



STORMWATER MANAGEMENT PLAN

TARONGA WILDLIFE HOSPITAL – NUTRITION CENTRE



PREPARED FOR:
TARONGA ZOO
Bradleys Head Road
Mosman NSW 2088



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1.0 Introduction

The purpose of this report is to detail the proposed stormwater drainage management plan and WSUD strategy for the proposed Taronga Wildlife Hospital Nutrition Centre development at Bradleys Head Road, Mosman NSW, on behalf of Taronga Zoo as required by the SEARs for the State Significant Development Application (SSDS) submission associated with the proposed development.

This report addresses the following items/condition of SEAR:

Condition 9. Flooding – Section 6 of this report identifies any on-site flood impacts associated with the proposed development and provides detailed study of the flood impact assessment as per SEAR.

Condition 10. Stormwater drainage and water quality – Section 3 and 4 of the report provides details on the following as required by SEAR:

- Proposed stormwater drainage design
- On-site detention facilities
- Water quality measures
- Nominated stormwater discharge point

Condition 21. Construction impacts - Section 5 of the report provides details on the assessment of potential impacts of proposed civil works on the amenity of the surrounding area. Details on site protection measures, such as site access, sediment control measures, temporary stormwater drainage, dust control and maintenance have been provided.

Consultation – As required by SEAR, the proposed stormwater drainage and water treatment scheme will be discussed with Mosman Council.

This stage of the Taronga Zoo project involves demolition of existing buildings and construction of a 2-storey nutrition centre with a basement plant room level. Post-development, the site will be incorporate elevated paths, stairs, landscaping and paved areas resulting in impervious coefficient (C) of approximately 0.72, which is a minimal increase from the existing impervious coefficient of approximately 0.70. The proposed stormwater drainage will connect to existing inground stormwater drainage discharging to existing end-of-line rainwater harvesting tanks and treatment units to attenuate flows to pre-development levels in accordance with Mosman Council – Policy for Stormwater Management in Mosman, dated October 2006.

The following design features are detailed in this report:

- Stormwater Management System Design
- Stormwater Treatment System
- Soil and Erosion Management

2.0 Site Location

The proposed site is located towards the north western section of Taronga Zoo, to the west of Taronga Institute of Science and Learning. (please see below Figure 2.0)



Figure 2.0 Proposed Site Location

3.0 Stormwater Drainage Design

3.1 Existing Stormwater Drainage Infrastructure

A desktop review and site inspection were carried out by Meinhardt Bonacci to determine the existing drainage infrastructure and overland flow paths within the development site. The inspection and desktop review revealed the following:

- The existing site slopes diagonally from east to west at an average fall of approximately 1:1 within the existing landscape areas.
- There is a network of existing inground stormwater pits and pipes primarily to the west of the site to facilitate draining.
- The existing stormwater drainage connects into the existing grated pit located on the roadway adjacent to the site to the west.
- These existing stormwater networks within the development area reticulate the captured stormwater to the existing stormwater treatment plant, which is located to the southwest of Taronga Zoo near Sydney Harbour, through the Zoo's internal private stormwater drainage system.
- All stormwater drainage is treated in above mentioned treatment plant before being discharged into Sydney Harbour. There are no stormwater connections into Mosman Council drainage assets.
- The details of existing stormwater drainage (location, size, and depth) have been provided in Service proving investigation report no.75166, prepared by SureSearch, dated 11.02.2021

Please refer to Figure 3.1 for an illustration of the existing stormwater drainage infrastructure.

