MIDCOAST
TOWN PLANNING

Statement of Environmental Effects

5 Lot Large Residential Subdivision (Staged)

Lot 1 DP 1219123, 24 Manor Road, Harrington. NSW

Prepared For: Terrence and Janeen Clifton

Date: 29 January 2024

Our Reference: P00631_R1.docx

town planning
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Title:	**Statement of Environmental Effects**
Project:	**5 Lot, Large Residential Subdivison (Staged)** Lot 1 DP 12919123 24 Manor Road Harrington NSW
Client:	*Terrence and Janeen Clifton*
Report No.:	*P00631_R1.docx*
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Midcoast Town Planning and the authors responsible for the preparation and compilation of this report declare that we do not have, nor expect to have a beneficial interest in the study area of this project and will not benefit from any of the recommendations outlined in this report.

The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

All data and plans contained within this report are prepared for the exclusive use of Terrence and Janeen Clifton to accompany this report for the land described herein and are not to be used for any other purpose or by any other person or entity. No reliance should be placed on the information contained in this report for any purposes apart from those stated therein.

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Table of Contents

1 Chapter 1

1.1 Introduction

PDA Planning has been engaged by Terrance and Janeen Clifton to prepare a Statement of Environmental Effects (SEE) for a 5-lot large lot subdivision (staged) at 24 Manor Road Harrington, Lot 1 DP1219123.

This report assesses the potential environmental impacts of the proposed subdivision.

The decision making process for the proposed development falls under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The Council, in deciding whether consent should be granted, must examine and take into account relevant matters for consideration. This report is intended to assist in this decision making process and to provide information that satisfies the requirements of Section 4.15 of the EP&A Act.

1.2 Proposed Development

The land for the proposed subdivision is known as Lot 1 DP1219123, 24 Manor Road, Harrington. The land is shown in **Figure 1.**

Figure 1 - Site Location

Source: MidCoast Council Online Mapping, 20 January 2024

2 Proposed Development

2.1 Existing Environment

Lot 1 DP 1219123, 24 Manor Road, Harrington is located on the western extent of the built environment of Harrington. The land has access to Manor Road.

Lot 1 is predominantly cleared and generally slopes from north to south. A vegetated Council reserve is located to the south of the land. The land also has direct frontage to the Manning River.

Lot 1 is located to the south of adjoining land that has been approved for large lot residential subdivision, being the subject of the DA 413/2014 approval.

Part of that Development Approval requires the northern boundary of the land to be provided with road frontage and services constructed to Council required standards that will allow for the future Stage 2 of the subdivision to occur. The current Lot 1 has a 4m wide rights of access to Manor Road.

A Master Plan for the subdivision of the land was approved by the Department of Planning in 2005 under the provisions of State Environmental Planning Policy 71. The proposed subdivision is generally in accordance with this approval. A copy of this approval is attached at **Appendix A**.

2.2 Proposed Subdivision

It is proposed to subdivide the subject land in two stages being:

- Stage 1 being the creation of an allotment of 7,394m2 lot containing the existing dwelling with a residue development lot containing a restriction on any further development of that land until services are provided; and
- Stage 2 being the subdivision of the residue lot into 4 lots. These lots will be provided with water, sewer, sealed road access and electricity. Proposed Lots 204 will be accessed from the future sealed road by an access handle.

The proposed subdivision is depicted in the plans accompanying the Development Application.

3 Planning Provisions

3.1 Greater Taree Local Environmental Plan 2010

3.1.1 Zoning

The land is zoned R5 Large Lot Residential and RU1 Primary Production under the provisions of Greater Taree Local Environmental Plan 2010.

The R5 zoned land has a minimum lot size of 4000m2. The RU1 Primary Production land will continue to be included in one parcel and is not proposed to be subdivided.

Subdivision of the land as proposed is permissible in the zone and consistent with the following R5 zone objectives.

• *To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality.*

• *To ensure that large residential lots do not hinder the proper and orderly development of urban areas in the future.*

• *To ensure that development in the area does not unreasonably increase the demand for public services or public facilities.*

• *To minimise conflict between land uses within this zone and land uses within adjoining zones.*

3.2 Greater Taree Development Control Plan 2010

Section C of Greater Taree Development Control Plan 2010 (DCP 2010) outlines the general requirements for subdivisions. The design principles outlined in DCP 2010 are addressed below.

Section C2.1

- **Slope and orientation of land.**

The slope and orientation of the land has been used to ensure that future dwellings will be retained on lots that will gain adequate solar access and to enable adequate drainage.

- **Considered orientation of allotments.**

Lots have been orientated to maximise solar access for future dwellings.

- **Configuration of the land to ensure future usability.**

The lots are designed to ensure that a building envelope can be provided with adequate areas for future open space.

- **Hazards such as soil stability, flooding, erosion and bushfires.**

All these potential hazards are addressed in this Statement of Environmental Effects.

- **Opportunities for solar and daylight access to future development.**

Lot size and configuration allows for adequate solar and daylight access to future dwellings.

- **Design of roads, access ways and individual site access.**

Individual site access has been designed to give maximum opportunity for site layout.

- **Retention of special qualities or features such as trees and views.**

The special qualities of views to the Manning River are retained for some lots.

- **The scenic quality of the landscape, including protection of dominant ridge lines and hilltops, or other visually prominent locations.**

The proposed layout enables maximisation of views to scenic locations from all lots.

- **Protection of character of existing waterways.**

There will be no adverse impacts to any waterways.

- **Availability of services and utilities.**

All services and utilities are available to the proposed lots.

- **Provision of adequate site drainage.**

Adequate drainage is provided to the proposed lots.

- **Provision of public open space.**

There is no need for provision of public open space.

- **Possible need to retain existing subdivision character.**

The proposed subdivision is consistent with adjoining approved large lot subdivision.

- **Heritage and archaeological conservation.**

Not Applicable.

- **Adequacy of each site considering the proposed use and relevant development standards such as setbacks, car parking, landscaping etc.**

Each lot will have adequate area for a dwelling and surrounding open space and setbacks.

- **The relationship of the subdivision layout to adjacent land suitable for subdivision;**

The proposed subdivision is in a location that includes lots of a similar size in the adjacent approved subdivision.

- **Enhancement of existing or future subdivision and village character.**

The proposed subdivision enables the more efficient use of large lot residential zoned land and is consistent with the urban environment of Harrington village.

- **Location of boundaries along natural features such as drainage lines where appropriate in order to minimise the likelihood of soil erosion.**

Lot boundaries are located to minimise soil erosion.

Section C3.1

1. Where roads and other engineering works are to be carried out, engineering plans must be lodged with the application. For detailed engineering and construction requirements for subdivision, reference should be made to Council's Auspec Development Specification. Applicants are advised to consult with Council's engineers prior to lodging an application.

There are no road or other engineering works that will become Council assets.

2. Should the subdivision be likely to have an impact on any threatened species, populations or ecological communities, a Species Impact Statement will be required. A 7-part test will be required to be submitted with the subdivision application to indicate likely ecological impacts.

The subdivision does not require any clearing of native vegetation.

3. Where native vegetation is to be impacted, an ecological assessment, carried out by a qualified ecologist, is to be submitted with the application and the relevant approvals are to be sought.

Not applicable.

4. Where a subdivision proposal is located on bushfire prone land, the applicant shall comply with *Planning for Bushfire Protection Guidelines* produced by the NSW Rural Fire Service.

A Bushfire Assessment is included with the DA.

5. Where a subdivision proposal requires an on-site sewerage management system to dispose of effluent the applicant shall comply with the Development Assessment Framework in Appendix E.

Not Applicable.

6. The establishment of asset protection zones within environmental zones shall be avoided.

There are no APZ's proposed within environmental zones.

7. Where a subdivision proposal is on land identified as being potentially subject to landslip, the applicant shall engage a geotechnical consultant to prepare a report on the viability of subdividing the land and, if viable, provide recommendations as to the siting, the type of buildings and waste water treatment systems which could be permitted on the subject land.

The land is not subject to landslip.

8. In areas suspected to contain contaminated land, Council may require the completion of a preliminary site investigation prior to considering an application to subdivide. Should contamination be found, Council will require a detailed site investigation carried out in accordance with the Department of Environment and Climate Change guidelines for *Consultants Reporting on Contaminated Land*, followed by any remedial action plan, validation and monitoring as required. A site audit statement prepared by an accredited site auditor will be required on completion of remediation.

The land is not contaminated.

9. In areas subject to flooding and inundation, subdivision of land will not be permitted where any lot to be created will be fully inundated by a 1% flood and the creation of such a lot will create potential for increased intensity of development on flood prone land. In assessing whether or not land will be wholly inundated by 1% flood, Council will disregard any proposals for filling that land.

The land is subject to flooding. Impacts are assessed in Section 4.

10. In areas subject to coastal hazard, subdivision design shall take into account the likelihood of short and long-term coastal recession, and dune transmigration.

The land is not subject to coastal hazards.

11. Development within the vicinity of Taree Airport shall take into account the potential impact of the height limitations and aircraft noise on development.

Not Applicable.

Section C3.2

1. Road and access way construction should take account of existing topography, vegetation, open space systems and natural constraints vegetation. Cut and fill should be minimised and vegetation retained wherever practicable.

Access has been designed to take into consideration the topography and natural constraints.

2. In cases where the road is to serve a dual function, i.e. where the road may be required to act as a drainage floodway, flows should be contained within the road reserve. Depths and velocities will be restricted in accordance with the design criteria included within *Australian Rainfall and Runoff I.E (Aust) 1987.*

This will be addressed as part of detailed design.

3. Unless specified elsewhere in this Part, the configuration of road shall accord with Council's Auspec Design Specification and other approved standards referenced therein. Pavement widths, depths and similar requirements are contained in this document.

Not applicable.

4. Streets should not operate as through traffic routes for externally generated traffic.

Not applicable.

5. Access from individual lots to major roads should be minimised. The use of minor roads for such access is desirable wherever practicable.

Only one access to the rear lot is proposed.

6. The applicant shall be responsible for connecting new to existing road construction. Where a subdivision adjoins an existing road of a standard less than Council's current standard, full width or half-width plus 3m road pavement construction, kerbing, footpath, and ancillary drainage shall be provided along the full length of the frontage to approved standards.

Not applicable.

7. All roads to be dedicated to Council are to be constructed to Auspec Design Specification Standards.

Not applicable.

8. Roads and lots should be located so that residential dwellings are not subjected to unacceptable traffic noise.

New lots will not be subject to traffic noise.

9. Street name signs shall be erected at the junction of all roads in the subdivision in accordance with Council's guidelines. Proposed street names shall be submitted to Council for approval prior to use.

Not applicable.

10. The road network should facilitate walking and cycling within the neighbourhood and pedestrian and cycleway connections to local activity centres.

Not applicable.

11. The alignment of footpaths should allow safe and convenient use by pedestrians and cyclists and should be variable enough to accommodate trees and other significant features.

Not applicable.

12. Pedestrian and cyclist paths should be constructed to provide a stable and attractive surface for projected users which is easily maintained and meets the criteria of *Crime Protection Through Environmental Design* (CPTD).

Not applicable.

13. Bus routes and stops to be provided in accordance with the required standards.

Not applicable.

Section C3.3

1. Siteworks are to be planned to allow topsoil to be stripped, stockpiled and reused on the site. No soil is to be removed from the site without consent.

No soil will be removed on site without consent.

2. Filling and levelling shall not adversely affect adjoining land and shall be carried out to Council's satisfaction, as indicated on approved engineering plans.

Noted.

3. The quality laying and compaction of fill will be required to meet Council's engineering standards. Geotechnical certification may be required to indicate compliance with Council's engineering standards and relevant Australian Standards.

Noted.

4. Levels shall generally be adjusted so that lots drain to the street and/or the stormwater drainage system. Where required, a system of inter-allotment drainage shall be installed to prevent or ponding of water, or intensification of runoff on to adjacent land.

Stormwater will drain to the north.

5. Cutting and filling should be planned to minimise damage or disturbance to existing vegetation.

There is no disturbance to vegetation.

6. Erosion control and sediment control principles shall be implemented in accordance with Part G of this DCP.

Noted.

Section C3.4

1. All lots to be created in unsewered areas must be provided with suitable means of effluent disposal in accordance with the requirements of Council's *Onsite Sewage Development Assessment Framework* (DAF 2012) in Appendix E.

Not Applicable.

2. Reticulated water and sewerage services shall be provided to all lots within urban (with the exception of lots in zone R5 shown on the lot size maps as having a minimum lot size of 10,000m^2 or 15,000m^2) and Industrial and Commercial areas.

Water and sewer will be provided.

3. In Rural, Environmental and R5 Large Lot Residential areas shown on the lot size maps as having a minimum lot size of 15000m^2 each lot shall be capable of supporting a suitable onsite sewage management system in accordance with the requirements of Council's *Onsite Sewage Development Assessment Framework* (DAF 2012) in Appendix E.

Not Applicable.

4. Reticulated electricity supply shall be made available to all lots. Underground power shall be provided to all lots in urban, commercial and industrial areas.

Reticulated electricity will be provided.

5. Provision of written evidence of compliance with the requirements of all relevant service authorities shall be supplied by the applicant prior to release of construction certificate or subdivision certificate, as may be appropriate.

Noted.

6. Compatible public utility services should be located in common trenches so as to minimise the land required, soil erosion and the cost of providing the services.

Noted.

7. Adequate buffers should be maintained between utilities and houses to protect residential amenity and health.

Noted.

8. The provision of utility services should not detrimentally impact on the landscape character of an area, or detrimentally impact vegetation corridors.

Utility services will not impact on the landscape character of an area, or detrimentally impact vegetation corridors.

