

**Lot 23 Brockman Highway,
Nannup
Askino Subdivision**

**Dilapidation Survey and
Subdivision Engineering
Report**

FOR THE SHIRE OF NANNUP

12 July 2010

Dilapidation Survey and Subdivision Engineering Report

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Executive Summary

This report provides details and costings for the repair of the existing stage of the Askino subdivision that has been handed over to the Shire. The damage has been categorized into 3 severity groups. Severity group 1, only requires general inspections to monitor deterioration, but is not severe enough to warrant action. Severity group 2 repairs values at \$21,225 + GST are those which need to be programmed for work in the coming two years. Severity group 3 works are in need of immediate repair and these works are \$27866 + GST.

For the future stages the report recommends the adoption of the current "Local Government Guidelines for Subdivisional Development" Edition 2, 2009 as an important step in updating the Shire's engineering standards. This document can then be used as the platform for directing the Shire's standards to the Developer and gaining control over the quality of the final product that the Developer hands over to the Shire.

A series of specific recommendations are made about the Developer's production of plans and information about bonding arrangements and about standards for the coming stages of the subdivision which align with the latest Edition of the Local Government Guidelines for Subdivisional Development.

The experience of this subdivision to date with respect to sub-surface water has prompted the reconsideration of design of the road crossfall, location of the stormwater pipes and inclusion of subsoil drainage, to control sub-surface water and minimise the likelihood of it disturbing the pavement.

The following recommendations are made:

1. That the Shire formally adopt the "**Local Government Guidelines for Subdivisional Development**" **Edition 2, 2009** as its standard for subdivision works.
2. That for large subdivisions the Shire continues the practice of design peer review or other outsourcing of design review.
3. Severity 3 defects should be repaired as soon as possible as they represent present hazards to pedestrians or vehicles.
4. Severity 2 defects should be monitored and programmed for repair over the next two years.
5. Severity 1 defects should be monitored only as part of the Shire's general maintenance program and programmed for repair only as required.
6. An end of road sign (chevron board D4-5) should be installed at the end of the asphalt pavement near the top of Hitchcock Drive. The section of road beyond this point should be formally closed temporarily under section 3.50A of the Local Government Act 1995, until the Developer repairs this section of the road.
7. An instruction should be issued to the Developer to clean and repair the damaged section of road referred to in recommendation 4. Realistically the state of the Stage 3 earthworks above this section of road are such that until Stage 3 is properly stabilised this section of road will need to remain closed. Nevertheless the Developer should be held responsible for the damage and issued with the instruction, with the aim of securing a written commitment from him to fully repair the works within say 2 months of the stage 3 roadworks commencing or within some other reasonable period of time. This must be accompanied by soil stabilisation actions for stage 3 lots and verges.
8. Subdivision heavy construction vehicles should be prohibited from using the section of Hitchcock Drive from Brockman Hwy to the top of the hill. The surface blow out and deformation mid-hill may deteriorate rapidly if heavy vehicles use this section of the road until the pavement is repaired and stabilizes.

9. The owner of lot 4 on the inside of the bend in Diggers Green should be issued with a notice to prevent the movement of further soil off this property onto the road.
10. Lots filled subsequent to clearance - The filling of residential building lots should meet Shire and the Design Engineer's standards. Partially cutting into the block and using the excess material to fill the low side is not appropriate and the plans do not show this. Where this has occurred the following recommendations are provided:
 - a) Where unapproved lot filling has occurred the owner should be instructed to remove this material.
 - b) If recommendation 10.a) cannot be carried out then 70A notification on Certificate of Titles should be mandated if possible to identify that the lot has been partially filled with onsite fill and that construction over the fill is not permitted.
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11. Road design should be required to incorporate two way cross fall. Stormwater pipe where required should follow the high side of the road and a subsoil pipe should be placed in the stormwater trench and fed into pits.
12. That prior to approving any retaining walls the Shire ensure they are in receipt of the follow up responses to its queries on the structural requirements of the walls.
13. That the Shire requires the contractor to certify that it has built the retaining walls in strict accordance with the geotechnical and structural engineers' requirements.
14. That the Developer be required to provide an Urban Water Management Plan for all future stages of the subdivision.
15. Adequate bonds must be held for the works and for the maintenance period. Refer to the "Local Government Guidelines for Subdivisional Development" Edition 2, 2009 for information on:
 - Soil stabilization bond
 - Outstanding works bond
 - Landscape maintenance bond
 - Streetscape maintenance bond
 - Defects Liability bond
16. A Soil Stabilization Strategy should be required in order to control erosion, as per the "Local Government Guidelines for Subdivisional Development" Edition 2, 2009.
17. The Developer should provide the development plans for the POS to the Shire's requirements. The development plans should incorporate the requirements of the Urban Water Management Plan should there be a requirement for water detention, sediment removal or filtering within the POS area.
18. Following approval of a POS development plan the Developer should be required to relocate or remove unsuitable material and to construct the POS to the approved plans.