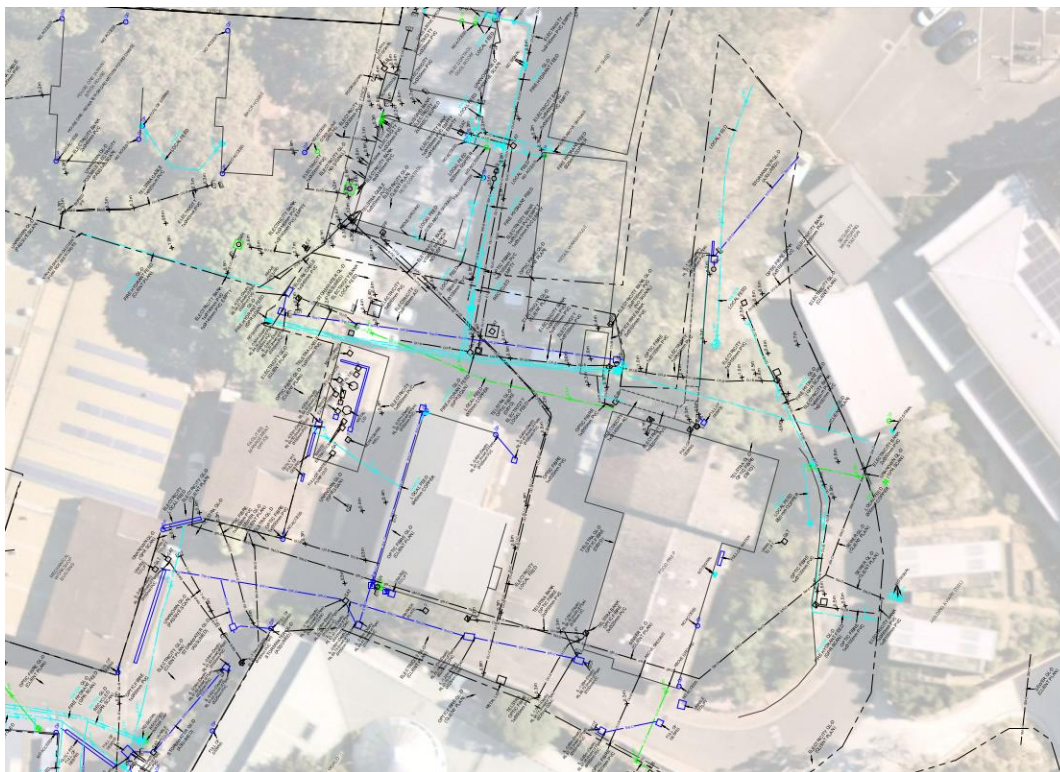


Figure 3.1 Existing Stormwater Drainage

3.2 Council Requirements

As per Mosman Council's general design parameters, the following design criteria will be adopted:

For gravity flow pipe systems:

Recurrence interval: 20 years
Time of concentration: 5 minutes
Rainfall intensity: 206 mm/hr
Runoff coefficient: Pervious: 0.75
Impervious: 1.0

For overland flowpath:

Recurrence interval: 100 years
Time of concentration: 5 minutes
Rainfall intensity: 267 mm/hr
Runoff coefficient: Pervious: 0.75
Impervious: 1.0
Minimum 1% fall from boundary to kerb.

Minimum freeboard of 300 mm to adjacent habitable floor levels of the development site and adjoining properties for overland flows.

Please refer to Table 3.2, for Pre-development and post-development catchments.

Catchment		Area [m ²] (Total Area 1767m ²)	Impervious Fractions (f)
Pre-development	Pervious	Landscape = 1204	0.75
	Impervious	Hardstand = 50	0.90
		Roof = 513	1.00

Post-development	Pervious	Landscape = 491	0.75
	Impervious	Hardstand = 302	0.90
		Roof = 974	1.00

Table 3.2 Pre-development and post-development catchments

3.3 Proposed Stormwater Drainage Scheme

The proposed roof catchment will be captured by downpipes that will transition through the building to the proposed inground stormwater drainage on levels 2 and 3 (at grade). Level 2 and Level 3 catchments will be captured through stormwater inlet pits and connect to the proposed inground stormwater drainage at grade as well.

Thus, all proposed stormwater drainage for the proposed site will be captured by a network of inground pits and pipes connecting to existing downstream internal stormwater drainage of Taronga Zoo to discharge via gravity.

There is an existing stormwater pipe and pit running across the proposed development which will be demolished. A new pit where all discharge of the proposed site will be collected will be constructed to connect to the existing stormwater line downstream.

Please refer to Appendix A for proposed stormwater drainage scheme.

3.4 Rainfall Data

The Rainfall intensity for proposed site has been derived from Rainfall intensity data provided by Bureau of Meteorology on <http://www.bom.gov.au>. These rainfall intensities are in line with the design parameters provided by Mosman Council.