Section C3.5

1. Drainage systems shall be designed and constructed in accordance with Council's Auspec 1 Design Specification. Natural drainage systems should be incorporated into designs where possible.
2. The major system must be able to accommodate the ARI=1:100 year and meet the safety criteria of the current Australian Rainfall & Runoff (AR&A). If capacity is limited in some way the underground (minor) system must be capable of safely conveying the balance. The minor system shall have a minimum capacity of 1:5 year ARI.
3. Drainage from subdivision sites should be consistent in both water quality and quantity terms with the predevelopment storm water patterns ie, neutral or no net increase on water quality and quantity. (This clause overrules the Table 4.2 in Council's Stormwater Management Plan 2000)
4. Water quality in water courses near subdivisions is to be protected by way of appropriate structures and/or filter mechanisms.
5. Drainage systems should be designed so as to ensure safety and minimise the likelihood of storm water inundation of existing and future dwellings.
6. Adequate provision should be made for measures during construction to ensure that the landform is stabilised and erosion controlled.

7. Where subdivisions drain either directly or indirectly into natural waterways, careful consideration of the impact of the development on erosion, pollution and sediment loading will be required.

Stormwater will drain to the north.

Section C3.6

1. Subdivision design is to take into account and integrate with the location of adjoining development and surrounding subdivision patterns, especially adjoining residential development, in the design of roads, open space and in the location of lots. Where there is an established street setback pattern or streetscape, this is to be followed.

The subdivision integrates with the existing dwelling on the site and is consistent with other subdivision in the locality.

2. Subdivision is to be designed to be able to integrate and connect with future adjoining land subdivisions.

Not Applicable.

3. Landscape buffers or like features shall be incorporated within subdivision design to provide separation between land uses where conflict may arise.

There are no land use conflicts.

4. Subdivision should be sympathetically designed to minimise the impact on heritage items of the subject land or adjoining lands.

There are no heritage items.

5. Subdivisions should be sympathetically designed to ensure that the existing heritage value of the streetscape and character of the area is maintained.

The streetscape does not have heritage value.

6. Adequate curtilage is to be provided around heritage items to provide an appropriate buffer.

Not Applicable.

7. A subdivision proposal on land within a conservation area and/or on land which contains, or is adjacent to, an item of environmental, Aboriginal or European heritage should illustrate the means proposed to preserve and protect such items. In this respect a heritage impact statement should accompany the application.

Not Applicable.

Section C3.7

1. Vegetation cover should be retained wherever practicable.
2. Vegetation should be enhanced where it forms a link to other bushland areas, buffer zones, wildlife corridors and the like.
3. Allowance for the movement of fauna species on sites should be maximised to maintain biological diversity.
4. Vegetation which is scenically and environmentally significant should be retained.
5. Vegetation which adds to the soil stability of the land should be retained.
6. All subdivision proposals should be designed so as to minimise fragmentation of bushland.
7. Opportunities for revegetation will be pursued as part of the subdivision process as a trade off for site development and as a means of value adding to the environment. In particular, revegetation of any existing creeks, streams and drainage lines, or repair and revegetation of eroded or otherwise degraded areas should be considered.
8. Degraded areas are to be rehabilitated as part of the subdivision.
9. Watercourses and drainage lines to be retained as part of the subdivision scheme and are to be stabilised and revegetated with appropriate native species.
10. Environmentally sensitive areas are to be preserved and enhanced with appropriate native vegetation and buffers where necessary.

There is no loss of vegetation because of the proposed subdivision.

Section C3.8

1. The overall design of any subdivision, whether residential or rural residential, should set aside open space which incorporates existing trees where practical.

Existing trees have been incorporated into the residual open space.

2. Housing sites should be confined to below ridgelines, so as not to become the dominant feature of the landscape.

Proposed house sites are not prominent.

3. Flat cleared land should be set aside for active recreation.

Not Applicable.

4. In approving a subdivision application Council may require the lodgement of a Landscape Plan to the satisfaction of Council and the undertaking of works as documented therein. These plantings shall be continuously maintained for a minimum of twelve (12) months.

Noted.

Section C4.1

1. Site frontage shall be sufficient to permit vehicular and pedestrian access to the site.

Sufficient vehicular and pedestrian access is provided.

2. Lots shall be of suitable dimension and orientation to ensure good solar access to future development. On roads running north- south, lots may need to be widened to provide for solar access and prevent overshadowing of dwellings and private open space.

Future building sites allow for good solar access to dwellings.

3. Residential development will only be considered where reticulated water and sewerage is available to the proposed subdivision.

Reticulated water and sewerage are available to the proposed subdivision.

4. Each lot should have a depth to frontage ratio sufficient to avoid the possibility of 'gunbarrel' type development and permit development to respond to particular site circumstances such as orientation, topography etc.

Depth to frontage ratio is appropriate.

5. Lots should be designed to allow the construction of a dwelling with a maximum cut or fill of 1m from the natural ground level.

Cut and fill will be minimised.

6. Where land slopes are generally greater than 5%, road and lot design should provide for dwellings to be generally parallel with the contours to minimise earthworks.

Building sites are parallel to the contours.

7. Lot sizes should be increased where sites are steep or contain significant landscape features including water courses and easements.

Not Applicable.

8. Battle-axe lots will only be permitted where the size of the lot (excluding the access handle) has a minimum area of 650m^2. Where a reduced lot size is proposed for a battleaxe block (less than 650m^2) the applicant will need to demonstrate that all other performance criteria relevant to amenity and access can be met.

Not Applicable.

9. Only one battleaxe Lot is to be created behind any full frontage lot as illustrated in Figure 3.

The proposal is for two battle-axe lots. Given the site constraints a variation to this requirement is sought.

10. Access to a single battle-axe lot shall have a minimum width of 4m.

Not Applicable.

11. Access to two battle-axe shaped lots, when combined, shall have a minimum width of 5m.

Access complies.

12. Where greater than two (2) allotments are to gain access from a shared driveway a Community title arrangement should be entered into to create the roadway as a Community Lot.

Not applicable.

3.3 State Environmental Planning Policy (Resilience and Hazards) 2021

State Environmental Planning Policy (Resilience and Hazards) 2021 updates and consolidates into one integrated policy SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection).

The Coastal Management SEPP gives effect to the objectives of the Coastal Management Act 2016 from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone.

An integrated and coordinated approach to land use planning is promoted by the SEPP. It defines the four coastal management areas in the Act through detailed mapping and specifies assessment criteria that are tailored for each coastal management area. Councils and other consent authorities must apply these criteria when assessing proposals for development that fall within one or more of the mapped areas.

The four coastal management areas are:

- Coastal wetlands and littoral rainforests area; areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26.
- Coastal vulnerability area; areas subject to coastal hazards such as coastal erosion and tidal inundation.
- Coastal environment area; areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included.
- Coastal use area; land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

Each coastal management area has differentiated objectives under the Act, which respond to their social and environmental values and key threats. The objectives for each management area are to be achieved using both strategic and site-specific approaches. When considering individual

development proposals, councils and other consent authorities will give effect to the Act's objectives by applying the development controls in the new planning policy.

The subject land is identified within the Coastal Environment Area and the Coastal Use Area. The relevant provisions of the SEPP are addressed below.

2.10 Development on land within the coastal environment area

(1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following—

(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,

(b) coastal environmental values and natural coastal processes,

(c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,

(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,

(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,

(f) Aboriginal cultural heritage, practices and places,

(g) the use of the surf zone.

The proposed development will have no adverse impacts on any of the above matters. The impacts of the proposed development is assessed further in Section 4 of this SEE.

(2) Development consent must not be granted to development on land to which this section applies unless the consent authority is satisfied that—

(a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subsection (1), or

(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or

(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

The siting of the proposed development is considered appropriate to ensure that any impacts identified in subsection (1) are avoided.

2.11 Development on land within the coastal use area

(1) Development consent must not be granted to development on land that is within the coastal use area unless the consent authority—

(a) has considered whether the proposed development is likely to cause an adverse impact on the following—

(i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,

(ii) overshadowing, wind funnelling and the loss of views from public places to foreshores,

(iii) the visual amenity and scenic qualities of the coast, including coastal headlands,

(iv) Aboriginal cultural heritage, practices and places,

(v) cultural and built environment heritage, and

The proposed development will have no adverse impacts on any of the above matters. The impacts of the proposed development is assessed further in Section 4 of this SEE.

(b) is satisfied that—

(i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or

(ii) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or

(iii) if that impact cannot be minimised—the development will be managed to mitigate that impact, and

(c) has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development.

The siting of the proposed development is considered appropriate to ensure that any impacts identified in subsection (1) are avoided. In addition the development is considered appropriate in the rural location.

2.12 Development in coastal zone generally—development not to increase risk of coastal hazards

Development consent must not be granted to development on land within the coastal zone unless the consent authority is satisfied that the proposed development is not likely to cause increased risk of coastal hazards on that land or other land.

There will be no increased risks of coastal hazards on this land, or other land, as a result of the proposed development.

2.13 Development in coastal zone generally—coastal management programs to be considered

Development consent must not be granted to development on land within the coastal zone unless the consent authority has taken into consideration the relevant provisions of any certified coastal management program that applies to the land.

There is no certified coastal management program that applies to the land.

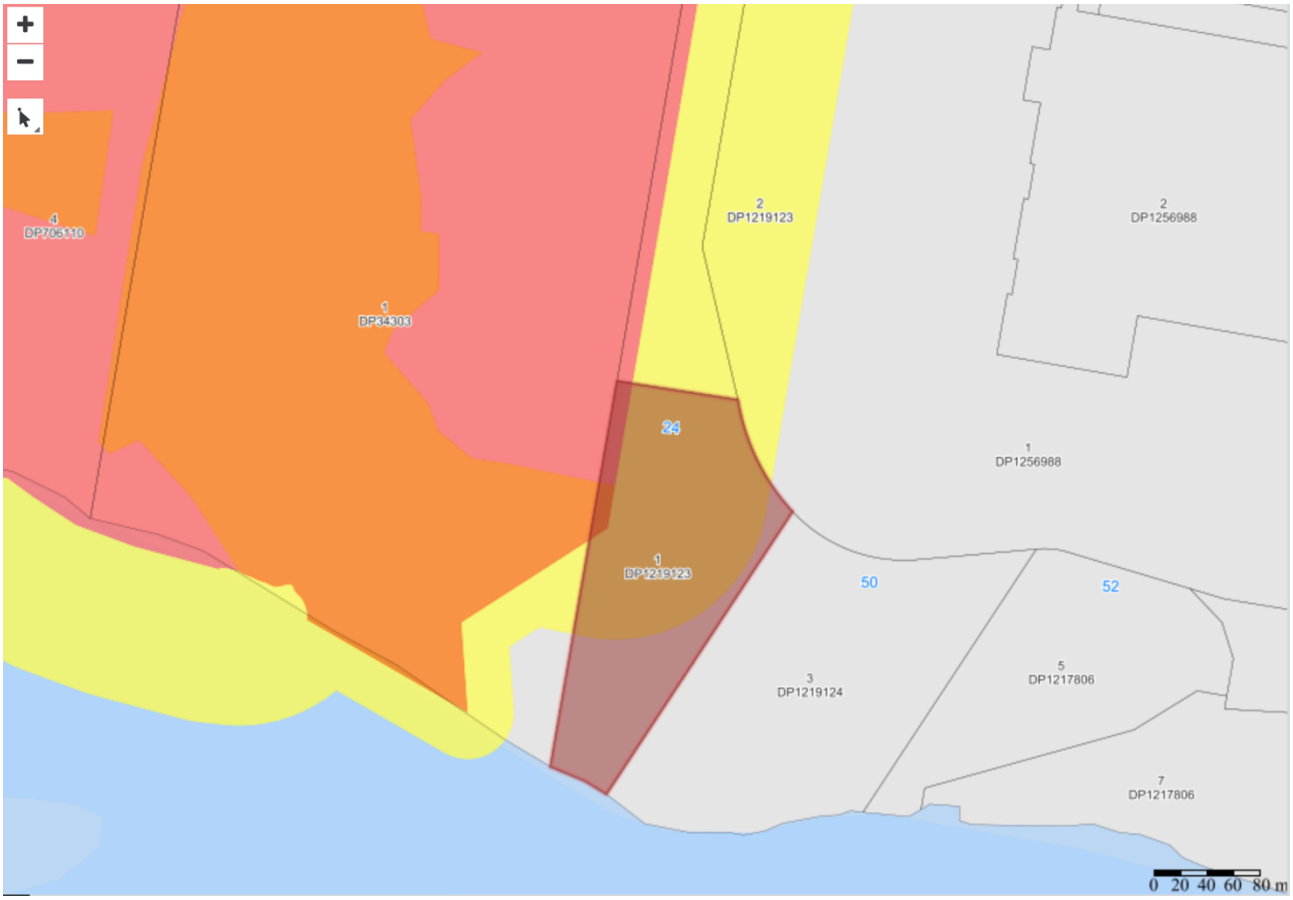
4 Impact Assessment

4.1 Bushfire

The subject land is classified as bushfire prone Category 1 vegetation buffer on Council's mapping as shown in **Figure 2** below.

A Bushfire Assessment prepared in accordance with Planning for Bushfire Protection (RFS 2019) has been prepared and is included with this Development Application.

Figure 2 Bushfire Classification
Source: MidCoast Council Online Mapping



4.2 Ecological

The proposed subdivision will not require the removal of any native vegetation.

4.3 Coastal Erosion

The proposed residential component of the subdivision is outside the 2100 year coastal erosion setback as identified by Council.

4.4 Servicing

Stage 2 of the proposed subdivision will be serviced by reticulated water and sewerage, electricity and telecommunications.

4.5 Acid Sulfate Soils

The subject land is not mapped as Class 3 ASS land under the provisions of GTCC LEP 2010.

A preliminary acid sulfate soils assessment was undertaken by Douglas Partners in 2005. The report confirmed that the topsoil on the site does not constitute a significant risk of generating acid upon oxidation. The mapping of the potential ASS on the site is included in **Appendix B**.

The Douglas Partners Report concludes that an Acid Sulfate Management Plan should be prepared before any construction activities. This is only relevant to Stage 2 of the proposed subdivision.

4.6 Contamination

The subject land is not identified as potentially contaminated on Council's mapping.

4.7 Aboriginal Heritage

There are no known Aboriginal heritage items on the subject land.

4.8 Noise and Air Quality

The subject land is located in a low noise residential environment. The construction of Stage 2 of the proposed subdivision will be required to be undertaken in accordance with the relevant guidelines for noise control during construction activities.

