands detailed in *Table 4.1* do not, however, allow for the reduction in demand from the Sydney Water mains due to rainwater collection. This is because stored rainwater will be available for only approximately 75% of the year, and the Sydney Water mains must be able to supply the maximum daily demand, which is during the other 25% of the year when there is no rainwater available.

Sydney Water has completed a Feasibility Letter for the Section 73 requirements of the development, a copy of which is included in *Appendix A*. The Feasibility Letter indicates that:

- the existing 150mm water main located in Caroline Street and the existing 150mm water mains in Eveleigh Street are available to provide part of the proposed development with a domestic supply.
- the existing 100mm water main in Louis Street and Vine Street does not comply with the 150mm size required for buildings of 4 to 6 storeys, and a water main replacement is required as part of the development, consisting of a new 150mm main in place of the existing 100mm main in Louis Street and Vine Street. The proposed 150mm main will also be re-connected to the houses along the west side of Louis Street that are currently connected to the existing 100mm main.

The water main replacement will be carried out as part of the development, and is shown in *Figure 2*.

In accordance with Sydney Water requirements, connections from the new development to the water mains will be carried out as detailed following, to minimise drops in pressure that may be caused due to the increase in demand:

- Buildings A4 to A6 (residential units along Eveleigh Street), Building C (Health and Fitness Gym) and Building E (the Art Gallery and commercial buildings) will connect to the existing 150mm water main on the eastern side of Eveleigh Street.
- Building B (Elders Spiritual Centre) and Buildings A1 to A3 (residential units along Louis Street) will connect to the proposed 150mm water main replacement in Louis Street.
- Building D (AHC Offices and retail space) and Building F (Health and Respite Centre) will connect to the existing 150mm water main in Caroline Street.

5. Water Supply for Fire Fighting

A fire hydrant system will be provided for all the buildings to be developed. A summary of the requirements for the fire hydrants as required by *Building Service NSW, Volume 1 Building Code of Australia*, and *AS 2419.1 – 1994 Fire hydrant installation*s is as follows:

- for each of Buildings B, C, D, F (with 1 or 2 storeys): there will be one hydrant capable of discharging at 10L/s with minimum 150kPa residual pressure at the nozzle (even during peak water consumption periods). The hydrant can be externally located, provided that all points on all floors is within reach of a 10m hose stream issuing from a nozzle at the end of a 60m length of hose laid on the ground or floor, connected to a hydrant outlet.
- for each of Buildings A1 to A6, E (with 3 or more storeys): there will be two hydrants capable of discharging simultaneously at 10L/s each with minimum 150kPa residual pressure at the nozzle (even during peak water consumption periods). The hydrants can be externally located, provided that all points on all floors is within reach of a 10m hose stream issuing from a nozzle at the end of a 60m length of hose laid on the ground or floor, connected to a hydrant outlet.

A pressure inquiry was undertaken by Sydney Water for the 150mm diameter water main that runs along Caroline Street and down the east side of Eveleigh Street. The results of this inquiry are included in *Appendix B*, and indicate that this main is not sufficient to provide the required 10L/s at 150kPa residual pressure (i.e. pressure at the hose nozzle) at two hydrants simultaneously.

Sydney Water has also indicated that the 600mm diameter main along Lawson Street and the 375mm diameter main along Eveleigh Street do not supply this area and cannot be used to boost the supply to the proposed development.

Therefore a booster pump station will be provided, with an offtake from the existing 150mm main at the low end of Vine Street. As the existing mains are old (circa 1928), the booster pump station will feed a new, separate ring main. The ring main will be 100mm diameter, as shown on *Figure 2*, and will supply the fire hydrants.

6. Sewerage

The area to be developed is currently serviced by the following sewer mains owned by Sydney Water:

- a 225mm sewer main along Eveleigh Lane.
- a 225mm sewer main within the lot boundaries between Eveleigh Street and the railway corridor.