Please refer to Table 3.4 below for Rainfall data and Appendix B for IFD chart (Intensity and Frequency Data)

RAINFALL INTENSITY IN mm/h FOR VARIOUS DURATIONS AND RETURN PERIODS							
RETURN PERIOD (YEARS)							
DURATION	1	2	5	10	20	50	100
5 mins	100.	129.	163.	183.	209.	243.	269.
6 mins	93.9	120.	153.	171.	196.	228.	253.
10 mins	76.9	98.8	126.	142.	163.	191.	212.
20 mins	56.4	72.8	94.6	107.	124.	146.	163.
30 mins	45.9	59.5	77.9	88.8	103.	122.	136.
1 hour	31.1	40.4	53.4	61.2	71.2	84.5	94.7
2 hours	20.3	26.5	35.0	40.1	46.7	55.4	62.1
3 hours	15.7	20.4	27.0	30.8	35.8	42.5	47.6
6 hours	10.1	13.1	17.1	19.5	22.6	26.7	29.9
12 hours	6.49	8.40	11.0	12.5	14.4	17.0	19.0
24 hours	4.19	5.42	7.08	8.06	9.33	11.0	12.3
48 hours	2.64	3.43	4.49	5.13	5.95	7.03	7.86
72 hours	1.96	2.54	3.33	3.80	4.41	5.20	5.82

Table 3.4 Rainfall Data

3.5 Post-Development Site Discharge Rates

The site discharge rates have been calculated using rational method, based on Council parameters discussed above in section 3.2.

Rational method:

Discharge 'Q (20 or 100 yrs) = (C*I*A)/360,

where C = runoff co-efficient, I = Rainfall intensity, A = Catchment area

Storm Event (ARI)	1 in 20 years	1 in 100 years
Pre-development (L/s)	85.3L/s	126.4L/s
Post-development (L/s)	86.2L/s	127.7L/s

Table 3.5 Site Discharge Rates

The increase in post development discharge is approximately 1%, furthermore, since the proposed drainage connection is to private internal drainage, there is no anticipated impact on Council assets. A consultation with Council's drainage engineer will be undertaken to obtain in principle approval.

4.0 Water Sensitive Urban Design (WSUD)

The aim of WSUD is to remove pollutants from stormwater before discharging it into existing drainage system/downstream catchment. Best Practice Environmental Management Guidelines (BPMEG) require the following pollution reduction targets:

- Total Suspended Solids 80%
- Total Phosphorous 45%
- Total Nitrogen 45%
- Litter 70%

Taronga Zoo has an existing Waste Water Treatment Plant (WWTP) located to the south west corner of the zoo, adjacent to Sydney Harbour that meets the WSUD requirements.

4.1 Existing Stormwater Treatment System

The WWTP captures the first-flush component from the overland stormwater flow from various animal enclosures and open areas within and surrounding the zoo – reclaiming approximately 100 ML annually. Excess stormwater during large storm events is redirected to an ocean outfall. The treated water from the plant is reused on site for irrigation, filling the moats, cleaning/hose down and toilet flushing purposes. Any excess treated water, such as during storm events, is also channelled to the ocean outfall following UV disinfection. The first flush diversion point and the effluent discharge are monitored by the NSW EPA.

This information has been extracted from *Taronga Zoo Wastewater Treatment Plant - Capacity and Condition Review*, prepared by KMH Environmental, dated March 2017.

Please refer to below Figure 4.1 for WWTP layout and Appendix C for treatment flowchart.



Figure 4.1 Waste Water Treatment Plant at Taronga Zoo

4.2 Proposed Stormwater Treatment

The proposed stormwater drainage will be treated in the existing WWTP before being discharged into Sydney Harbour. The treatment process will be same as noted in Section 4.1 above.

5.0 Sediment and Erosion Control Measures

Civil drawings or Sediment and Erosion control plans and details will be provided outlining the control measure. All sediment control measures to be installed in accordance with Landcom Managing Urban Stormwater "Blue Book".

Please refer to Appendix D for proposed sediment and erosion control plan.

5.1 Site protection Measures

It is proposed to provide the following measures discussed below, to inhibit the movement of sediment off the site during the demolition and construction phases.

5.1.1 Site Access

The site access for construction vehicles will be provided from the roads adjacent to the site area, primarily via Bradleys Head Road and Whiting Beach Road through Temporary Construction vehicle shaker ramps with a cattle grid. Please refer to Figure 5.2 below.