4.9 Flooding

The subject land is classified as flood prone buffer on Council's mapping. The FPL2 flood level for the subject land is 3.10m AHD. The land has levels ranging from 2.4m – 2.7m AHD. It is therefore affected by the FPL2 event.

The FPL3 flood level for the subject land is 3.60m AHD with a 0.2m/s velocity.

Section E4.3 of Council's DCP 2010 is relevant to Stage 2 of the proposed subdivision and is addressed below.

Hydraulic Hazard Category

• No subdivision is to occur on land wholly inundated by flooding up to FPL2 event, unless it is demonstrated that the risk of flooding can be effectively and appropriately mitigated without impacting the adjacent floodplain.

The proposed subdivision will result in the future construction of three dwellings which will not have any adverse impact on the adjacent floodplain.

• Subdivision proposed in residential zones where partly inundated by flooding up to FPL2 may be considered where it can be demonstrated that all resultant lots are able to provide adequate flood free land suitable for future development and effluent disposal (if applicable) Mounds are not considered suitable for this type of subdivision.

Council approved the subdivision of the adjacent land which is also zoned R5 Large Lot Residential. Stage 2 of the proposed subdivision provides enough building area on each lot for dwellings to be constructed with a floor level of 3.60m AHD, which is at most 1.2 metres above natural ground. Such dwellings can be constructed on piers and designed to withstand a flood event, which is likely only to be in a low hazard environment.

Flood Effects

- **Engineer's report required to certify that the development will not increase flood effects elsewhere, having regard to:**
  - **Loss of flood storage.**
  - **Changes in flood levels, flows and velocities caused by alterations to the flood conveyance.**
  - **The cumulative impact of multiple potential developments in the floodplain**.

Given that dwellings would be located on piers, there would be no loss of flood storage in Stage 2 of the proposed subdivision. Stage 2 will also not have any impact on flood levels, flows or velocities. Given that there would be no impacts on flood characteristics the development of Stage 2 does not contribute to any cumulative development effect on flooding in the locality.

4.10 Traffic

There would be no adverse impact on the local road network from the development of Stage 2 of the proposed subdivision.

4.11 Water Quality

A Water Quality Assessment report was prepared for the original subdivision by J Wyndham Prince. A copy of this report is included in **Appendix C**.

The proposed development will have no adverse impact on water quality of the Manning River which is situated adjacent to the proposed subdivision.

5 Conclusion

Information presented in this Statement of Environmental Effects indicates that the proposed development being a five (5) lot residential subdivision on Lot 1 DP1219123 is consistent with the relevant Local and State planning instruments. The potential impacts of the proposed development have been examined in detail and the environmental impacts have been found to be acceptable or able to be managed so that there are no detrimental impacts. The proposed development will not adversely impact upon the surrounding environment.

Appendix A

SEPP 71 MASTER PLAN

ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979

ADOPTION OF MASTER PLAN NO. 43-10-2005

(FILE NO. 9036118)

SEPP 71 MASTER PLAN FOR SUBDIVISION OF LAND AT MANOR ROAD, HARRINGTON, GREATER TAREE CITY COUNCIL

I, Sam Haddad, Deputy Director-General, Office of Sustainable Development Assessment and Approvals, as delegate of the Minister for Planning, under Instrument of Delegation dated 13 January 2003, pursuant to clause 22 of *State Environmental Planning Policy No.71—Coastal Protection,* determine the draft Master Plan referred to in the attached Schedule 1, by adopting the Master Plan outlined in the attached Schedule 2, subject to the Variations in the attached Schedule 3. Matters outlined in the attached Schedule 4 must be addressed at subsequent application Stages under the *Environmental Planning and Assessment Act* 1979.

S Haddad

Sam Haddad
Deputy Director General
Office of Sustainable Development Assessment & Approvals

Sydney, 30th September 2005

DRAFT

SCHEDULE 1

PART A—TABLE

Application for a draft master plan made by:	Tony Fish, Geolyse Pty Ltd PO Box 280, Tuncurry, 2428.
Application made to:	Minister for Planning
Draft Master Plan:	MP 43-10-2004
On land comprising:	Lots 1 & 2 DP 621005 and Lot 31 DP 847223 at Manor Road Harrington
For the carrying out of:	Development described in Part A, Schedule 2
S.119 Public inquiry held:	No
Timeframe	Significant delays in the processing of this application were experienced in seeking to resolve the critical issue of flood risk and safe evacuation of the site between the department and the applicant.
Submissions	A total of nine (9) submissions were received regarding the Application, of which seven (7) where from NSW Government Agencies Mid-Coast Water and Greater Taree Council and two (2) submissions were received from the public. (See Section 5.0 of Planning Report).
Application made on:	13 October 2004

PART B—NOTES RELATING TO THE ADOPTION OF MP NO. 43-10-2004

Responsibility for other approvals / agreements

The applicant is solely responsible for ensuring that all additional consents and agreements are obtained from other authorities, as relevant.

Legal notices

Any advice or notice to the consent authority shall be served on the Director-General.

Appendix B

ASS MAP

Figure 6 – Acid Sulfate Soils/Drainage Characteristics

Appendix C

STORMWATER REPORT

STORMWATER MANAGEMENT STRATEGY

For

SEPP 71 MASTERPLAN

Manor Road, HARRINGTON

Lots 1 and 2 in DP 621005; Lot 31 in DP 847233

Prepared for: Archer Properties (No. 3) Pty. Ltd.
PO Box 355
ENFIELD NSW 2136
Telephone: (02) 9747 0119

Prepared by: J. Wyndham Prince Pty. Ltd.
77 Union Rd.
PENRITH NSW 2750
Telephone: (02) 4732 3366
Facsimile: (02) 4721 7638

- CONTENTS -

1. INTRODUCTION

This report details the procedures used and presents the results of investigations undertaken in developing a Stormwater Management Strategy to integrate with and support the development application and SEPP 71 Masterplan process for the proposed Manor Road Subdivision, Harrington. The objective of this investigation is to identify the stormwater issues to be taken into account in the detailed planning, design and development of the Manor Road Subdivision, to identify appropriate options and locations for the control of the quantity and quality of stormwater leaving the site, and to identify the land areas required to implement the recommended options.

The Manor Road Subdivision is proposed to create a rural residential estate. In addition to the rural residential lots, the proposal involves the creation of public reserve lots and approximately 1700 metres of road. The land to be subdivided is Lots 1 & 2 DP 621005 and Lot 31 DP 847223

The investigation addresses engineering, environmental, social and economic considerations and places a strong focus on conserving the existing flow regimes and natural systems associated with the site.

2. EXECUTIVE SUMMARY

2.1 Project Objective

J. Wyndham Prince Pty Ltd has prepared a Stormwater Management Strategy to integrate with the development planning process for the Manor Road Subdivision. The plan has been prepared to conform to the statutory requirements and industry best practice for stormwater management in this catchment. Sufficient detail is provided to support the development proposal for the site.

The overall stormwater management objectives for the site were identified as:

Environmental	-	Provide appropriately designed, functional water quality facilities;
	-	Maintain environmental flows to and inundation patterns in downstream riparian zone;
	-	Adopt principles of total catchment management and water sensitive urban design;
	-	Achieve statutory water quality requirements.
Urban Amenity	-	Achieve aesthetic design forms that enhance urban amenity and address proposed adjacent land uses (residential, recreational, environmental and transport);
	-	Provide pleasing views into and out of the central drainage corridor.
Engineering Considerations	-	Achieve industry best practice in technical analysis of catchment hydrology and system hydraulic performance;
	-	Minimise the use of hard engineering infrastructure.
Economics	-	Provide a cost effective, functional stormwater management system that optimises performance and keeps maintenance costs and requirements to an acceptable level;
	-	Minimise land take for bio-engineering features;
	-	Maximise value for expenditure of development and public monies.

2.2 Statutory Requirements

The recommendations contained in guidelines of the following agencies have been addressed in the master planning process.

- Greater Taree City Council (GTCC)
- Department of Infrastructure Planning and Natural Resources (DIPNR)
- Environmental Protection Authority (EPA)
- ANZECC

2.3 Methodology

The investigation included the following technical tasks:

Site Evaluation	Evaluate the site and its characteristics, including landform and geotechnical issues.
Water Quality Assessment	Evaluate indicative sizing of potential water quality treatment techniques.
Options/Treatment Techniques	Identify and evaluate a range of suitable treatment techniques to address water quality and water quantity objectives.
Preferred Treatment	Determine size, location, and performance of preferred treatment techniques.

2.4 Proposed Stormwater Management Strategy

A range of structural stormwater management techniques and options were considered for managing stormwater for the Manor Road Subdivision site. The strategy identified has some common features for the whole estate and some different features depending on the location within the site. The site, as is explained in further detail in later sections, is split into two subcatchments.

The eastern catchment drains to existing 1050mm diameter pipes within the Harrington Waters Estate to the east. The remainder of the site (known as the western catchment) drains to a central corridor and then to a riparian zone adjoining the Manning River. See Figure 1.

The elements of the strategy are summarised as follows:

Estate Wide Strategy Elements	Roof water – On-lot rainwater tanks with on-lot infiltration basins for sub-surface disposal (emulating individual bio-retention / raingarden) Driveways and paved areas – direct flow to grassed surfaces within each lot.
Eastern Catchment Elements	Overflows from the individual lot infiltration basins are directed to the eastern side of each lot (by shaping the basin accordingly) for discharge to a table drain along the rear boundary of the lots for discharge to the two 1050mm diameter pipes within the Harrington Waters estate.
Western Catchment Elements	Overflows from the individual lot infiltration basins are directed to either the road frontage or rear of the lot (by shaping the basin accordingly) for discharge to a table drain. The table drains connect as shown on Figure 2 and drain to the Central Corridor. Roadways – flows are directed to a table drain (Bio-retention swale) located along each road then through shallow box culverts for discharge to the Central Corridor and to a shallow infiltration basin (bio-retention basin).

Overflows from the Central Corridor bio-retention basin are directed to the riparian zone to the south adjoining the Manning River.

A general arrangement plan indicating proposed locations for the stormwater management system for the Manor Road Subdivision site is attached to this report in Figure 2.

2.5 Conclusion

The stormwater management strategy for the developed site provides a basis for the detailed design and development of the site to ensure that the objectives for stormwater management and site discharge are achieved.

Our investigations indicate that there is adequate capacity within the site to support the proposed subdivision.

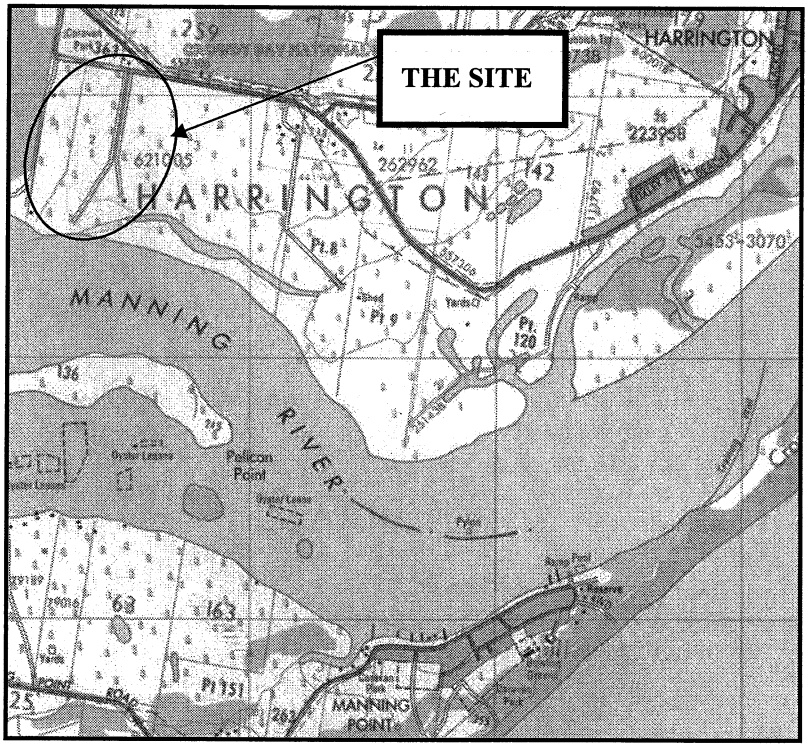
The proposed stormwater management treatment system provides a minimal impact solution. This minimal impact solution is achieved through utilising the site's inherent characteristics: its location to the river and its soil permeability to ensure that the principles of ecologically sustainable development are best achieved. The approach brings together the environmental, social, economic and engineering aspects of development design as a cohesive and integrated whole for the site.

3. THE EXISTING ENVIRONMENT

3.1 The Site

The site, which totals approximately 23 Hectares, is located adjacent to Manor Road, Harrington. The site is located on the western fringe of Harrington, adjacent to the Harrington Waters Residential estate. The site is bordered by Manor Road and Harrington Road to the north, Harrington Water development to the east, existing rural property to the west and the Manning River to the south. The site includes Lots 1 & 2 DP 621005 and Lot 31 DP 847233.

The location of the site is shown below and in more detail on Figure 1.



Location of Manor Road site

3.2 Landforms

The site consists of a generally flat land with little relief through most of the site to a moderately steep forested area on the sites west. The site is completely cleared with three existing houses located on the southern part of the site, near the Manning River.

The ground levels of the site are generally between RL 2.2 m AHD and RL 2.6 m AHD. The southern part of the site (at the depression/watercourse) falls to approximately RL 1.2 m AHD at the invert of the depression.

3.3 Existing Drainage System

The site is affected by a small watercourse. This watercourse is located at the southern part of the site and appears to be part of a, now disconnected, tributary of the Manning River. This watercourse, as shown on the site plan above, was once connected to a larger creek system which formed a series of creeks within the overbanks of the Manning River. It

appears as though works within the Harrington Waters Estate have disconnected the portion of the creek within the Manor Road site from any remnants on the eastern side of Harrington Waters.

