APPENDIX A STORMWATER REQUIREMENTS

CITY OF Playford

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Document Control

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Contents

1. DESIGN RESPONSIBILITIES

This document is written to establish Councils requirements for New Land Division Development. Some guidance is provided for house development but in these instances the owner/ developer should seek guidance from Councils Planning Team.

Although this document encompasses all aspects of Land Division and Development, it is realised many developments are not as large and complex as seemingly defined here. Notes have been added in italic's (*) to assist and guide those subdividing and developing smaller lots.

The Stormwater drainage system is to be designed in accordance with:

1. 'Australian Rainfall and Runoff – A guide to flood estimation 2019'
2. AS/NZS 3500.3: Stormwater Drainage
3. AS/NZS 4058: Precast Concrete Pipes
4. AS/NZS 3725: Design for installation of buried concrete pipes
5. AS 1597: Precast reinforced concrete box culverts
6. AS 1260: PVC-U pipes and fittings for drainage, waste and vent application
7. 'The Queensland Urban Drainage Manual'
8. 'DIT's Standard Specification for Excavation and Reinstatement of Road Pavements'
9. 'DIT's Specification for works on Roads'
10. IPWEA Infrastructure Guidelines SA
11. 'IPWEA/ Council Standard Details'

The developer is responsible for identifying themselves with flood risk mapping. As a guide flood mapping is available at the Plan Sa website under Planning and Building, Planning and Design, Overlays, Hazard Overlays. The developer must liaise with the City of Playford at the planning stage on flood levels and proposed remedial measures.

The developer is required, as a part of the DA approval, to submit an overall stormwater management plan. This should not be considered as a detailed design but should be able to demonstrate how existing predevelopment flows affect the site and how the design will cater for them and the post development flows in the future. The format is to include, but not limited exclusively to:

1. Introduction and description of the site including any existing drainage and easements;
2. Narrative and calculation of the pre-development flow and how the undeveloped pre-development flow regime has been accounted for;
3. Narrative and calculation of method of drainage and attenuation to prevent exceeding the pre-development flow.
4. Narrative on calculation of the piped drainage design to capture and accommodate the 5 year storm, (0.22 EY) for residential urban design, the 10 year storm (0.11 EY) for industrial/ commercial urban and rural design, and the 100 year storm (1% AEP) overland flow path;
5. Narrative and calculation on method of detention (if required) within the site for a 100 year storm event;
6. Provide details of water quality and demonstrate that they are in accordance with Environment Agency guidelines.
7. Any necessary plans, sections and details and supporting calculations and or Computer Models
8. Details of connections and reinstatement of Council infrastructure to Councils satisfaction.

**For a single urban lot (unless specifically requested) a Stormwater Management Plan will not be required. In areas where there is no existing piped infrastructure to discharge to a Stormwater Management may be required. For small divisions this level of information may not be required. Prior to lodgement Council can advise on what will be required.*

2. OVERARCHING DESIGN REQUIREMENTS

**For a single dwelling fronting an existing road with a drainage system these requirements do not apply and all roof runoff may be directed to the existing water table. Councils Planning Department can advise further. For several dwellings discharging to the kerb, assessment will be based on the combined volume entering the existing system.*

Overall, the following rules apply to all Land Division/ Developments

1. The post-development flow design should mimic the natural runoff regime, both flow rate and volume must match pre-development condition.
2. Where the drainage enters Councils existing system it must not have a detrimental effect on that system.
3. Design Storms for Minor and Major systems should be
    a) for residential urban design 1 in 5 (20%) AEP, (0.22 EY),
    b) for industrial and commercial urban design 1 in 10 (10%) AEP, (0.11 EY),
    c) For rural systems all stormwater shall generally be detained within the boundary of the site, and
    d) for overland flow path 1% AEP

As stated previously there are variations and additional requirements depending on the nature of the Development/ Land Division. These can be split into 4 categories.

- Residential urban,
- Residential rural (single dwelling)
- Commercial urban and
- Commercial rural.

a. The Minor System (Piped System)

The minor system shall be capable of conveying the frequent rainfall events that occur throughout the year in an underground system without upwelling.