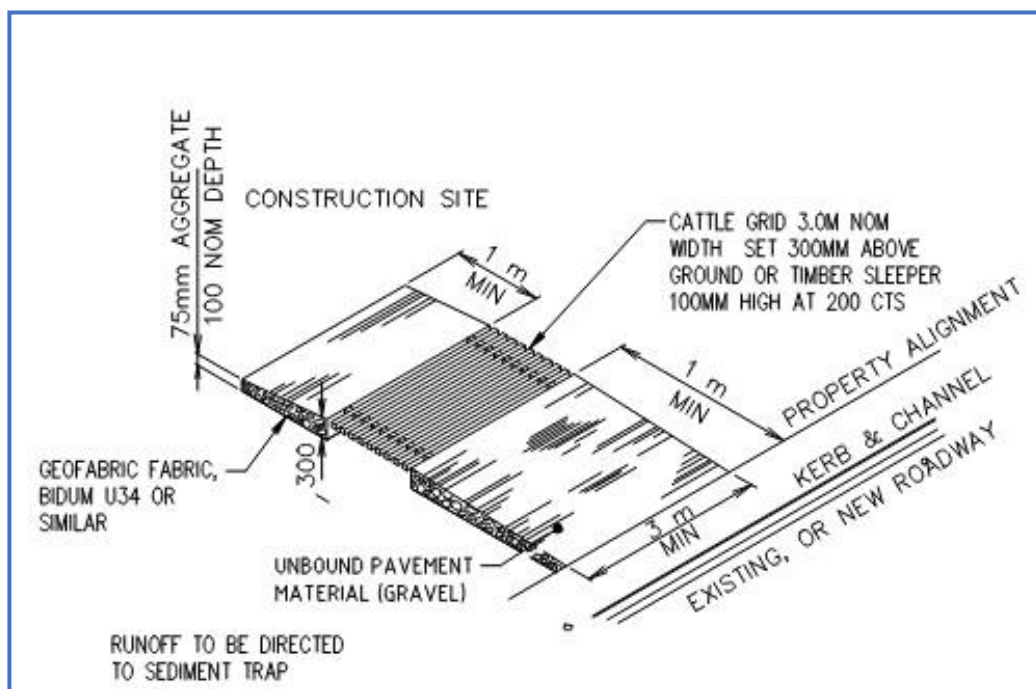


Figure 5.1.1 Temporary Construction Vehicle Entry/Exit Sediment Trap

5.1.2 Sediment Control

All exposed earth areas where it may be possible for runoff to transport silt down slope shall be protected with a sediment and erosion control silt fence generally installed along the boundaries of the site.

The fence will be constructed in accordance with details provided by the Department of Conservation and Land Management incorporating geotextile fabric which will not allow suspended particles greater than 50mg/L non-filterable solids to pass through, and as such comply with the appropriate provisions of the Clean Waters Act 1970.

The construction of the silt fence will include the following:

- Geotextile fabric buried to a maximum of 100mm below the surface
- Overlapping any joins in the fabric
- Turning up on the ends for a length of 1 meter to prevent volumes of suspended solids escaping in a storm event

Please refer to Figure 5.1.2(a) below.

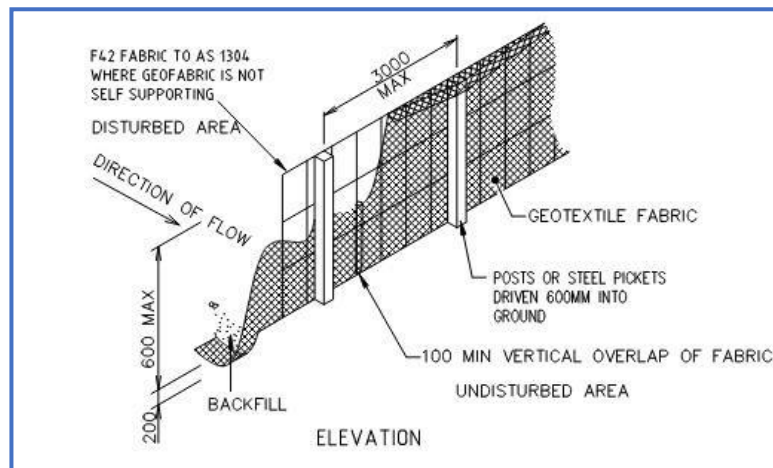


Figure 5.1.2 (a) Sediment Fence

Existing stormwater infrastructure is also to be protected from incoming sediment with the incorporation of geotextile pit filters to the existing downstream stormwater pits in proximity of the proposed site area.