At the eastern part of the site the adjoining landowner, has installed as part of the Harrington Waters estate, two 1050 diameter pipes at the site's eastern boundary. These pipes are intended to drain the eastern portion of the site, and this appears to have been taken into account in their design. (Ref. 1)

3.4 Geotechnical Information

A comprehensive geotechnical investigation of the site was undertaken by Douglas Partners in December 2003 – January 2004. The report issued by Douglas Partners (Ref. 2) indicates the following key data about the site:

- Within the residential zones – *"Subsurface conditions encountered within the pits indicated a mainly sandy profile consisting of silty sand, sand and indurated sand. The deeper bores encountered similar conditions including very loose sand and clayey sand."* (Ref. 2 – page 18).
- Infiltration rates of soils on the site varied between 30 mm/hr to 220 mm/hr. (Ref. 2 – Page 22)
- Groundwater levels are generally at RL 1 m AHD – RL 1.15 m AHD (at the time of testing). (Ref. 2 – Drawing No.2)
- Potential Acid Sulphate Soils – low probability of acid sulphate soils between 1m–3m of ground surface on northern and western part of the site, high probability in south-east corner of the site. (Ref. 2 – page 13).

3.5 Rainfall Data

3.5.1 Daily Rainfall Data

Rainfall records for the Harrington area were obtained from the Bureau of Meteorology. The nearest rainfall station to the site was obtained as follows:

Station No	Location	Years of Record	Type of Record
60030	Taree	June 1964 – June 1981	6 minute

This data was utilised in the water quality modelling undertaken for site.

3.5.2 Intensity-Frequency-Duration (I.F.D.)

Design rainfall intensity-frequency-duration (I.F.D.) data for the site were obtained using methods set out in Australian Rainfall and Runoff (ARR.) 1987 (Ref. 3). A summary of the rainfall intensities adopted in this study is given in Table 3.1. The critical storm duration's were determined using these values for each sub-catchment.

The models used to examine the performance of the catchment utilised temporal patterns for synthetic design storms as detailed in A.R.R. (Ref. 3).

Table 3.1

HARRINGTON RAINFALL INTENSITIES (mm/hr)

Storm Duration (min.)	Rainfall Intensities (mm/hr) Recurrence Interval (ARI)	
	5	100
5	144	238
10	111	183
15	92	153
20	80	133
25	72	119
30	65	108
45	53	87
60	44.7	75
90	35.4	59
120	29.9	50
180	23.5	39.8
270	18.5	31.5
360	15.6	26.7
540	12.3	21.3
720	10.40	18.2
1080	8.22	14.7
1440	6.95	12.7
2880	4.57	8.85

4. DEVELOPMENT GUIDELINES, OPPORTUNITIES AND CONSTRAINTS

4.1 Statutory Requirements

The controls imposed by the following authorities and the recommendations contained in the following guidelines have also been addressed in the development planning process.

4.1.1 Greater Taree City Council

Greater Taree City Council has adopted an Urban Stormwater Management Plan (Ref. 4). Table 4.2 of that plan indicates the Quantitative Post-Construction Phase Stormwater Management Objectives for New Development for various development types. The relevant objectives for **low density residential** development are listed below:

Litter	70% of average annual litter load greater than 5mm
Coarse Sediment	80% of average annual load for particles of 0.5mm or less.
Fine Particles	50% of average annual load for particles 0.1 mm or less
Total Phosphorous	45% retention of average annual load
Total Nitrogen	45% retention of average annual load
Oil and Grease	Variable, requires site specific assessment

In the absence of relevant criteria for a rural residential subdivision, the low density residential objectives have been utilised.

Council has adopted relevant criteria for construction phase activities.

Flood Liability from the Manning River

Advice from Greater Taree City Council indicates that the 1% AEP flood level has been adopted as the relevant flood planning level for the City. The applicable 1% AEP flood level at the site is RL 2.5 m AHD.

Council has also indicated that the proposed development should have proposed floor levels 0.5 m above the 1% AEP flood level.

In terms of water quantity control, during pre-lodgement discussions with Council officers it was clear that due to the site's location adjacent to the Manning River that **no water quantity control was required.**

4.1.2 Environment Protection Authority (EPA) Requirements

The EPA supports, as a general principle, no net deterioration in water quality and recommends the following;

- Incorporate best management practices to minimize impacts on water quality during construction and long term operation of the development.
- Produce an estimate of the expected pollutant loads from the site and identify and describe the likely environmental impact of these loads (changes in water quality).
- Water quality criteria need to be linked with existing Council catchment and stormwater management plans.

- Adequate sediment and nutrient controls should be implemented during and after development of the land in accordance with Council's requirements (Erosion and Sediment Control plans).

The EPA has set guidelines for stormwater quality from urban developments in their Managing Urban Stormwater Council Handbook (Ref. 5) This document nominates quantitative post construction phase stormwater management objectives for the reduction of various pollutants for a range of new developments. The retention criteria for the site are nominated as follows:

Total Phosphorous	45% retention of average annual load
Total Nitrogen	45% retention of average annual load
Suspended Solids	80% of average annual load for particles 0.5 mm or less
Fine Particles	50% of average annual load for particles 0.1 mm or less
Litter	Retention of litter greater than 50 mm for flows up to 25% of the 1 year ARI peak flow
Coarse Sediment	Retention of sediment coarser than 0.125mm for flows up to 25% of the 1 year ARI peak flow
Oil and Grease	In areas with concentrated hydrocarbon deposition, no visible oils for flows up to 25% of the 1 year ARI peak flow

4.1.3 Department of Infrastructure Planning and Natural Resources (DIPNR)

Officers of DIPNR (Natural Resources Section) have indicated that a riparian zone exists within the site adjacent to the Manning River. They indicated that this zone has been significantly depleted of water flow since the development of the Harrington Waters Estate, and they indicated that any proposal to replenish flows to the riparian zone or support the riparian vegetation should be encouraged.

4.1.4 ANZECC Water Quality Guidelines. (2000)

The ANZECC Guidelines (Ref. 6) provide a range of default "trigger" values for certain pollutants as a starting point for the design of strategies to improve water quality.

The ANZECC Guidelines defines the trigger values as *"The guideline trigger values are the concentrations (or loads) of the key performance indicators, below which there is a low risk that adverse biological effects will occur. The physical and chemical trigger values are not designed to be used as 'magical numbers' or threshold values at which an environmental problem is inferred if they are exceeded. Rather they are designed to be used in conjunction with professional judgement, to provide an initial assessment of the state of a water body regarding the issue in question."*

The trigger values should be used where site data (ie biological effects) or local reference data is not available.

Default trigger values are used to assess risk of adverse effects due to pollutants such as nutrients, biodegradable organic matter and pH in various ecosystem types and were derived from unmodified to slightly modified ecosystems supplied by state agencies and collected within five geographical regions in Australia and New Zealand.

The trigger values applicable to Manning River were determined from Table 3.3.2 (Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems) tabulated in the ANZECC Guidelines (Ref. 6). For estuaries they are as follows:

- Total Phosphorous 0.030 mg/l
- Total Nitrogen 0.35 mg/l

4.2 Local Environmental Study

The Appendix B of Local Environmental Study prepared for Greater Taree City Council in November 2001 by Jellife Environmental Pty. Ltd. Identified a principle for future development on the Manor Road site. (Ref. 7). This was:

- For stormwater quality management measures within the Harrington site to achieve as a minimum, pollutant retention of 80% of average annual suspended solids load, 45% of the average annual TN load and 45% retention of the average annual TP load, which would otherwise occur.

4.3 Water Sensitive Urban Design (WSUD)

Water Sensitive Urban Design aims to minimize the hydrological impacts of urban development and maximize the multiple use benefits of a stormwater system.

Urban Stormwater: Best Practice Environmental Management Guidelines (CSIRO 1999) (Ref. 8) list five key objectives of WSUD for application to urban storm water planning and design;

- Protect natural systems, protect and enhance natural water systems within urban developments
- Integrate storm water treatment into the landscape; use stormwater in the landscape by incorporating multiple use corridors that maximize the visual and recreational amenity of developments
- Protect water quality; protect the water quality draining from urban development
- Reduce run off and peak flows; reduce peak flows from urban developments by local detention measures and minimizing impervious areas
- Add value while minimizing development costs; minimize the drainage infrastructure cost of development

The LHCCREMS Draft Model Planning Provisions 1999 (Donovan, Cameron and Coombes) (Ref. 9) describes the multiple objectives of WSUD as being:

- To reduce the risk of flood damage in developed areas
- To reduce storm water run off volumes and peaks, and the velocity of discharges
- To prevent excessive erosion of catchments, waterways, slopes and stream banks
- To minimize water borne sediment loadings
- To enhance in stream water quality
- To minimize contaminant transport by storm water to surface or ground waters
- To improve efficiency in the use of water, and reduce demand for imported mains water

- To reduce sewer overflows in wet weather
- To protect and restore riparian ecosystems
- To promote scenic, landscape and recreational values for stream corridors

4.4 Stormwater Management Objectives

In considering appropriate options for stormwater management the following general objectives were adopted:

Environmental	-	Provide appropriately designed, functional water quality facilities;
	-	Maintain environmental flows to and inundation patterns in downstream riparian zone;
	-	Adopt principles of total catchment management and water sensitive urban design;
	-	Achieve statutory water quality requirements.
Urban Amenity	-	Achieve aesthetic design forms that enhance urban amenity and address proposed adjacent land uses (residential, recreational, environmental and transport);
	-	Provide pleasing views into and out of the central drainage corridor.
Engineering Considerations	-	Achieve industry best practice in technical analysis of catchment hydrology and system hydraulic performance;
	-	Minimise the use of hard engineering infrastructure.
Economics	-	Provide a cost effective, functional stormwater management system that optimises performance and keeps maintenance costs and requirements to an acceptable level;
	-	Minimise land take for bio-engineering features;
	-	Maximise value for expenditure of development and public monies.

4.5 Opportunities

In the design of any drainage scheme it is desirable to build on the naturally occurring physical and environmental assets of the site to maximise the quality of the ultimate living environment. In particular water should be recognised as an important resource that can enhance and bring a focus to areas accessible to the whole community.

For the Manor Road Subdivision there is an opportunity to provide an environmental support zone and replenish water flow to the riparian zone adjacent to the Manning River.

5. STORMWATER MANAGEMENT STRATEGY

The stormwater management strategy proposed for the site was developed in consideration of the statutory requirements and guidelines listed in Section 4 and the site's natural characteristics as outlined in Section 3.

5.1 Stormwater Management Options

A range of stormwater management techniques and options considered for the management of nutrients and suspended solids discharging from the site are summarised as follows:

5.1.1 "Enviropod" Pit Inserts

"Enviropod" pit inserts which are provided on every inlet pit throughout the catchment to remove litter, vegetative matter, free oils and grease and sediments prior to discharge to a downstream treatment device. It is understood that Council does not support the use of "Enviropod" pit inserts.

5.1.2 Constructed Wetlands

Surface Conventional wetlands located generally within the drainage corridors. (on-line).

Sub Surface Gravel filled shallow wetlands located within the drainage corridors. (on-line).

5.1.3 Bio-Retention Systems/Rain Garden

Bio-Retention systems consist of a filtration bed with either gravel or sandy loam media and an extended detention zone typically from 100-300 mm deep designed to detain and treat first flush flows from the upstream catchment. They typically take the form of a linear swale and are located within the verge area of a road reserve or extend within the bushland corridors or other open space areas. The surface of the Bio-Retention System can be grassed or mass planted with water tolerant species. Filtration beds of Bio-Retention systems are typically 0.6 metres deep.

5.1.4 StormFilter Filtration System

The StormFilter is an underground pollution control device that treats first flush flows. The unit consists of a vault containing a number of cartridges each loaded with media that targets specific pollutants. Each cartridge has a maximum treatable flowrate of approximately 1 litre per second, and the unit can accommodate up to 24 cartridges providing a maximum treatable flowrate of 24 litres per second.

5.1.5 Infiltration Trench/Basin

An infiltration trench is a simple underground pollution control device that involves a shallow trench with a sand/gravel media. Stormwater runoff is directed into the trench for treatment / disposal. An infiltration basin allows for water to pond on the surface and infiltrate into the ground.

Suspended solids and some dissolved pollutants are trapped within the gravel and the remaining water is discharged to the surrounding subsoil for disposal.

Infiltration trenches are best located in sandy soils, within flat terrain and above the existing groundwater levels.

5.1.6 Stormwater Re-Use (Rainwater Tanks)

Rainwater tanks could be utilised on individual lots for stormwater retention and re-use for irrigation of lawns and gardens, and use in domestic toilets and laundries. This application creates opportunities to reduce the demand on potable water supplies and associated potable water supply infrastructure.

The retention and re-use of stormwater in toilets, laundry and over lawns and gardens would also result in a reduction in the total volume of stormwater runoff to catchments.

Rainwater tanks alone within each allotment offer minimal water quality benefit as the water captured in a rainwater tank is predominantly sourced from "clean" roof surfaces. Tanks that capture other impervious surfaces may provide some water quality benefits, in terms of gross pollutants and coarse sediment removal.

5.1.7 Below ground storage tanks

Underground Storage tanks located either within allotments (private) or within roads and open space areas (public).

5.2 Reductions in Potable Water Demand

Reduction in potable water demand can be achieved through implementation of demand management initiatives and the re-use of non-potable water supplies - grey water, recycled wastewater and stormwater (rainwater tanks).

Demand management strategies include: resident education on waterwise practices, triple A rated showerheads, water efficient taps, dual flush toilets, and low water demand gardens (native plantings, mulch, micro irrigation). Research by Sydney Water has indicated that the use of AAA showerheads and dual flush toilets can reduce total domestic water use by 15%. Separate studies by Coombes Consulting Group (2002) (Ref. 10) found that the use of AAA fittings and appliances can reduce total domestic water use by 17.5%.

It is therefore recommended that demand management measures be implemented within all allotments/dwellings to achieve initial reductions in potable water demand. Further reductions in potable water demand can be obtained by supplementing the demand management measures with appropriately sized rain water tanks.

The introduction of "BASIX" (Building Sustainability Index) across NSW through SEPP (BASIX) 2004 requires from 1 July 2005 all housing developments to comply with the requirement to achieve a 40% reduction in water usage. Incorporation of an appropriately sized rainwater tanks on each proposed dwelling, with the additional measures highlighted above will achieve the required 40% reduction.