The estimated sewage discharge for the development has been calculated based on the *Sewerage Code of Australia, Sydney Water Edition* (WSA 02-2002, Water Services Association of Australia), and is summarised in *Table6-1.*

Table 6-1 Estimated sewage discharge

Building	Estimated equivalent population (EP)	Estimated sewage discharge (kL/day)
Buildings A1 to A6 (residential apartment buildings)	186.0	186.2
Building B (Elders Spiritual Centre)	2.5	2.7
Building C (Health and Fitness Gym)	30.5	30.7
Building D (AHC offices and retail space)	6.0	6.2
Building E (Art Gallery and commercial and retail space)	9.8	10.0
Building F (Health and Respite Centre)	19.0	19.2
Total	253.8	45.7

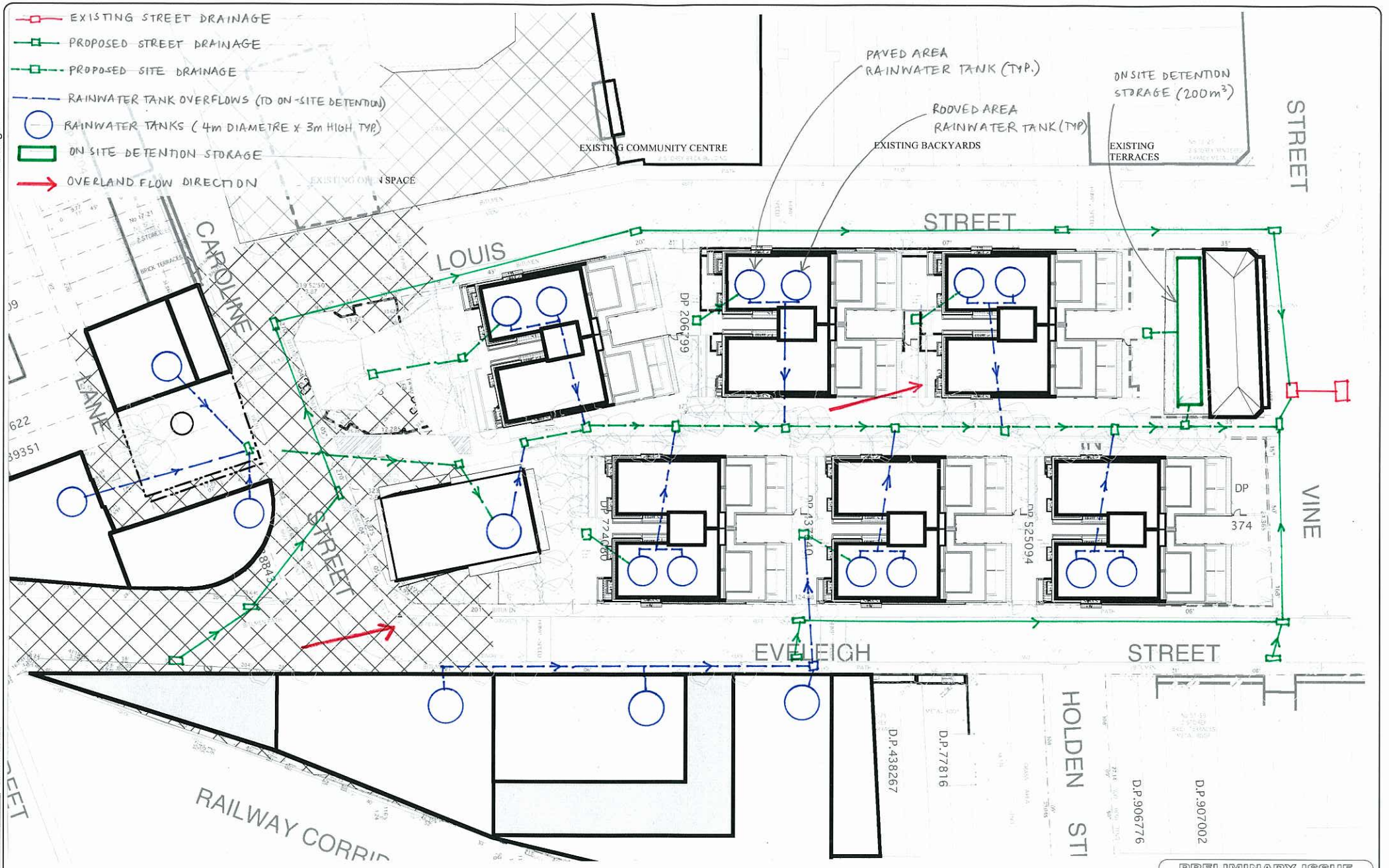
Sydney Water has completed a Feasibility Letter for the Section 73 requirements of the development, a copy of which is included in *Appendix A*. In accordance with these requirements, connections from the new development to the sewer mains will be provided as follows:

- the existing 225mm sewer main located in Eveleigh Lane will serve Buildings A1 to A6 (residential units), Building B (Elders Spiritual Centre), Building F (Health and Respite Centre), Building D (AHC Offices and retail space) and Building C (Health and Fitness Gym).
- the existing 225mm sewer main located between Eveleigh Street and the railway corridor will serve Building E (Art Gallery and commercial and retail space).