- For Residential Urban Land Division/ Developments the underground stormwater system is to be located within land owned and operated by council (reserves and road reserves). All stormwater systems sited outside of council owned land is to be vested in an easement in the name of City of Playford.
- As noted above for Residential Urban Land Division/ Developments the minor runoff system shall be capable of conveying the 1 in 5 (20%) AEP, (0.22 EY) event via the underground stormwater system. However, where there is a limited ability to convey the overland gap flow the minor runoff system may be increased following negotiation with Council.
- Rear of Allotment Drainage shall be capable of conveying the 1 in 20 AEP (0.05 EY)
- For Residential Rural Developments stormwater shall be attenuated on site via tanks when there is no established infrastructure to drain to. This water may be used for non-potable purposes and excess discharged to soak-aways. Discharge to roadside swales is not accepted unless agreed with Council.
- For Commercial Rural Developments stormwater is to be managed on site via tanks and basins where there is no established infrastructure to drain to. Discharge to roadside swales is not accepted.
- There is to be no ponding in the street and the limit of the downstream drainage system is not to be exceeded.

Roadside swales are generally designed to capture and convey road runoff only and have limited capacity. They should not be considered as infrastructure designed to convey stormwater from a development unless agreed with by Council.

b. The Major System

a. The major system is to be capable of conveying the 1% AEP rainfall event via a safe and unobstructed overland flow path in conjunction with the underground system.
b. The flows generated from the major event are to be disposed of so that no property will be inundated during that event.
c. The flows can be disposed of via a combination of the underground system and unobstructed overland flow routes. However, the limit of the downstream drainage system must not be exceeded.
d. These overland flow routes are to be founded within the public realm i.e. road reserves and reserves and are not to be located in private allotments.

Stormwater infrastructure such as rear of allotment drains that are located in private land are to be located within an easement in the name of the City of Playford. The easements are to be a minimum 3m wide with a minimum of 1m clearance from the edge of the pipe to the easement boundary.

While the option for a gravity drain exists pumping shall not be considered. Wet systems in Councils drainage network are not supported.

The use of Water Sensitive Urban Design treatment methods is encouraged and should be analysed and incorporated into the design where appropriate. Consultation with Council is required on the nature of WSUD systems.

c. The Urban Growth Areas

As stated in Councils Land Division Guidelines the Minister has rezoned 3 areas within Playford for Urban Development, known colloquially as the Growth Areas. These areas are:

- Angle Vale
- Playford North Extension
- Virginia

To ensure delivery of the stormwater infrastructure necessary for the Growth Areas, Council will provide to the developer the Stormwater Master Plan and any other design requirements for inclusion in their regional stormwater design. See Councils Land Division Guidelines

3. PIPED DRAINAGE SYSTEMS

The underground stormwater infrastructure (Minor System) compromises of the underground pipe and pit system that conveys runoff generated by the minor storm events. The pits, pipes and culverts are to be constructed from reinforced concrete unless otherwise negotiated with council. The underground system must be designed to be free draining and able to be self-cleansing and is to be vested to the City of Playford.

a. Pit Types

The City of Playford has 4 types of pit structures:

- Side entry pits that capture the runoff conveyed by the kerb and watertable
- Grated inlet pits that capture runoff within spoon drains and carparks
- Field gully pits that capture runoff in overflow paths and reserves
- Junction boxes that act as inspection points

Side Entry Pits

Two types of side entry pits (SEP) are currently used by The City of Playford.

- Lintel frame side entry pit (See details SD300, SD325)
- Central support side entry pit (See details SD300, SD330)

Side entry pits that are located in areas considered at risk from vehicular runover i.e. adjacent junctions, parking bays etc. are to be lintel frame SEP's. All other SEP's may be either lintel frame or central support as per standard detail SD300 and SD330.

All pits are to have a depressed apron in the water table as shown on SD320 and SD 330

All SEP's are to have a minimum 110mm clear throat opening. To facilitate this on lintel frame pits it will be necessary to locally widen the throat by way of a 45° chamfer in the pit apron, without increasing the grade of the apron.

SEP's on roads greater than 2% need to have deflectors.

Each SEP is to allow for a minimum of 85% capture from upstream flows.

At a sag point the underground drainage is to be designed for a 5% AEP flow provided there is an overland flow path for gap flows from the 1% AEP storm event. If an overland flow path cannot be achieved, then the underground system is to be designed 1% AEP storm event.

Sag Pit systems are to be designed with 50% blockage of the pit inlet capacity

Grated Inlet Pits

All grated inlet pits are to be constructed in accordance with standard detail SD300, SD305 and SD310

The use of grated inlet pits is to be negotiated with council in situations where side entry pits cannot be used

Each grate inlet pit is to allow for a minimum of 85% capture from upstream flows.