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1. Introduction

Ascent Engineering was commissioned to assess the current damage to the Shire of Nannup's infrastructure at the subdivision at Lot 23 Brockman Highway, Nannup and to report on rectification costs. Ascent Engineering was also asked to provide comment on subdivisional engineering assessment relating to the subdivision to assist with the assessment process and future works compliance.

A visual inspection of the site was carried out on 24 June 2010. The purpose of the inspection was to identify and quantify failures in the existing works and to provide an estimate for their repair. The future design of the subdivision is also considered.

This Report has been set out with discussion and followed by recommendations for each stage of the works, including the Public Open Space (POS).

The Stages referred to in this report are as shown in the diagram below. Note that they do not necessarily reflect the exact stage numbers used by the Developer, but provide construction stages for reporting purposes.

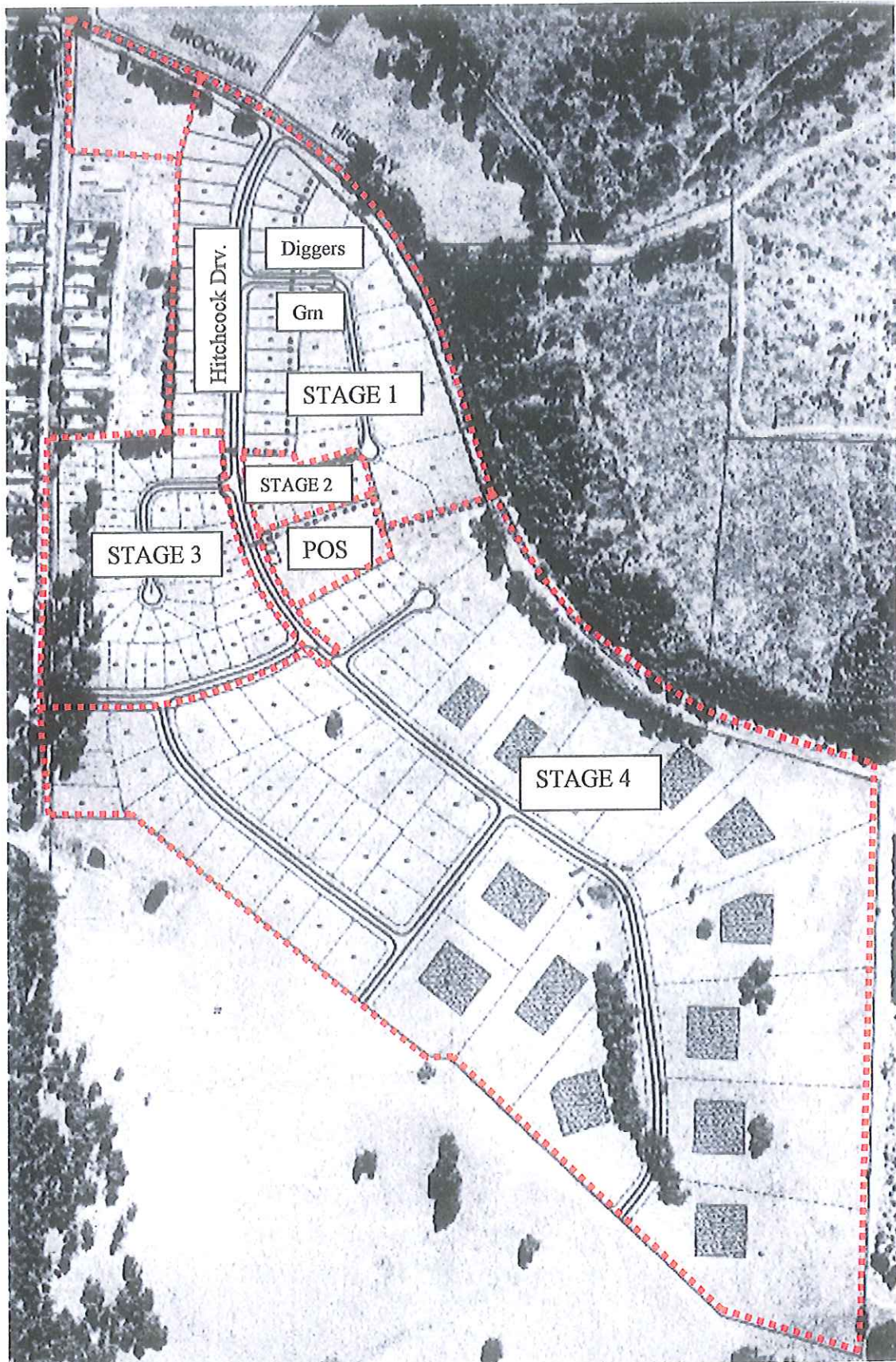


Figure 1. Subdivision Stages for Report Purposes

2. General

2.1. Shire Engineering Standards

Lot 23 Brockman Highway, Nannup has two characteristics which increase the complexity of engineering construction. The site is clayey making it geo-technically difficult, and it is hilly making it geometrically difficult to build on.

Sound Shire engineering assessment for the design and construction of the subdivision is important in order to minimise future failure risks to the subdivision and to minimise the risk of environmental or human harm.

The most recent Edition of the "Local Government Guidelines for Subdivisional Development" Edition 2, 2009 is a document suitable for adoption by local authorities for their subdivision standards. The organisation which sponsored this document, the Institute of Public Works Engineers Australia (IPWEA), is one that is strongly affiliated with local government engineering and is encouraging its uniform use across Western Australia in order to provide consistent standards throughout the State. It is an update of the early version of this document that is currently in use by the Shire of Nannup. The document also aligns with the current State government policy on many subdivision engineering requirements such as water management and "Liveable Neighbourhoods". Importantly it is free to download from the IPWEA website and use.