These sewer mains are shown in *Figure 3*.

The existing 225mm sewer main between Eveleigh Street and the railway corridor will be deviated if required, depending on the position of Building E.

In addition, all disused private sewerage services will be connected and sealed at the point of connection to the Sydney Water sewer main.



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NOT FOR CONSTRUCTION

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A3 ORIGINAL
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I Smyth
SIGNED 23.10.07
DATE

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PROJECT
PEMULWUY
FIGURE 1
STORMWATER CONCEPTS

PROJECT No.	DISCIPLINE	NUMBER	REV.
200735350	-A356-	F1	1

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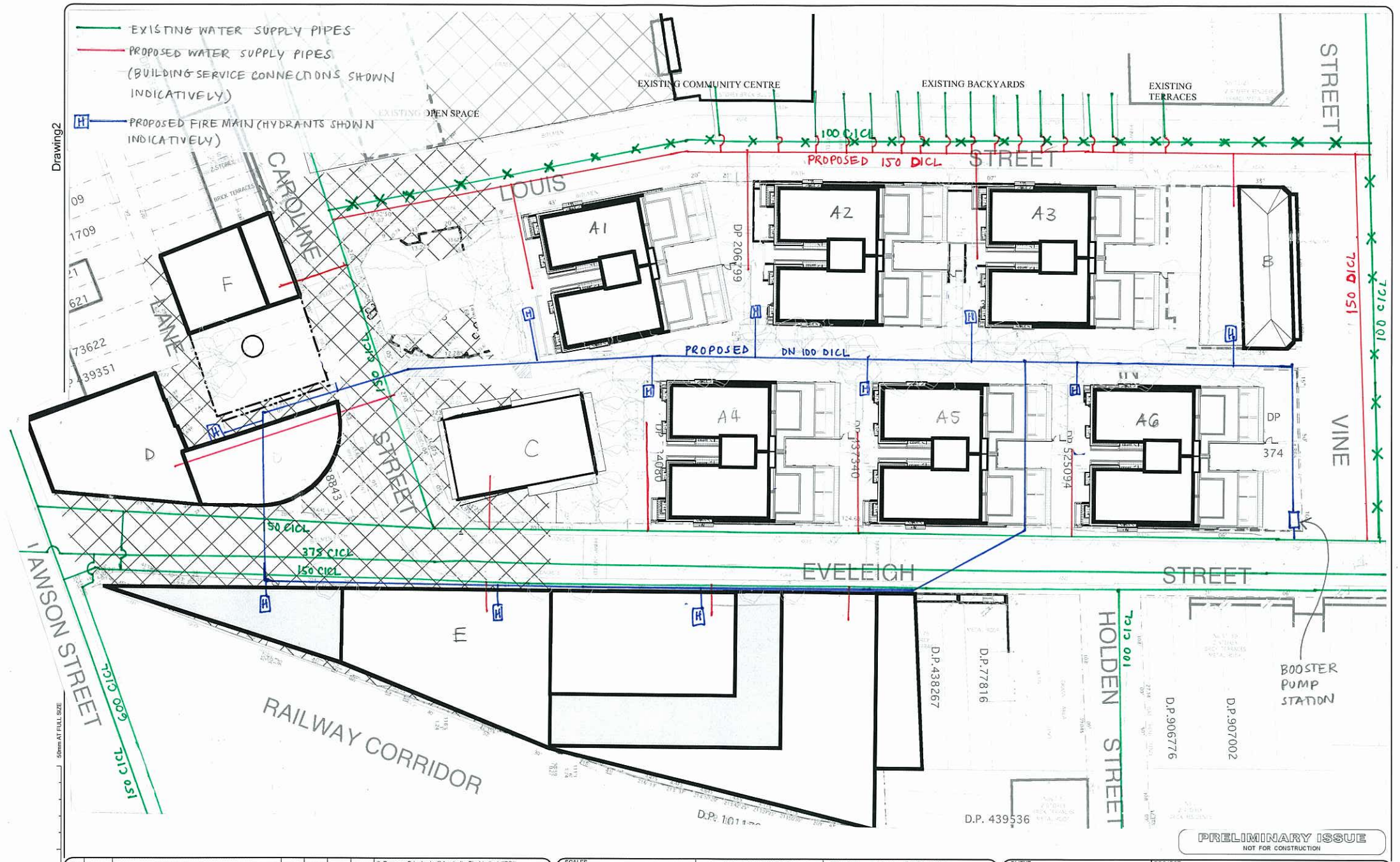