Each grated inlet pit is to be designed with 50% blockage of the pit inlet capacity

Grated inlet pits are to have heavy duty (Class D) lids to allow for traffic movements over the top of them.

Field Inlet Pits

All field inlet pits are to be constructed in accordance with standard detail SD315

If required, block-outs for subsoil drains are to be provided in pit wall.

Junction Box

Junction boxes are to be provided at the conjunction of two or more pipes, change of pipe grade, change in pipe size and changes in horizontal pipe alignments. They are to be:

- All junction boxes are to be RCP. Fibre Reinforced Concrete may be used only with the agreement of the Council.
- All RCP junction boxes are to be reinforced and constructed in accordance with standard detail SD300
- Junction boxes to be minimum 600 mm x 600 mm, with heavy duty lids when situated within a road reserve
- All pits that are deeper than 1.2m deep will require to be at least 900mm x 900mm (See SD305 for depth vs pit size)
- 150mm freeboard from the top of the pit to the HGL is to be achieved in the minor system so that no pit surcharges during a minor storm event.
- All pipes entering the pit are to have a minimum 50mm clearance from the outer edge of the pipe penetration to the inner face of the pit.
- Pit cover lids are to be heavy duty (Class D) lids to allow for traffic movements over the top of them

b. Pipe Requirements

Concrete Pipes

All pipes are to be reinforced concrete pipe (RCP) with rubber ring joints. Council do not approve the use of Fibre Reinforced Concrete (FRC) pipes. Minimum requirements are:

- Minimum Pipe diameter = 375 mm.
- Minimum Pipe cover = 600 mm.
- Minimum Pipe Class = Class 2 (behind kerb), Class 4 (under roads and other trafficable areas)
- Minimum Pipe grade = 0.5%. If the designer feels these minimum grades cannot be achieved Council may accept a minor reduction in grade only where it can be demonstrated:
    - An increase in site levels is unobtainable or will have a detrimental effect on adjacent property
    - self-cleansing velocity can be achieved. This must be demonstrated as a part of the drainage model.
- Pipe grades at the head of the run and under roads must be a minimum of 0.5%
- Maximum grade = 20%
- All pipes must achieve Self-Cleansing Velocity. Self-Cleansing Velocity = 1.2m/s (Absolute minimum = 0.7m/s).
- A reduction in cover is not acceptable. In road reserve minimum pipe cover = 600mm

Prior to concrete pipes being installed the superintendent is to invite Council to witness the quality of the pipes. The superintendent remains responsible for inspecting and checking the pipes for defects.

c. Rear of Allotment Drains

Pipes to be RCP (preferred), UPVC is acceptable.

For UPVC pipe use class SN4 with solvent welded joints

Pipe diameter = 300 mm (preferred), 225 mm (minimum for horizontal run), 100 mm (minimum for riser).

Pipe grade = 1 % (preferred), 0.5 % (minimum)

Risers must be joined to horizontal run using a minimum 90° connection, in direction of flow.

d. Culverts and headwalls

Minimum Culvert height = 300 mm.

Minimum Culvert cover = 300 mm.

Minimum Culvert grade = 0.5 %. Where larger culverts are used Council may accept (by negotiation) lower grades. A self-cleansing velocity check will be required.

Headwalls for varying pipe sizes should be in accordance with standard details SD345, SD350, SD351, SD355

Headwalls must be installed with rock placed behind top and wings to prevent erosion.

The top of the headwall should be set back to coincide with the batter of the slope. Scour protection is to be provided from the outfall to the invert of the open channel or basin.

4. PRIVATE DRAINAGE SYSTEMS

a. House Drainage

The property owner is responsible for all drainage within the boundary of their property. The property owner is also responsible for the maintenance and upkeep of drainage from their property to the roadside under section 221 of the Development Act.

Where drainage connects to Councils drainage system drainage is to meet Councils standard details and be to the satisfaction of Council (SD380)

Maximum discharge rate from any kerb side stormwater outlet shall be 15 l/s

b. Community Titles

Within the Community Title boundary, outside of Councils road reserve the material requirements for the drainage system are at the designers discretion. However, Drainage between the Development boundary to Councils system is to be in accordance with Councils standard details and to the satisfaction of Council.

Discharge from the Development must meet Councils requirements for flow rate and volume as defined in Section 2 – Overarching Design Principles. It is required that:

- Discharge rate from the development should not exceed the 1:5 (20%) AEP
- The development should be able to detain the stormwater generated by a maximum 1% AEP (0.01 EY) storm and discharge at the designed 1:5 (20%) AEP rate.