2.2. Subdivision Design

It is understood that the 1.5% of the superintendence fee was used for a peer review of the design. This approach is to be commended as it assists in ensuring a compliant design and is recommended for large future subdivisions.

For this reason it was not considered necessary to re-look at design for the Askino subdivision. However, in generally reviewing the plans the fundamentals of design for the project appear to be sound. It should be noted that comment is provided in the Stages 3 to 5 sections about a different approach to the road crossfall, stormwater pipe location and the use of subsoil pipe, given the issues that have surfaced in relation to subsurface water damaging the pavement.

2.3. Recommendations

1. That the Shire formally adopts the "Local Government Guidelines for Subdivisional Development" Edition 2, 2009 as its standard for subdivision works.
2. That for large subdivisions the Shire continues the practice of design peer review or other outsourcing of design review.

3. Stage 1

3.1. Existing Damage

The damage to the pavements, footpaths and verges within the subdivision is largely due to water intrusion. Surface water has caused extensive scouring of the verges and has washed soil onto the roads. It has undermined sections of footpath leaving them without support and it has eroded verges leaving deep channelling.

3.2. Pavements and Subsoil

The condition of the pavement is generally sound. There are two sections which are in poor condition however, the first being in Hitchcock Drive mid-hill (Figure 4.) and the second being over the top of the crest continuing past the Public Open Space.



Figure 2. Pavement Damage opposite POS

In the first location sub-surface water has penetrated the pavement wrecking this section of road. It is not clear whether there are any springs under the roads, whether the uphill service trenches that are filled with sand have tracked water in and under the pavement, or whether surface water has penetrated under the footpath and then under the pavement. In any case remedial installation of sub-soil drainage is needed to intercept the water and direct it into pits to prevent it from coming under the road.