5.3 Proposed Water Cycle Management Strategy

The stormwater management strategy proposed for the site focuses on minimising the impacts of the development on the total water cycle and maximising the environmental, social and economic benefits achievable by utilising responsible and sustainable stormwater management practices. In particular, the proposed strategy is aimed at minimising the hard engineering features and providing for "natural" treatment and management systems, wherever practicable.

The proposed strategy utilises the existing high soil permeability and the similarity of the existing site soils to media that would otherwise be utilised in a bio-retention swale/rain garden.

Considering firstly, the high soil permeability, it is apparent from the reported infiltration rates (Section 3.4) that the soil has capacity for infiltration at rates similar to the 100 year ARI rainfall intensities for the site.

Secondly, given the similarities between the soil characteristics of the site and the media that would be utilised if a bio-retention swale or raingarden was installed, it is proposed to utilise these existing soil in its natural condition as the media for the water quality treatment system.

The other significant consideration in the development of the stormwater management strategy is the different discharge locations for the eastern and western catchments. As discussed previously, the eastern catchment only includes 10 rural residential lots draining generally towards the two 1050 mm diameter pipes installed by Harrington Waters. The western catchment includes the remaining 37 lots in addition to the roads and central corridor.

The stormwater management strategy consists of the following elements.

Location	Proposed Elements
On Lot Treatments **Common to both catchments**	Adoption of appropriate waterwise landscaping practices (resident education, native gardens, mulch, micro-irrigation). Implementation of water efficient fittings and appliances in all dwellings (dual flush toilet, AAA shower heads, water efficient taps and plumbing). Opportunity for the provision of rainwater tanks (to supplement demand management measures to achieve overall 40% reduction in potable water demand and to achieve reductions in average annual post-development runoff) Individual on-lot Infiltration Basins. Interallotment table drains / swales where lots do not grade naturally to the road /central corridor.
Street Level Treatments **Western Catchment Only**	**Table Drain / Bio-Retention Swales** A series of table drains are proposed along the edge of each road within the proposed subdivision. The table drains will be shaped to act as bio-retention swales along their length with shallow box culverts across the road at specific locations to transfer any overflows to the central corridor.
Corridor Treatment **Western Catchment Only**	**Infiltration Basin / Bio-Retention Swale** A single Infiltration Basin/Bio-retention Swale is proposed within the central corridor. Stormwater surcharge from this infiltration basin will discharge to the environmental riparian support zone at the southern part of the site.

The stormwater management concept is illustrated in Figure 2.

5.4 Litter and Sediment Control

Local drainage throughout the development should be filtered prior to discharge into the downstream drainage systems and environmental support corridor before discharging to the Manning River. As no drainage pits are proposed and the only local drainage system is intended to involve cross road box culverts (discharging the roadside swales to the central corridor) no additional litter or sediment control is proposed. Appropriately maintained roadside swales will achieve substantial reductions in sediment transport.

In regard to the eastern catchment, the discharge to the downstream system will be mainly from overflows from the proposed infiltration basin, the volume of gross pollutants is expected to be minimal. No additional sediment or litter controls are proposed.

5.5 Construction Stage

Erosion and sediment control measures are to be implemented during the construction phase in accordance with the requirements of Greater Taree City Council and the guidelines set out by the NSW Department of Housing (the "Blue Book" Ref. 11).

The erosion and sediment controls will include the following measures:

- Construction of temporary diversion drains ("Blue Book" Standard Drawing SD 5-8) or provision of staked straw bales (SD 6-6) on the high side of the disturbed areas to direct upstream runoff around the area.
- The use of silt fencing (SD 6-7) on the downstream side of the area of works to retain soil.
- Provision of a stabilised site access (SD 5-7) at appropriate points where construction vehicles will enter and leave the site to reduce the likelihood of vehicles tracking soil materials onto public roads.
- Topsoil stockpile (SD 4-1) located adjacent to the areas of disturbance and to have an earth bank (SD 5-2) on the upslope side to divert runoff around the stockpile with a sediment fence (SD 6-7) located 1 to 2 metres downslope of the stockpile.
- Rock wrapped in geofabric or straw bales will be installed in or around any stormwater drainage inlet.

As the operations of bio-retention water quality treatment systems are sensitive to the impact of sedimentation, these controls should generally be maintained until the majority of site building works are complete. Alternatively, a very high level of at source control on individual allotments during the building and site landscaping works would be required.

5.6 Long Term Management

Regular maintenance of the stormwater quality treatment devices is required to control weeds, remove rubbish, and monitor plant establishment and health. Some sediment build-up is expected on the floor of the bio-retention systems and may require removal to maintain the high standard of stormwater treatment.

Proper management and maintenance of the water quality control systems will ensure long-term, functional stormwater treatment. A site-specific Operation and Maintenance (O & M) manual would be prepared for the system. The O & M manual would provide information on the Best Management Practices (BMP's) for the long-term operation of the treatment devices.

6. WATER QUALITY MODELLING

The water quality analysis for this study was undertaken using the model MUSIC (Model for Urban Stormwater Improvement Conceptualisation) (Ref. 12). This water quality modelling software was developed by the Cooperative Research Centre (CRC) for Catchment Hydrology which is based at Monash University and was released in July 2002.

The model provides a number of features relevant for the Manor Road Subdivision site:

- It is able to model the potential nutrient reduction benefits of constructed wetlands, grass swales, Bio-Retention Swales and it incorporates mechanisms to model stormwater re-use as a treatment technique.

- It provides mechanisms to evaluate the attainment of water quality objectives.

The MUSIC modelling was undertaken to provide an increased level of confidence that the water cycle management system proposed for the site will result in reductions in overall post–development pollutant loads and concentrations being discharged into the Manning River and that these discharges comply with the designated target objectives.

The modelling undertaken is representative of the treatment system proposed to be utilised at the Manor Road Subdivision site. As discussed in the previous section, it is proposed to use the existing natural system to manage to stormwater discharge within the site. Accordingly, the modelling undertaken is conceptual only and is not the exact system design to be implemented at the Manor Road Subdivision site.

As indicated on Figures 2 & 3, the system involves the individual treatment of housing lots, with a secondary treatment system for the road reserve areas.

6.1 Individual Lot

A MUSIC model was set up to indicatively represent a 4000 m^2 rural residential lot. This model included approximately 500 m^2 of roof area and 500 m^2 of paved (ground level) surface, surrounded by 3000 m^2 of grassed surface.

Indicatively, the model includes the "urban" area and a bio-retention swale (to emulate the infiltration trench/basin).

The general arrangement of the MUSIC model is indicated in Attachment A.

6.2 Road Reserve Areas

The second MUSIC model represents the road reserve areas and central corridor system. The modelling includes the grassed swales/table drain to be provided along the edge of each road and assumes that the road surface discharges to the table drain/swale prior to discharge into the infiltration basin/bio-retention swale located at the southern end of the central corridor. The general arrangement of the MUSIC model is indicated in Attachment B.

6.3 Rainfall Data

The MUSIC model is able to utilise rainfall data based on 6 minute, hourly, 6 hourly and daily time steps. In accordance with the recommendations of the MUSIC manual it is desirable to utilise 6 minute time step data for the analysis. The Bureau of Meteorology provided the 6 minute pluviograph data available at the closest station to the site (Station 60030 Taree). The MUSIC modelling was undertaken using the 17 years (June.1964 - June 1981) of 6 Minute data provided for this station.

6.4 Pollutant Loading Rates

In the absence of site specific data, the pollutant loading rates adopted for the site are based on the default values built into the MUSIC model. The adopted loading rates are presented in Table 6.1.

Table 6.1

ADOPTED ANNUAL POLLUTANT LOADING RATES

Pollutant	Base Flow (mg/L)	Storm Flow (mg/L)
TSS	12.6	158
TP	0.151	0.355
TN	2.09	2.63

6.5 Treatment Device Performance

The expected sediment and nutrient removal performance of the systems was determined using the default equations and parameters provided in the MUSIC model (Ref. 12). The water quality reduction mechanisms in MUSIC are based on an exponential decay equation referred to as the k – C* curve (refer to Wong et al. Ref.13). The performance parameters used are summarised in Table 6.2.

Modelling Assumptions

Surface Area

For the individual lot system, the surface area was set based on an extended detention depth of 50mm, with a surface area capable of retaining a 1 year storm event from all impervious surfaces on the lot. Accordingly, a surface area of 252m^2 was adopted.

For the road reserve areas, the effective bio-swale surface area was based on the length of the table drains adjoining the road with an average width of 1 metre. Accordingly a surface area of 2,674 m^2 was adopted, with the central corridor swale having a surface area of 1000 m^2.

Filter Media

It is assumed that a bio-retention system will utilise a sand filter media having a bed depth of (0.3 - 0.6) m and filter particle effective diameter of 0.45 mm and a saturated hydraulic conductivity of 100 mm /hr. This is generally consistent with the soils occurring on the Manor Road site.

Table 6.2

MUSIC – Performance Parameters

Pollutant	k (m/yr)	C* (mg/L)
TSS	1000	12.000
TP	500	0.130
TN	50	1.300

6.6 Pollutant Load Estimates

Total annual pollutant load estimates were derived using MUSIC for the developed site incorporating the **modelled** water quality treatment system. The estimated annual pollutant loads for each of the model situations are presented in Table 6.3 and Table 6.4.

Table 6.3

SUMMARY OF MEAN ANNUAL POLLUTANT LOADS AND REDUCTIONS

Individual Lot

Pollutants	Source	Discharge	Reduction
TSS (kg/yr)	367	33.3	90.9%
TP (kg/yr)	0.745	0.116	84.4%
TN (kg/yr)	5.16	1.15	77.8%
GP (kg/yr)	45.8	0	100.0%

Table 6.4

SUMMARY OF MEAN ANNUAL POLLUTANT LOADS AND REDUCTIONS

Road Reserve Area

Pollutants	Source	Discharge	Reduction
TSS (kg/yr)	6500	701	89.2%
TP (kg/yr)	13.2	2.24	83.0%
TN (kg/yr)	90.8	16.7	81.6%
GP (kg/yr)	707	1.39	99.8%

Detail results from MUSIC for the 17 year period modelled (June 1964 – June 1981) including cumulative frequency graphs of pollutant concentrations are provided in Attachments A & B. The pollutant concentrations for the modelled period for the two systems are reported in Table 6.5 and Table 6.6. These are compared directly against the various target objectives.

Table 6.5

COMPARISON OF POLLUTANT CONCENTRATIONS TO TARGET LEVELS

Individual Lot

Pollutant	MUSIC Mean Pollutant Loading Rate- Urban Storm Conditions	MUSIC Median Discharge Concentration	ANZECC Trigger Values	MUSIC Reduction of Pollutant Loads	EPA Target Reductions	GTCC Target Reductions
	(mg/l)	(mg/l)	(mg/l)	%	%	%
TSS	158	0	* 6.000	91%	80	80
TP	0.355	0	0.025	84%	45	45
TN	2.63	0	0.35	78%	45	45

Table 6.6

COMPARISON OF POLLUTANT CONCENTRATIONS TO TARGET LEVELS

Road Reserve Area

Pollutant	MUSIC Mean Pollutant Loading Rate- Urban Storm Conditions	MUSIC Median Discharge Concentration	ANZECC Trigger Values	MUSIC Reduction of Pollutant Loads	EPA Target Reductions	GTCC Target Reductions
	(mg/l)	(mg/l)	(mg/l)	%	%	%
TSS	158	0	* 6.000	89%	80	80
TP	0.355	0	0.025	83%	45	45
TN	2.63	0	0.35	82%	45	45

6.7 Discussion of Modeling Results

The results of the modelled water management strategy obtained from the MUSIC models highlights the following matters:

- *A median pollutant concentration of 0 mg/l for both modelled systems.* This is due to the fact that most storm events would not result in any runoff from the site – even with the rural residential subdivision in place.

- The modelled water quality management system for the site will ensure that post development nutrient discharges from the site are reduced by a minimum of 78%. This complies with the guideline of 45% retention of the average annual nutrient load nominated by GTCC. (Ref. 4).

- The modelled water quality management system would ensure that Suspended Solids are reduced below the nominated target level of 80% recommended by GTCC. (Ref. 4).

- The median and 90% pollutant discharge concentrations from the development are well under the target values for unmodified or slightly modified ecosystems nominated in the ANZECC guidelines (Ref. 6). 90% concentrations can be evaluated from the cumulative frequency graphs in Attachments A & B.

6.8 Model Results in terms of the Site Configuration

In terms of the specific site configuration, the eastern catchment would comprise 10 parallel "individual lot" systems draining to the Harrington Waters Estate. The modeling results, given the similarities between the modeled system and the natural soils with the shaped infiltration basin/bio-swale, indicate that the identified water quality control targets for the discharge to the Harrington Waters estate comply with the nominated targets set by GTCC.

In terms of the specific site configuration, the western catchment would comprise 45 parallel "individual lot" systems flowing to the "road reserve area" system and a further 7 parallel systems draining directly to the environmental riparian support zone. Similarly, the results indicate that the nominated targets can be achieved.

7. CONCLUSION & RECOMMENDATIONS

The strategy developed for the Manor Road Subdivision site at Harrington demonstrates that the stormwater that flows through the site and generated from the site with the proposed rural residential development can be managed to achieve the objectives established by Greater Taree City Council. The adoption of the proposed strategy will ensure that as development proceeds on the site that the required levels of water quality treatment are achieved and that the proposed development and works utilise the natural features of the site to their maximum capacity.

In addition, the proposed strategy recognises the principles established in the Jelliffe Environmental report for the Local Environmental Study for the site during the rezoning process.

Our investigation indicates that the site can be developed to support appropriate rural residential housing with the incorporation of the identified treatment measures without causing any detrimental impacts on the environment.

It is recommended that the stormwater strategy be implemented as part of the development proposal and that the general principles, objectives and strategies identified in this report be approved for implementation in the detailed design for the site.