If detention is required, the storm water should be detained wholly within the Community Title prior to being discharged to Councils system.

A gross pollutant trap is required prior to discharge to Council system

c. Commercial/ Industrial Development

Within the Development boundary, outside of Councils road reserve the material requirements for the drainage system are at the designers discretion. However, Drainage between the Development boundary to Councils system is to be in accordance with Councils standard details and to the satisfaction of Council.

Discharge from the Development must meet Councils requirements for flow rate and volume as defined in Section 2 – Overarching Design Principles. It is required that:

- Discharge rate from the development should not exceed the 1:10 (10%) AEP (please note point below on downstream discharge capacity)
- The development should be able to detain the stormwater generated by a maximum 1% AEP (0.01 EY) and discharge at the designed 1:10 (10%) AEP rate.

If detention is required, the storm water should be detained wholly within the Development prior to being discharged to Councils system.

Runoff from hardstand areas within the development to Councils reserve via a vehicle crossover or path is not permitted

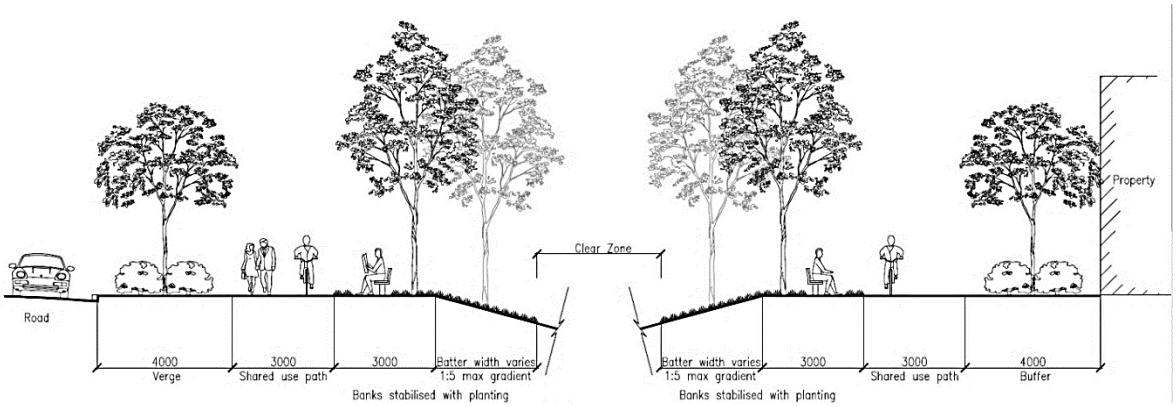
Given the large impervious area generated by Commercial and Industrial development, consultation with Council may be required on the capacity of the downstream system and the appropriate point of discharge.

A gross pollutant trap is required prior to discharge to Council system.

5. LARGE OPEN CHANNELS

Large open channels may be used to convey the major and minor storm events between and from Land Divisions/ Developments.

Open drains are to be constructed with the primary function of conveying stormwater from stormwater outfalls and overflows from adjacent catchments. They are to be founded within the public realm i.e. road reserves and open reserves and are not to be located in easements on private allotments. Large open channels of this nature must be integral to and incorporated into the overall stormwater, road, pedestrian cycle network and landscape master plans for the Land Division/ Development.



Example of Open Channel in an Urban Environment

a. Design Criteria

Channels are to be landscaped in consultation with Council and Councils Land Division Requirements – Appendix C

Maintenance access must be provided on either side of the drainage easement.

To minimise bed erosion and scouring whilst maintaining a longitudinal flow, a minimum longitudinal grade of 1% is required, unless further negotiated with council

Minimum 1 in 5 batter slopes are to be achieved on the side slopes on the channel. The slopes are to be stabilised with either grass and native planting or geotextile matting and native vegetation. The vegetation is to be established prior to practical completion of the drain being achieved and should be agreed with Council Landscape Architect

Structures and high amenity landscape treatments within the drainage reserve are to be located above the 1% AEP flow line. Existing fences and structures may be required to be modified to not obstruct the conveyance of the flow.

Open drains are to be maintained for an extended period after practical completion of the drain works has been achieved. The length of time is to be agreed and written into the Infrastructure Agreement.

b. Outfall Requirements

Pipes discharging to open drains are to terminate with a headwall. Headwalls are to be constructed in accordance with standard detail SD345 for pipes and culverts up to 375mm, SD350 for pipes and culverts up to 750mm and SD351 for pipes and culverts up to 1800mm.