Subsoil pipe should be adjacent to the footpath (clear of services) in the three locations shown below. The mid-hill subsoil should cross the low side of the pavement failure and finish in the existing pit. This will assist removal of water from under the pavement in this location. Each subsoil pipe should be 100mm diameter

wrapped in geofabric sock and in a granular material filled trench. They should commence with a flushing point have gradual fall and finish in an existing pit.



Figure 3. Subsoil Pipe Locations - Stage 1.

While the surface washout is obvious in Hitchcock Drive, there is also pavement deformation against the right hand side kerb (right looking up the hill), running up the hill. This is very likely related to ingress of water and vehicular traffic on the road. Heavy vehicles account for much more damage to pavements than do cars, particularly in relation to pavement deformation.

3.3. Repair Costs

Existing damage and the cost to repair is set out in the following table. Appendix A sets out the full dilapidation survey report and individual item costs. Costs are in 2010 values and exclude the Public Open Space (POS). This section remains the responsibility of the Developer.

STAGE 1 SHIRE COSTS SUMMARY				
	Cost (\$) excl. GST			
Component	Severity 1	Severity 2	Severity 3	Total
Drainage	\$0	\$ 1,500	\$ 500	\$ 2,000
Kerb	\$0	\$ 2,030	\$ 1,680	\$ 3,710
Footpath	\$0	\$ 10,296	\$ 10,392	\$ 20,688
Pavement & Subsoil	\$0	\$ 12,900	\$ 11,950	\$ 24,850
Landscape	\$0	\$ 630	\$ 2,475	\$ 3,105
General	\$0	\$ 869	\$ 869	\$ 1,738
Total	\$0	\$ 21,225	\$ 27,866	\$ 56,091

NOTES		
Severity Interpretation		
Level	Description	Action Required
1	Minor defects	Routine maintenance inspection only required
2	Intermediate defects which may lead to safety hazards or failure to perform	Program for repair - carry out programmed maintenance over the next three years
3	Defects causing immediate hazard to pedestrians or vehicles or performance failure	Immediate repair required

Table 1. Stage 1 Damage Severity and Cost Summary

It is understood that Stage 1 of the project, excluding the POS has been handed over to the Shire of Nannup and that the maintenance period has ended. Costs for rectification are therefore the responsibility of the Shire, unless determined otherwise through legal interpretation.

Examples of Severity 1, 2 and 3 damage is shown in the photographs below.



Figure 4. Pavement Damage Severity 3



Figure 5. Footpath Damage Severity 3



Figure 6. Footpath Damage Severity 2



Figure 7. Kerb Damage Severity 3

4. Stage 2

4.1. Lots with Fill and Retaining Walls

Lot filling using clayey material is unacceptable using clayey soils. The plans do not specify this and it creates a significant risk to the future buildings of excessive settlement and cracking. Where filling is necessary behind retaining walls granular material is specified in the plans and certification is required. Where this has occurred it must be removed by the Developer and must not be permitted in future stages.

4.2. Recommendations

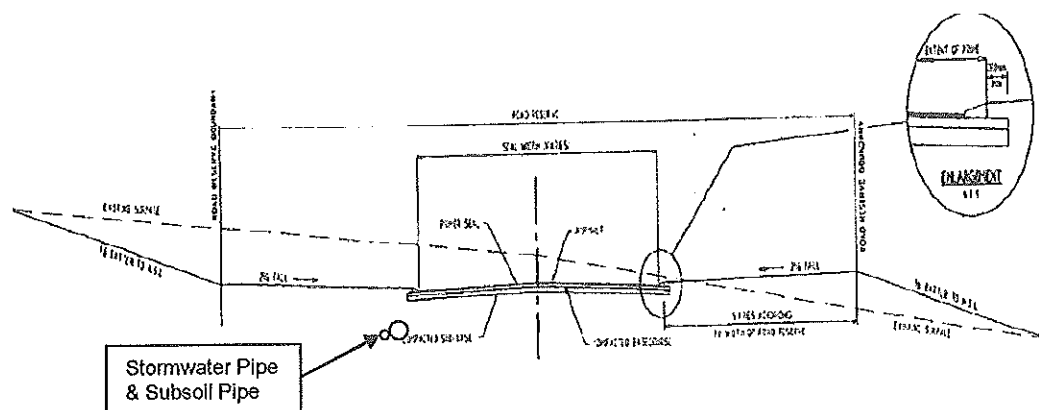
1. The recommendation regarding lot filling for Stage 1 applies to Stage 2 also.
2. Recommendations regarding Stages 3 & 4 pertaining to the retaining walls apply also to Stage 2.