8. REFERENCES

1. W.P. BROWN & PARTNERS PTY.LTD. (2003) – Design plans for Harrington Waters Estate Stage 4.2 Part A.

2. DOUGLAS PARTNERS (2004) – Report on Geotechnical Investigation, Proposed Rural Residential Subdivision Manor Road, Harrington.

3. INSTITUTION OF ENGINEERS, AUSTRALIA (1987) - Australian Rainfall and Runoff. - Institution of Engineers Australia.

4. GREATER TAREE CITY COUNCIL – Urban Stormwater Management Plan

5. NSW ENVIRONMENT PROTECTION AUTHORITY (1997) - Managing Urban Stormwater: Council Handbook - Draft

6. AUSTRALIAN AND NEW ZEALAND ENVIRONMENT AND CONSERVATION COUNCIL (2000) – National Water Quality Management Strategy – Volume 4 - Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

7. JELLIFE ENVIRONMENTAL PTY. LTD. (2001) – On-site Effluent Disposal and Stormwater Quality Study, as Appendix B to the Local Environmental Study for Greater Taree City Council.

8. CSIRO (1999) – Urban Stormwater: Best Practice Environmental Management Guidelines

9. DONOVAN, CAMERON AND COOMBES (1999) – The Lower Hunter and Central Coast Regional Environmental Strategy Draft Model Planning Provisions

10. COOMBES CONSULTING GROUP (2000) – Integrated Water Management – Epping North Project

11. NSW DEPARTMENT OF HOUSING (1998) – Managing Urban Stormwater – Soils and Construction – 3rd Edition.

12. CRC FOR CATCHMENT HYDROLOGY (2002) - MUSIC Model for Urban Stormwater Improvement Conceptualisation – User Manual Version 1.00.

13. WONG, T.H.F., DUNCAN, H.P., FLETCHER, T.D & JENKINS G.A. (2001) – A Unified Approach to Modelling Stormwater Treatment, - Proceedings of the 2nd South Pacific Stormwater Conference, Auckland, New Zealand, 27-29 June 2001, pp 319-327.

9. FIGURES

FIGURE 1 SITE PLAN

FIGURE 2 STORMWATER MANAGEMENT STRATEGY - PLAN

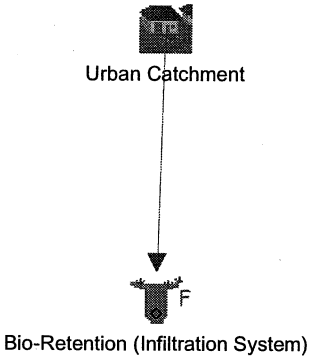
FIGURE 3 STORMWATER MANAGEMENT STRATEGY – DETAILS

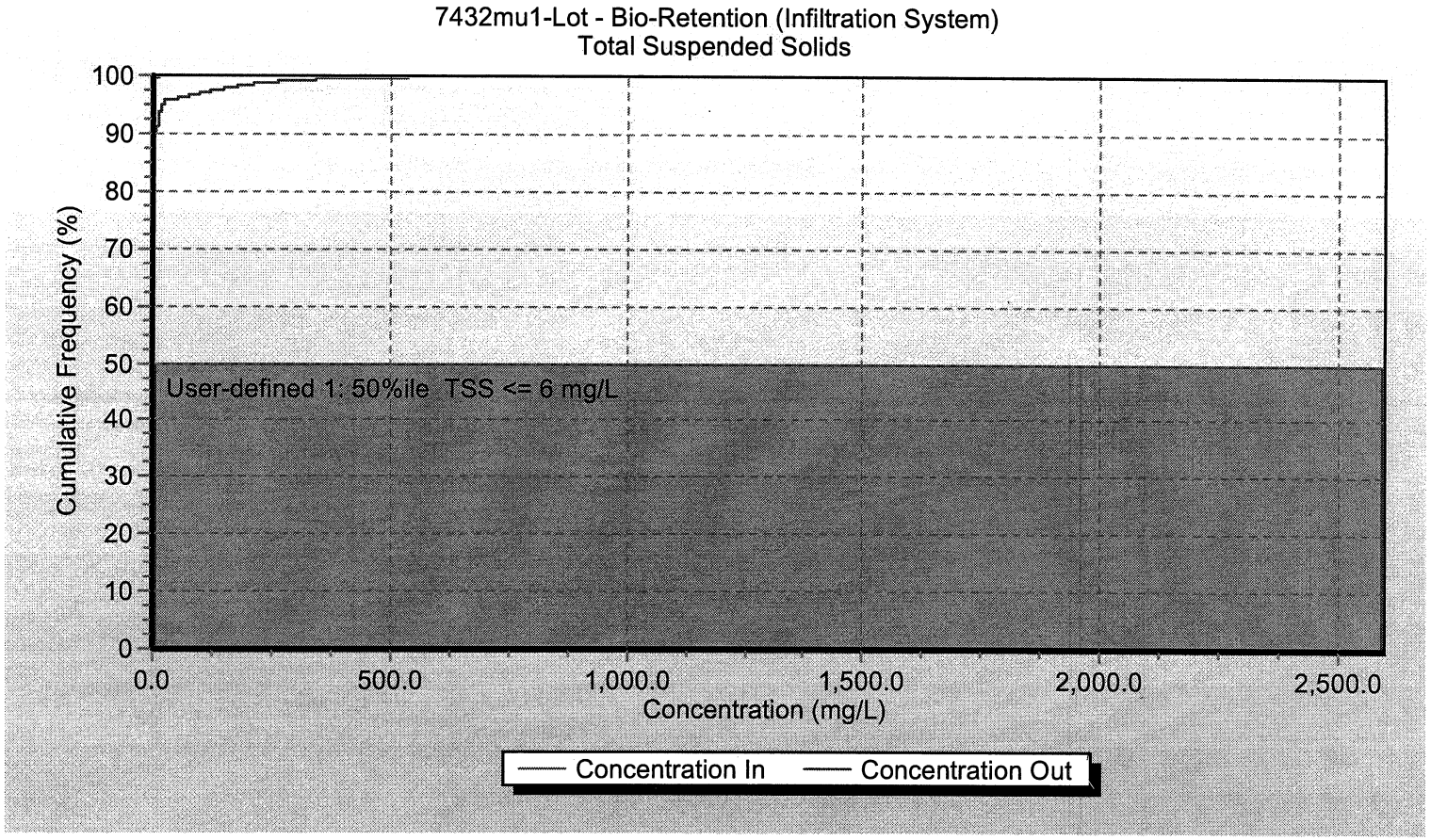
ATTACHMENT A

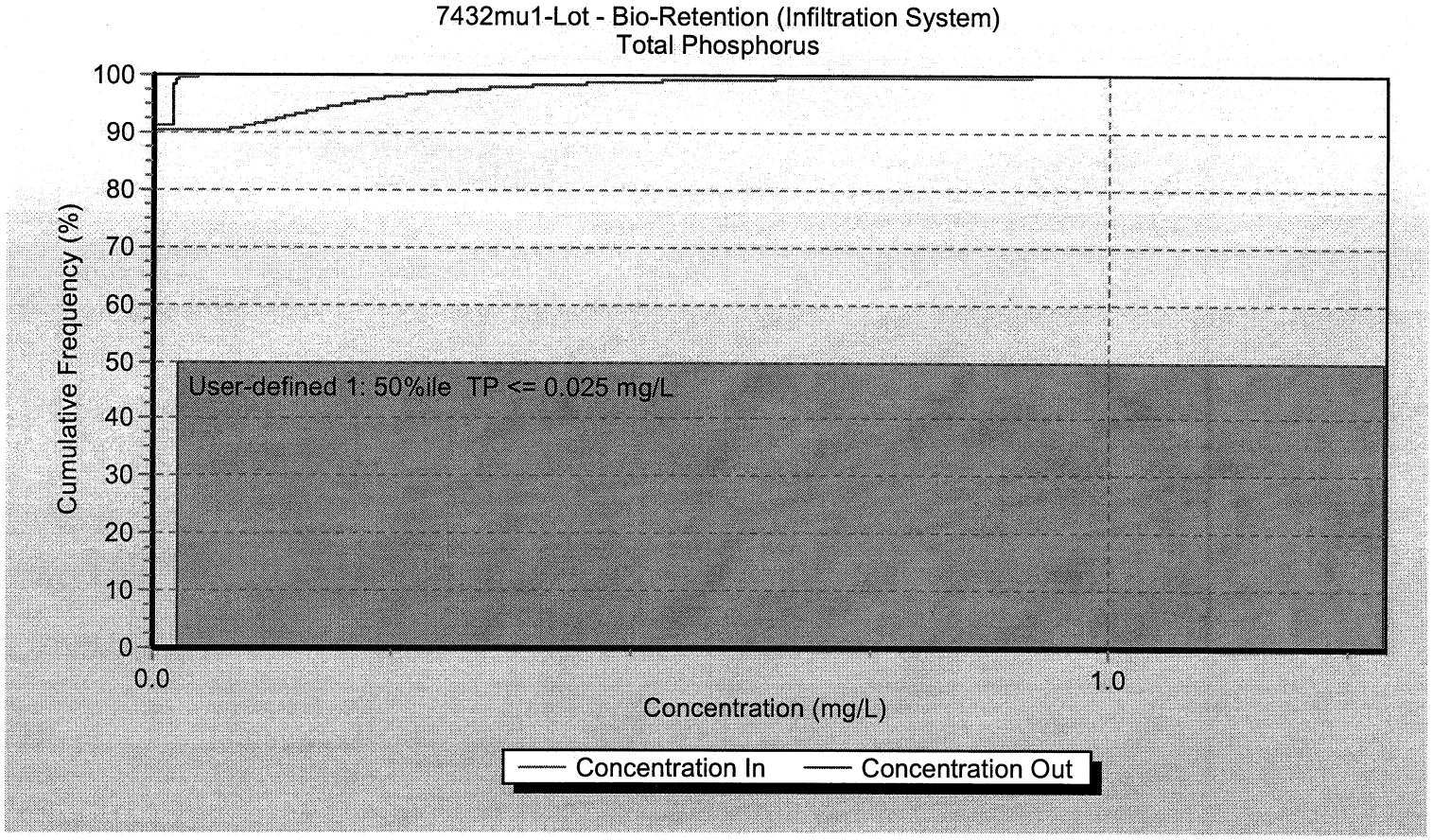
MUSIC MODELLING RESULTS

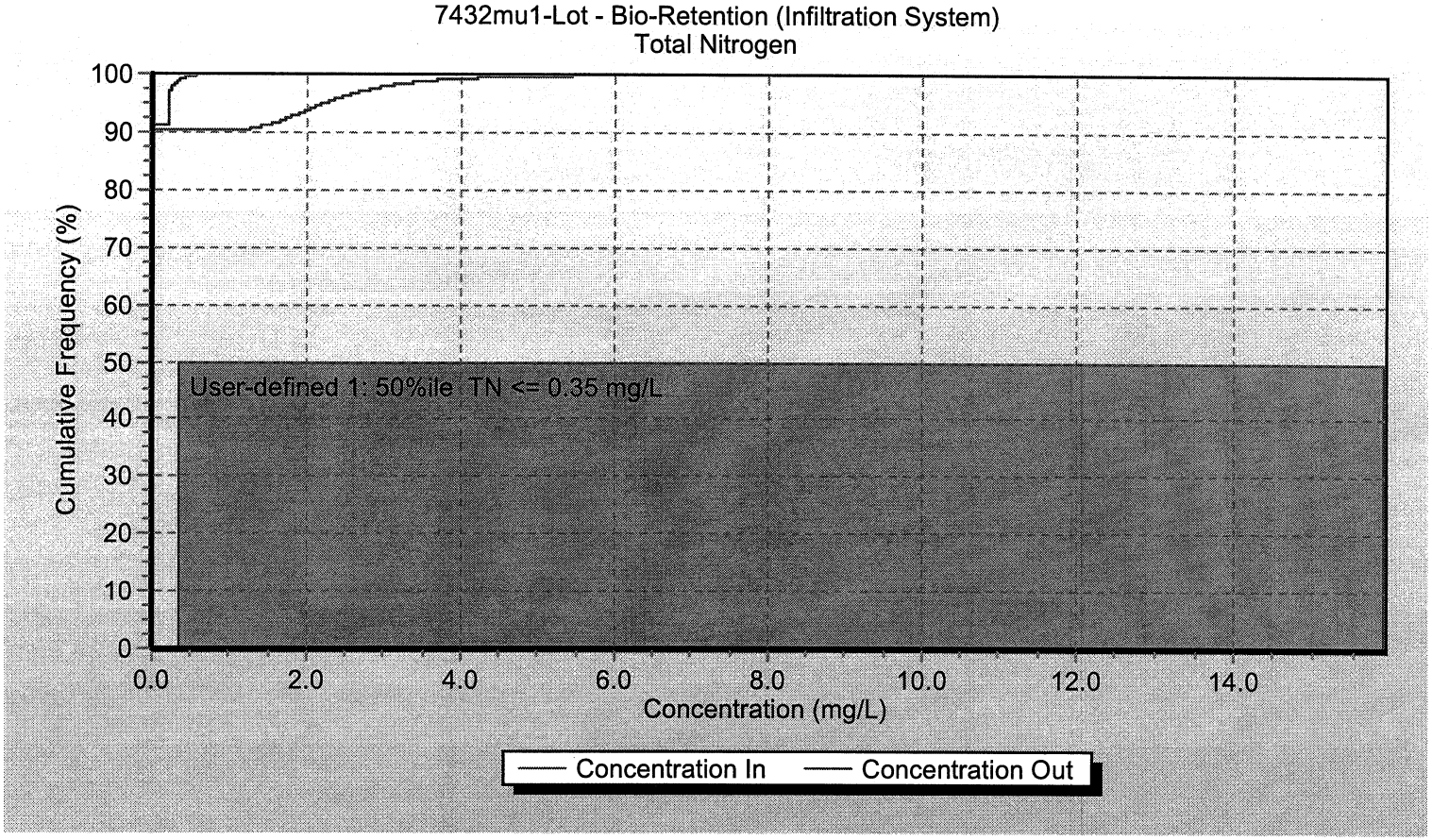
(INDIVIDUAL LOT SYSTEM)