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PROJECT
PEMULWUY
FIGURE 2
WATER SUPPLY CONCEPTS

PROJECT No.	DISCIPLINE	NUMBER	REV.
200735350	- A356 -	F2	1

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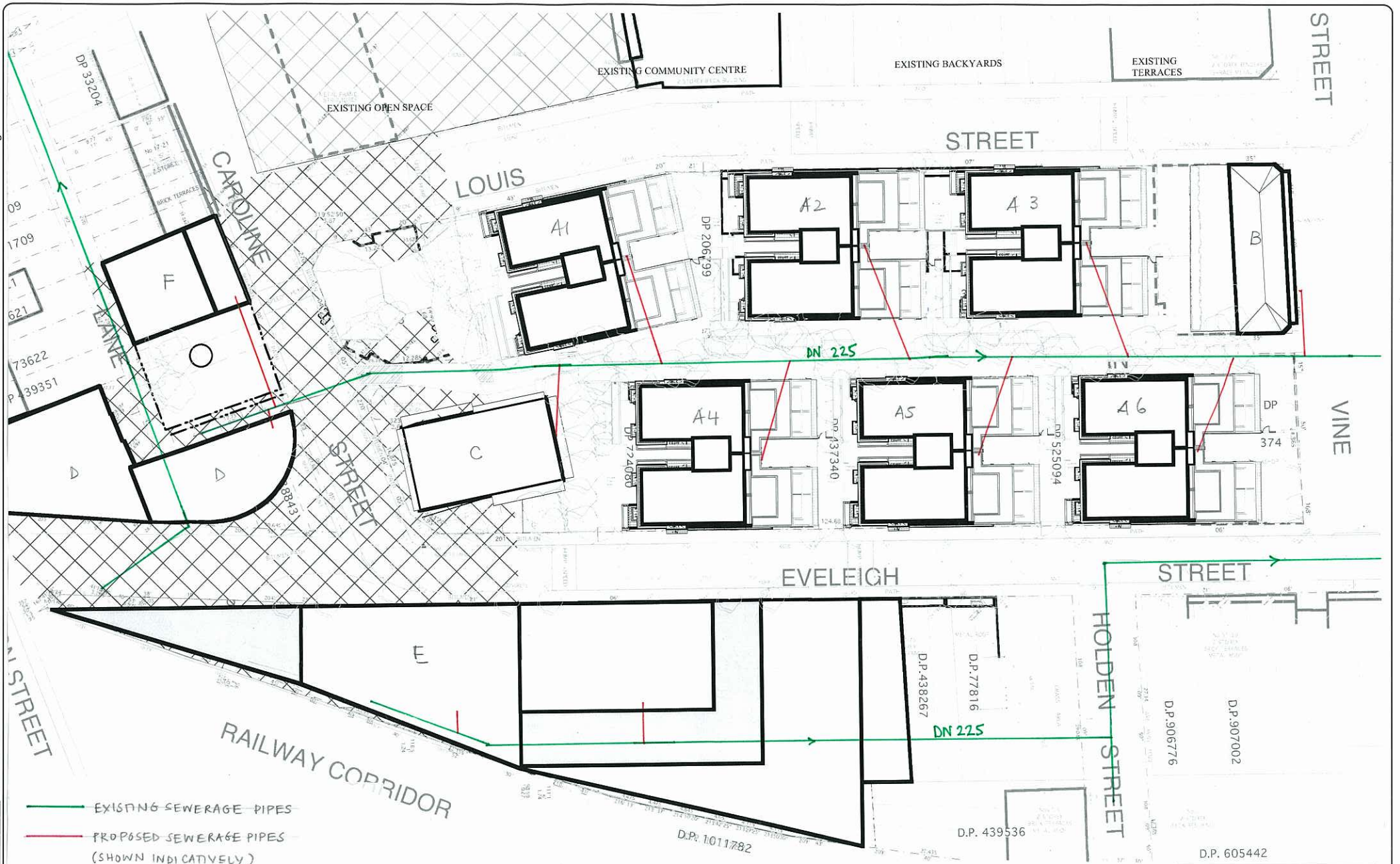

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PROJECT: PEMULWUY
FIGURE 3
SEWERAGE CONCEPTS

PROJECT No.	DISCIPLINE	NUMBER	REV.
200735350	- A35 -	F3	1

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