Downstream of the headwall appropriate scour protection is required. This can be achieved through Reno mattresses, rocks, concrete or other appropriate means. The scour treatment is to be constructed to direct flow to its intended path and protect nearby embankments.

The top of the headwall should be set back to coincide with the batter of the slope. Scour protection is to be provided from the outfall to the invert of the existing drain.

The incoming pipe into the headwall shall be a grade no greater than 2%

The velocity of the water discharging from the headwall is to be no greater than 1.5 m/s. For velocities greater than 1.5m/s further scour treatment is required to break up the flow and reduce the velocity.

Drainage structures such as concrete lined channels and exposed soil surfaces will not be accepted, only established and managed 'soft engineering' i.e. grass lined and landscaped will be accepted.

All batter slopes are to be stabilised for detention basins, drains and swales to the approval of Council immediately prior to issuing practical completion for civil works. These measures are to be indicated within the civil scope of works and will be subject to approvals.

6. DETENTION SYSTEMS

New Land Division/ Development generally results in increased flows from the site due to an increase in impervious surfaces such as roof and pavements. The discharge of this increased flow into the existing stormwater drainage may increase the risk of flooding downstream properties and adversely effect on natural watercourses and drainage infrastructure downstream.

Detention basins may be required to mitigate these increased flows to maintain council existing stormwater systems. Detention systems are to be incorporated within the Land Division/ Development and, where appropriate should be incorporated into the Landscape, Pedestrian Movement and Cycling strategy. Systems that are to be sited externally from the development are to form part of an external infrastructure agreement.

The detention system is to be sized to ensure that the peak flow rate discharging from the post developed site does not exceed the peak flow rate for the pre-developed site. If council has a set discharge limit then the detention system is to be designed in order to detain the peak flow rate from the post developed site to the set discharge limit.

Open Basins

The shape and landscaping within the basin is to be in accordance with the agreed landscape treatment and is to be established prior to the council accepting handover of the basin works. Basin are to be landscaped in consultation with Council and Councils Land Division Requirements – Appendix C

Maximum depth of 1.5m

Batter slopes of 1 in 5, batters greater or lesser than 1 in 5 will require approval by council following a review of the design and proposed landscape treatment

Stormwater Inlets and Outfalls are to have appropriate scour protection to ensure both the batters and invert of the basin do not erode

A low flow channel is to be provided from the in-fall headwall to the outfall headwall of the basin. The invert of the basin is to locally grade to the low channel to avoid ponding of water within the basin.

Structures such as play equipment within detention basins are to be sited above the flood level from a 1 in 5 (20%) AEP.

7. ENVIRONMENTAL

All stormwater flows that discharge into open channels, detention systems and existing council stormwater pipes are to be treated in order to remove gross pollutants and sediments. Typical forms of control to be used should be trash racks and gross pollutant traps.

On private owned developments these systems are to be located within the property boundaries of the development and are the responsibility of the developer.

The minimum standard of treatment shall be able to remove the following percentages of pollutants from the typical annual urban load (Ref: CSIRO "Urban Stormwater Best Practice Environmental Management Guidelines"):

Suspended solids	80% reduction
Total Phosphorus	60% reduction
Total Nitrogen	45% reduction
Litter	70% reduction

All stormwater flows that discharge into open channels and detention systems are to have an end of line approved gross pollutant/ sediment trap. This is required to minimise the amount of pollutants entering the detention system. The sediment trap is to be maintained by the developer for a period of 12 months after practical completion is granted.

The design of wetlands and ephemeral landscaping is to be done in consultation with the Consultant and Councils Landscape Architect.

Maintenance access is to be incorporated into the design depending on the location of the gross pollutant/ sediment trap

Site Construction contamination requirements

Any stormwater works undertaken within existing watercourses are to be in accordance with the guidelines set by the Department of Environment and Water (DEW) for water affecting activity and agreed with Council.

All developments throughout the construction stage require a Soil Erosion and Drainage Management Plan to minimise the effects of construction. The contractor is responsible for their own works and maintaining the plan. See Councils Land Division Guidelines for further information.

Silt control measures are required to be installed during construction and are to be in accordance with the EPA's Code of Practice. This includes the use of vegetated buffers, hay bales, filter/ silt fences, and sediment traps/ basins. Trash collection devices, in particular gross pollution traps, may be required, where indicated by Council e.g. where the development discharges to a natural watercourse.

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