6 min Rainfall (June 1964 – June 1981)


Urban Catchment
Bio-Retention (Infiltration System)


7432mu1-Lot - Bio-Retention (Infiltration System)
Total Suspended Solids
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
User-defined 1: 50%ile TSS <= 6 mg/L
0.0
500.0
1,000.0
1,500.0
2,000.0
2,500.0
Concentration (mg/L)
Concentration In
Concentration Out


7432mu1-Lot - Bio-Retention (Infiltration System)
Total Phosphorus
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
User-defined 1: 50%ile TP <= 0.025 mg/L
0.0
1.0
Concentration (mg/L)
Concentration In
Concentration Out

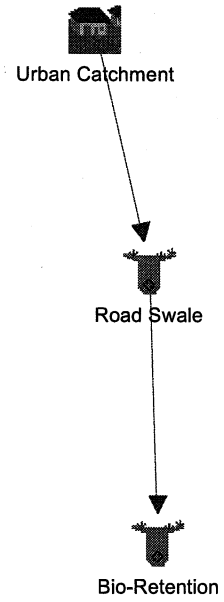

7432mu1-Lot - Bio-Retention (Infiltration System)
Total Nitrogen
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
User-defined 1: 50%ile TN <= 0.35 mg/L
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Concentration (mg/L)
Concentration In
Concentration Out

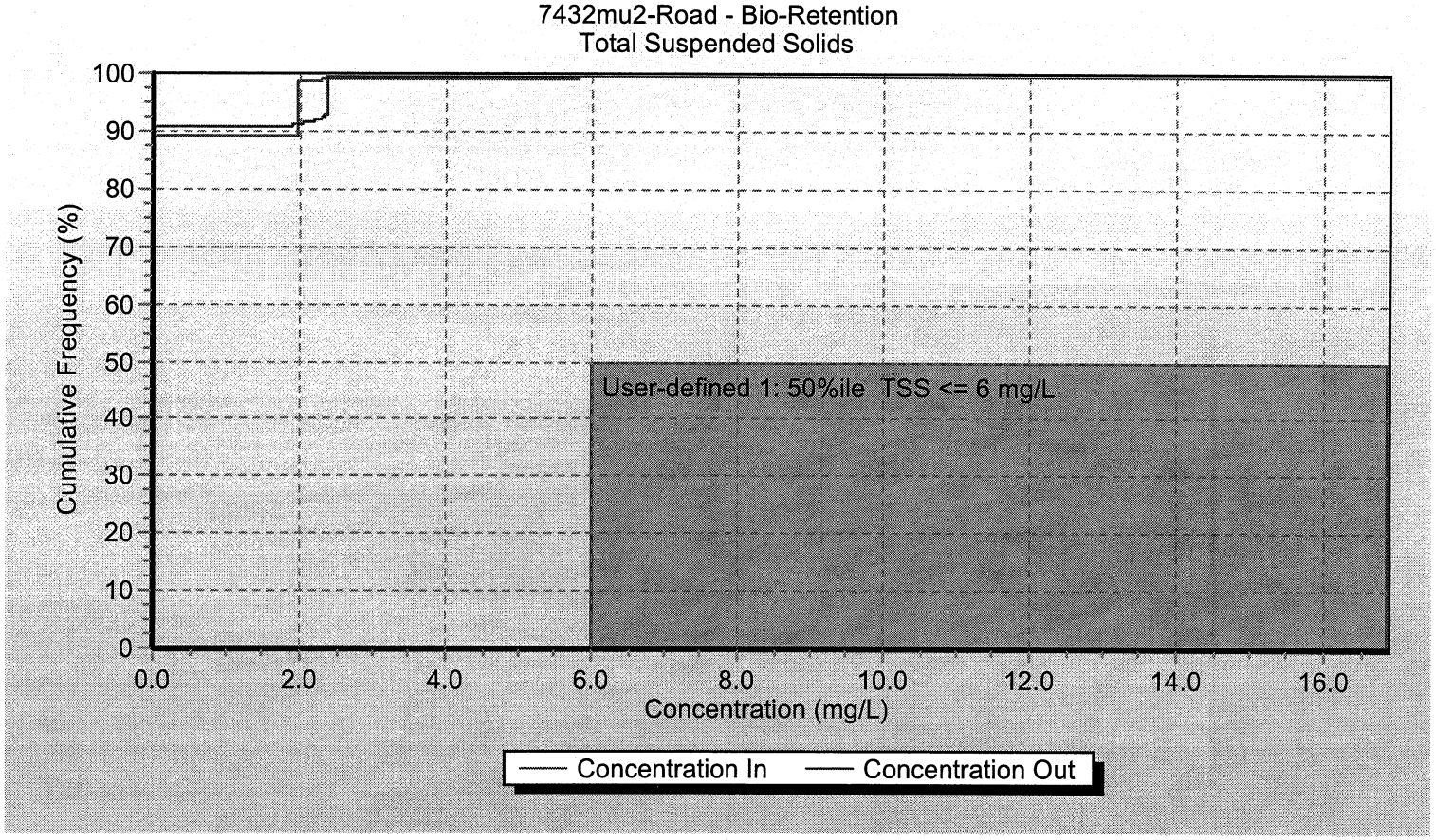
ATTACHMENT B

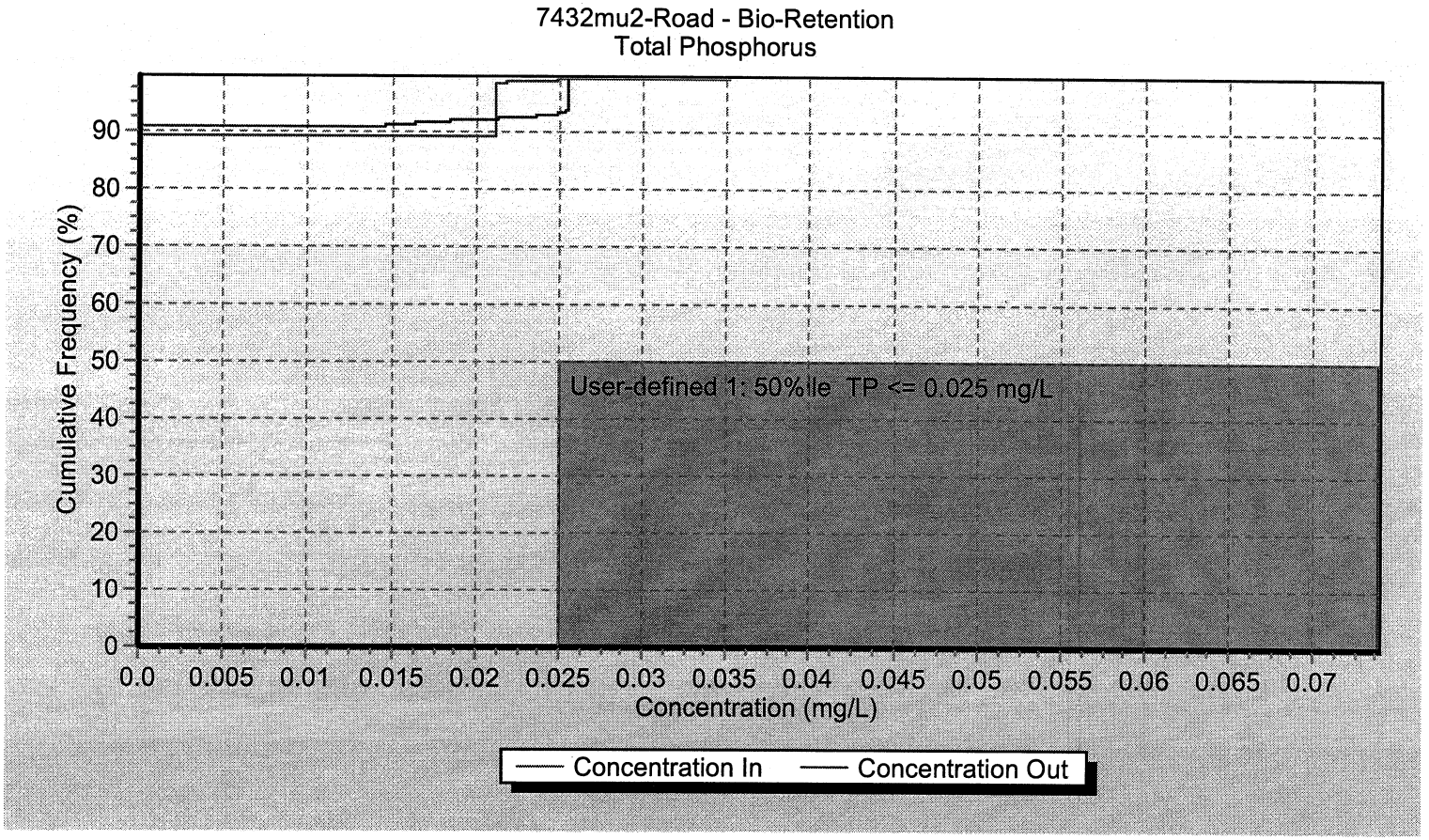
MUSIC MODELLING RESULTS

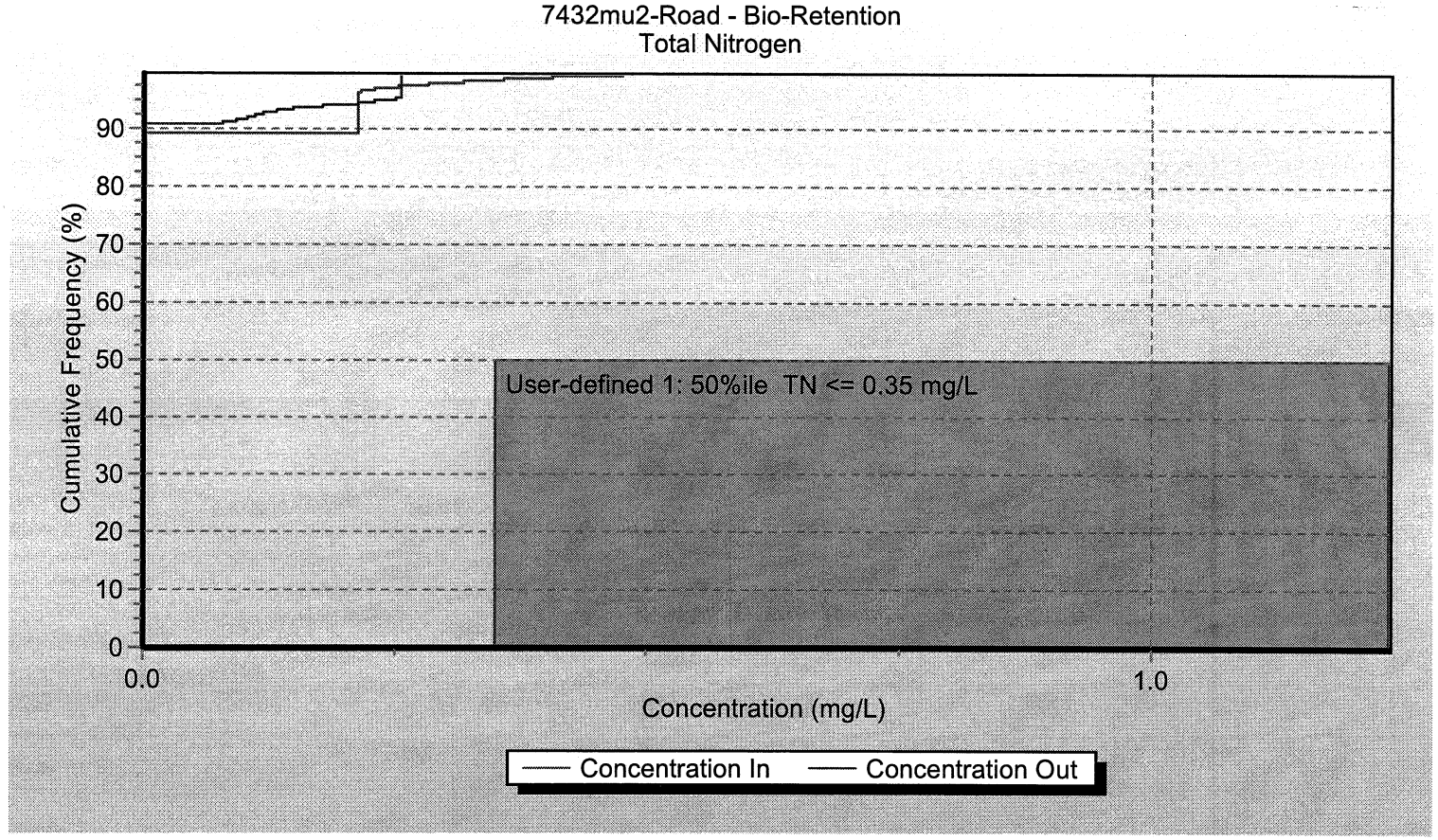
(ROAD RESERVE AREA)

6 min Rainfall (June 1964 – June 1981)