Please refer to Figure 5.1.2(b) and Figure 5.1.2(c) below:

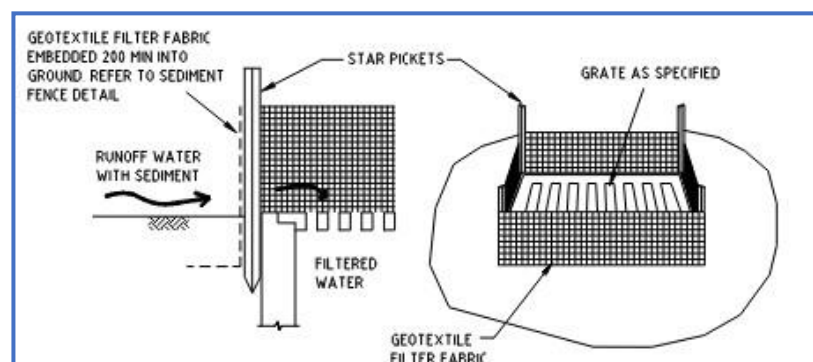


Figure 5.1.2(b) Geotextile Pit Filter 1

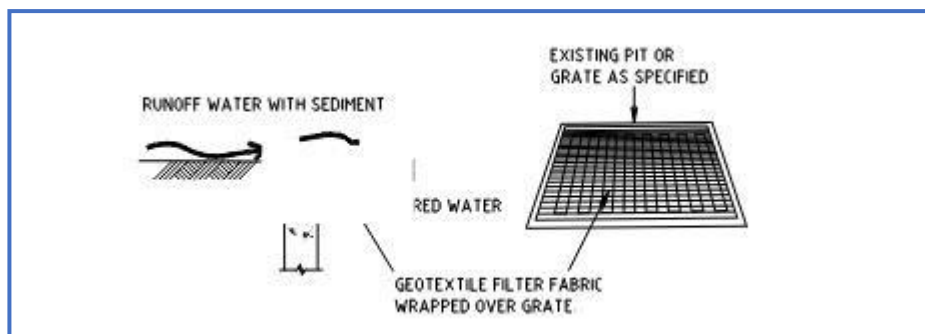


Figure 5.1.2(c) Geotextile Pit Filter 2

5.1.3 Temporary Stormwater Drainage (Where required)

Site runoff within the zones of the excavation will be drained into a central holding well within the excavation. Runoff will be allowed to settle out suspended particles and debris, and an acceptable water of 50mg per liter of Non-Filterable Residues (NFR) is required to be achieved prior to discharge.

5.1.4 Dust Control

The proposed dust control measures are as follows:

- Loose loads entering or leaving the site will be securely covered by a tarpaulin or like material in accordance with RMS and local Council Guideline
- Soil transport vehicles will use the single main access to the site
- There will be no burning of any materials on site
- Water sprays will be used across the site to suppress dust. The water will be applied either by water sprinklers or water carts across ground surfaces whenever the surface has dried out and has the potential to generate visible levels of dust either by the operation of equipment over the surface or by wind. The watercraft will be equipped with a pump and sprays
- Spraying water at the rate of not less than three (3) L/s and not less than 700kPa pressure. The area covered will be small enough that surfaces are maintained in a damp condition and large enough that runoff is not generated. The water spray equipment will be kept on site during the construction of the works
- During excavation, all trucks/machinery leaving the site will have their wheels washed and/or agitated prior to travelling on Council Roads

- Fences will have shade cloth or similar fabric fixed to the inside of the fence

5.1.5 Maintenance

- It will be the responsibility of the contractor to ensure sediment and erosion control devices on site are maintained. The devices shall be checked daily, and the appropriate maintenance undertaken as necessary
- Prior to the closing of the site each day, the road shall be swept, and materials deposited back onto the site
- Gutters and roadways will be kept clean regularly to maintain them free of sediment
- Appropriate covering techniques, such as the use of plastic sheeting will be used to cover excavation faces, stockpiles, and any unsealed surfaces
- If dust is being generated from a given surface, and water sprays fail
- If fugitive emissions have the potential to cause the ambient air quality to foul the ambient air quality
- The area of soils exposed at any one time will be minimized wherever possible by excavating in a localized progressive manner over the site
- Materials processing equipment suitably comply with regulatory requirements. The protection will include the covering of feed openings with rubber curtains or socks.