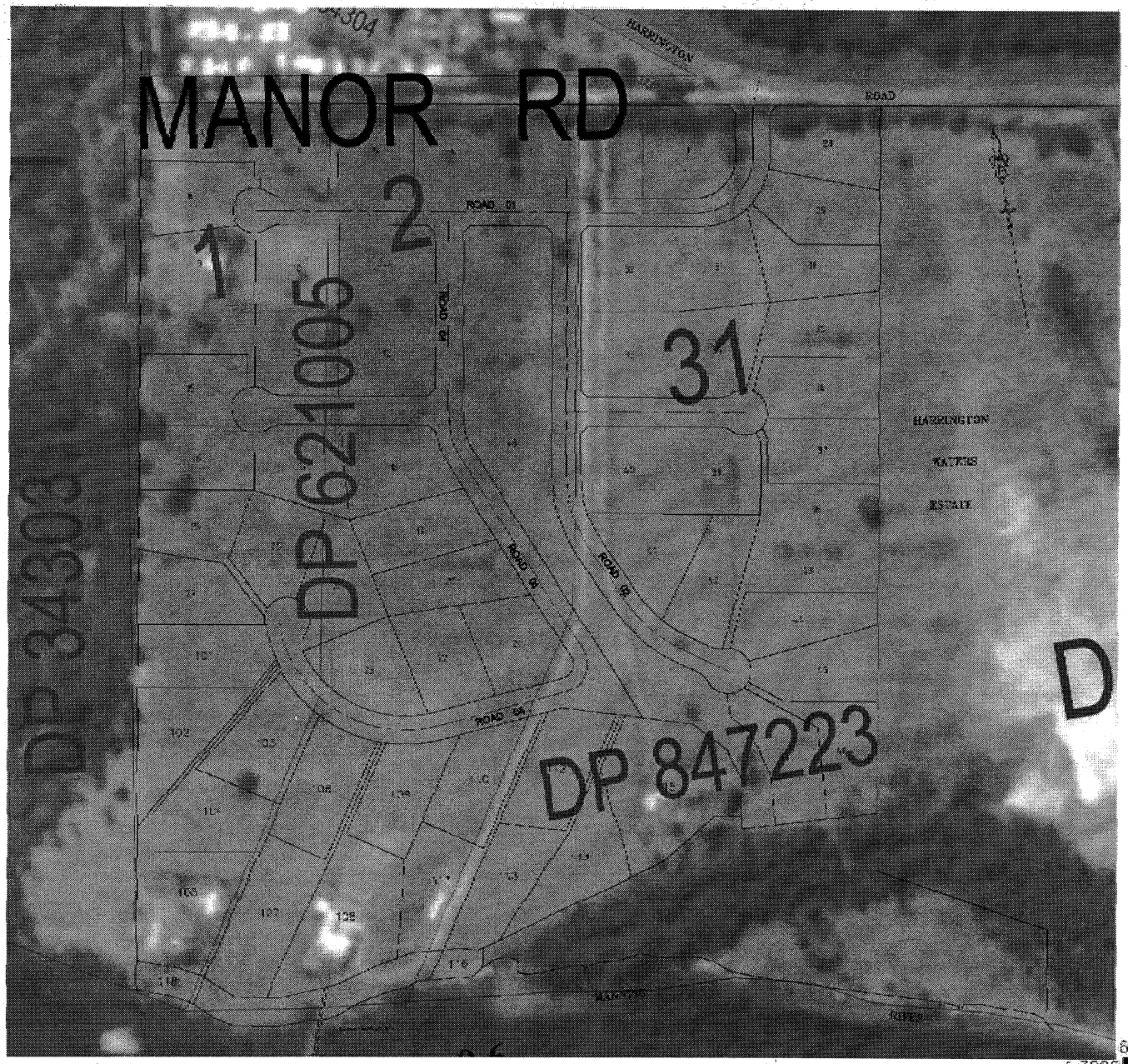

Urban Catchment
Road Swale
Bio-Retention


7432mu2-Road - Bio-Retention
Total Suspended Solids
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
Concentration (mg/L)
User-defined 1: 50%ile TSS <= 6 mg/L
Concentration In
Concentration Out


7432mu2-Road - Bio-Retention
Total Phosphorus
Cumulative Frequency (%)
90
80
70
60
50
40
30
20
10
0
User-defined 1: 50%ile TP <= 0.025 mg/L
0.0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045
0.05
0.055
0.06
0.065
0.07
Concentration (mg/L)
Concentration In
Concentration Out


7432mu2-Road - Bio-Retention
Total Nitrogen
Cumulative Frequency (%)
90
80
70
60
50
40
30
20
10
0
User-defined 1: 50%ile TN <= 0.35 mg/L
0.0
1.0
Concentration (mg/L)
Concentration In
Concentration Out

FIGURES



NOTES:

1. BACKGROUND IMAGE FROM GOOGLE MAPS APPROXIMATE ONLY.

FIGURE 1

60 30 0 30 60 90 120 150 180 210 240 270 300

METRES (FOR A3 PLOT)

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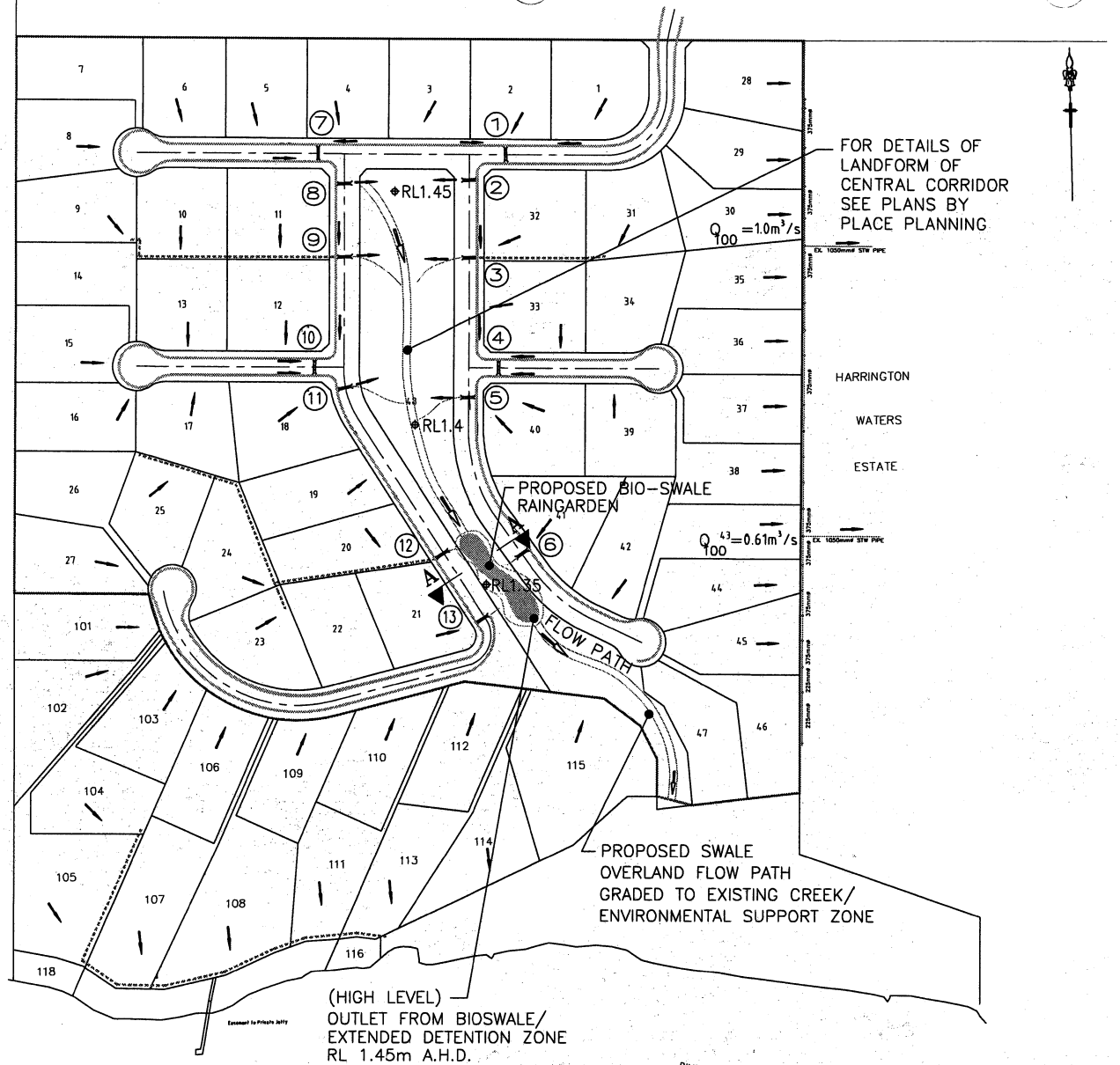
CONSULTING CIVIL ENGINEERS & PROJECT MANAGERS

PROPOSED RURAL RESIDENTIAL SUBDIVISION
HARRINGTON

7432/SW5 A



LEGEND:

- SITE BOUNDARY
- PROPOSED TABLE DRAIN/BIO-SWALE
- PROPOSED SWALE
- FLOW DIRECTION
- PROPOSED BIO-SWALE/INFILTRATION BASIN
- ① PROPOSED CULVERT
- EXISTING STORMWATER PIPE AND PIT

300mm HIGH BOX CULVERT WIDTHS

①	1500mm
②	1500mm
③	900mm
④	900mm
⑤	TWIN 1200mm
⑥	1200mm
⑦	TWIN 1200mm
⑧	TWIN 1200mm
⑨	1200mm
⑩	1200mm
⑪	TWIN 1500mm
⑫	TWIN 1200mm
⑬	1200mm

FIGURE 2

1: 3000 60 30 0 30 60 90 120 150 180 210 240 270 300

METRES (FOR A3 PLOT)

ISSUE No.	AMENDMENT	DATE
A	FIRST ISSUE	SEPT 04

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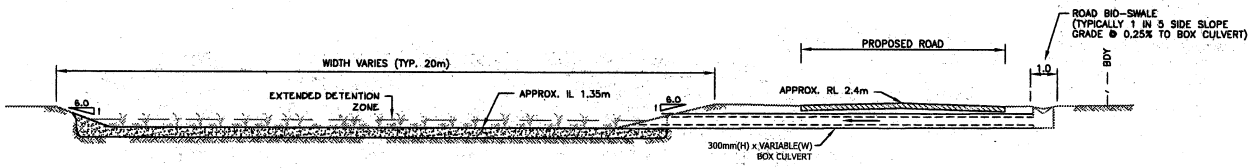
DESIGNED S.P. DRAWN J.G. CHECKED D.J. APPROVED ____ DATE ____
DATUM: A.H.D. ORIGIN:
SCALE: 1:3000 (A3)
CLIENT: ARCHER PROPERTIES

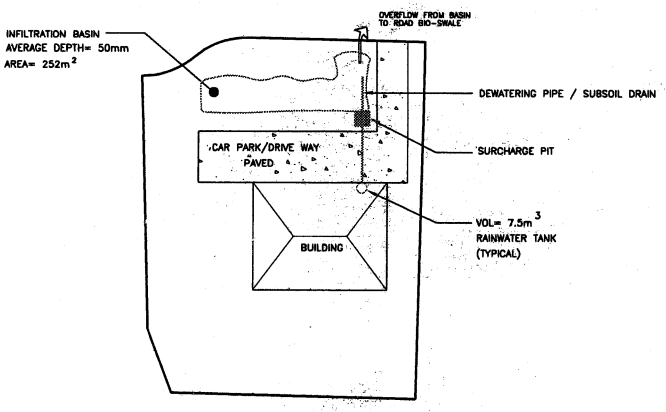
PROPOSED RURAL RESIDENTIAL SUBDIVISION HARRINGTON
STORMWATER MANAGEMENT STRATEGY PLAN

PLAN No. 7432/SW6 A
FILE No. 7432SW6
SHEET 2 OF 3 SHEETS



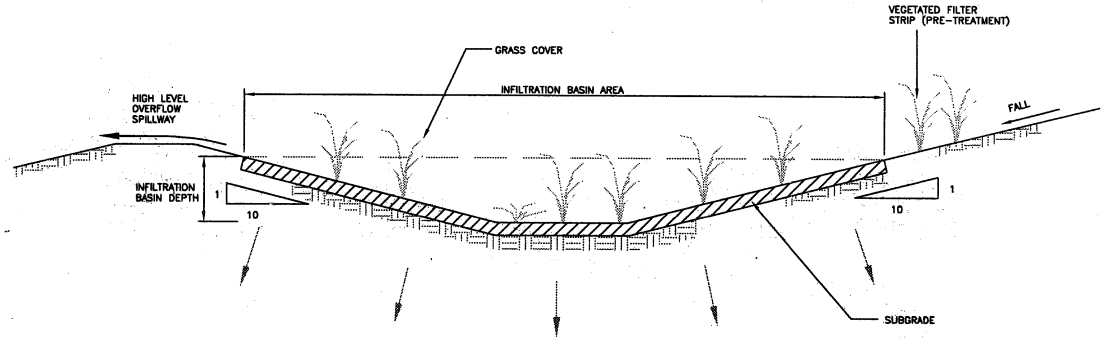
TYPICAL SECTION – CORRIDOR BIO-RETENTION SWALE / INFILTRATION BASIN

N.T.S.



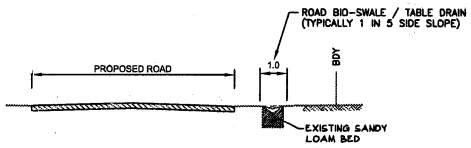
ALLOTMENT LAYOUT SCHEMATIC PLAN

N.T.S.



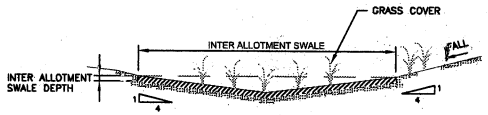
SYSTEM ARRANGEMENT

1. ROOF WATER CONNECTS TO RAINWATER TANK
2. RAINWATER RE-USED FOR TOILET FLUSHING & OUTDOOR USES
3. OVERFLOW FROM RAINWATER TANK TO SURCHARGE PIT
4. SURCHARGES INTO INFILTRATION BASIN
5. SURCHARGE PIT DEWATERED BY SUBSOIL DRAIN INTO SAND
6. OVERFLOW FROM BASIN DISCHARGES TO ROAD BIO-SWALE



TYPICAL BIO-RETENTION SWALE / TABLE DRAIN

NOT TO SCALE



TYPICAL ALLOTMENT SWALE DETAILS

N.T.S.

FIGURE 3

No.	AMENDMENT	DATE
F		
E		
D		
C		
B		
A	FIRST ISSUE	SEPT 04

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DESIGNED B.P. DATUM: A.H.D.
DRAWN B.P. ORIGIN:
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CLIENT: ARCHER PROPERTIES

PROPOSED RURAL RESIDENTIAL SUBDIVISION HARRINGTON

STORMWATER MANAGEMENT STRATEGY DETAILS

PLAN No. 7432/SW4 A
FILE No. 7432SW4
SHEET 3 OF 3 SHEETS