It is considered that by complying with the above, appropriate levels of protection are afforded to the site, the adjacent public roads, footpaths, and environment.

6.0 Flood Impact Assessment

The site under assessment was found to have little to no flood affection. Figure 6.1 below shows the topography and general layout of the upper catchments relevant to the proposed Taronga Wildlife Hospital Nutrition Centre and the approximate location of the proposed site marked in grey. Under the staggered and sloped general terrain, the upper catchment highlighted in the below Figure 6.1 were found contributing overland flows to the downstream in an associated manner. However, little to no direct overland flow was found to encroach the proposed site.

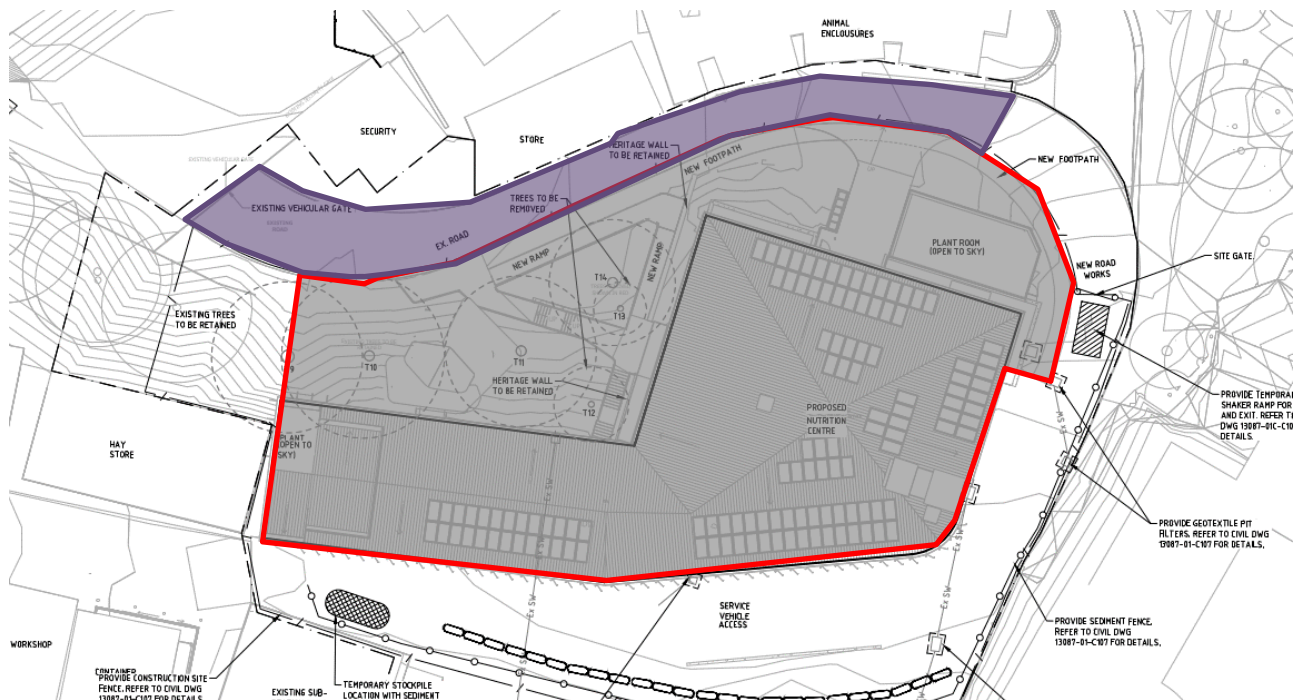


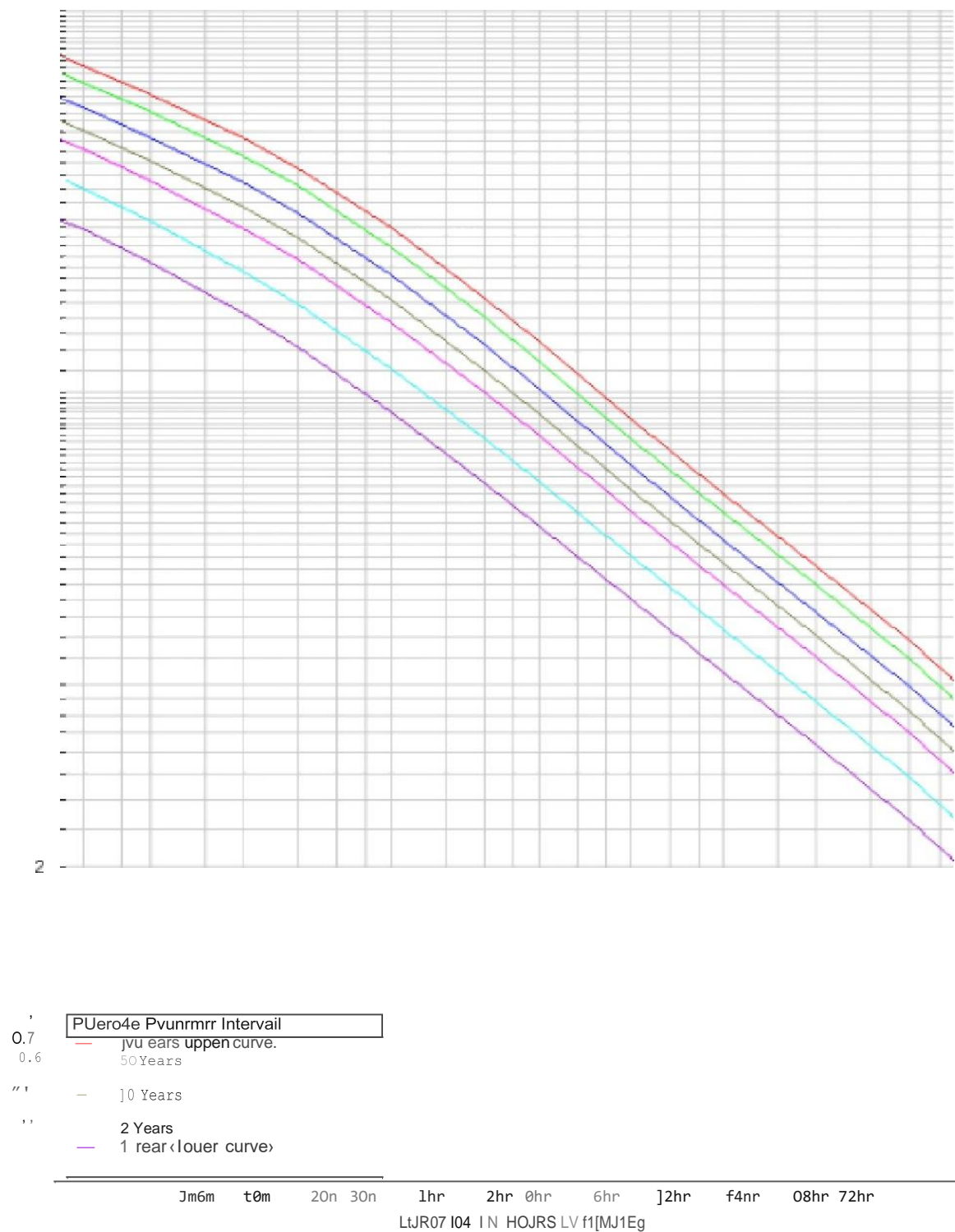
Figure 6.1 Upper Catchments to Proposed Taronga Zoo Wildlife Hospital

The upper catchments were determined based on a high level analysis of existing topographical contours and levels provided by surveyor Hammond Smeallie & Co Pty Ltd dated 20/03/2019. A detailed flood modelling had not been conducted for the site.

Further upstream to the highlighted catchment was the Taronga Institute of Science Learning and the car park area further to the east, which were determined not impacting downstream with overland flow. This was outlined in the *Taronga Zoo Flood Impact Assessment* report by GRC Hydro dated 25th June 2020 provided to Warren Smith & Partners.

Overall, the only direct association to the downstream site should be the existing internal roadway running in a north-south direction adjacent to the site. This roadway catchment will drain into the proposed kerb inlet pit associated with the development.

Appendix B — IFD CHART



Appendix D – PROPOSED SEDIMENT AND EROSION CONTROL PLAN