5. Stages 3 & 4

5.1. Design - Crossfall, Stormwater Pipes and Subsurface Pipes

This site, along with others to be developed in Nannup, requires design and construction techniques which differ from that of the Swan Coastal Plain. Hitchcock Drive has been designed as a one way crossfall road with the stormwater drainage running along the downhill side of the pavement. The experience of both Hitchcock Drive and Diggers Green is that sub-surface water has penetrated under the pavement and therefore it is recommended that a different design approach be taken for the remainder of the roads in the subdivision to minimise the likelihood of this problem from re-occurring.

It is recommended that a more traditional two way pavement crossfall be required with the stormwater drainage pipe on the uphill side of the road. Lateral pipes would then pick up the flows on the down hill side of the pavement. Alongside the stormwater pipe (in the same trench) a subsoil pipe should be provided. This will then intercept the subsurface water and direct it into the stormwater system before it gets under the pavement. This approach aligns with the recommended standard cross section for urban roads in the "Local Government Guidelines for Subdivisional Development" Edition 2, 2009, as shown below (p.53).



3.4. Landscaping / Erosion Control

Erosion control is a major issue for this subdivision. Backfilling of the existing scours areas and protection with a product such as Enviromat (from Geofabrics Australia) to stop further erosion is required. Seeding and watering should be carried out to establish vegetation.

While erosion has been listed as severity 3 in some cases, it will be difficult to repair the damaged areas during winter. In this case then appropriate pedestrian safety barriers should be installed and the works carried out at a more favourable time.



Figure 8. Erosion Adjacent to Brockman Hwy



Figure 9. Erosion Adjacent to Footpath in Hitchcock Drive

As the subdivision is built out storm water will be controlled, vegetation will be established and the erosion will be significantly reduced. In the interim however, stabilisation measures are required. Lot owner must be required to pipe their stormwater overflows to the road pavement and this will require them to replace some sections of footpath.

3.5. Retaining Walls and Lot filling

While no retaining walls were specified for the subdivision Stage 1 works there are now individual lot owners putting in boundary retaining walls. This may be contrary to the intent of the subdivision guide plan for visual amenity reasons. Boundary retaining walls should not be approved if they are not permitted in the subdivision guide plan.

If boundary retaining walls are permitted then they must be subject to profession design, including any backfilling material and they must be certified as being built to correct standards. Adjustment to services entering the lots will be needed to protect them and bring them to the surface. Subsoil pipes behind the retaining walls will need to be constructed with an appropriate outlet onto the pavement. As-constructed information should be provided to the Shire.

3.6. Recommendations

The following recommendations are made with respect to Stage 1 of the subdivision.

3. **Severity 3 defects** should be repaired as soon as possible as they represent present hazards to pedestrians or vehicles.
4. **Severity 2 defects** should be monitored and programmed for repair over the next two years.
5. **Severity 1 defects** should be monitored only as part of the Shire's general maintenance program and programmed for repair only as required.
6. An end of road sign (chevron board D4-5) should be installed at the end of the asphalt pavement near the top of Hitchcock Drive. The section of road beyond this point should be formally closed temporarily under section 3.50A of the Local Government Act 1995, until the Developer repairs this section of the road.
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9. The owner of **lot 4** on the inside of the bend in Diggers Green should be issued with a notice to prevent the movement of further soil off this property onto the road.
10. **Lots filled subsequent to clearance** - The filling of residential building lots should meet Shire and the Design Engineer's standards. Partially cutting into the block and using the excess material to fill the low side is not appropriate and the plans for Stage 1 do not show this. Where this has occurred the following recommendations are provided:
 - a) Where unapproved lot filling has occurred the owner should be instructed to remove this material.
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Figure 10. Typical Cross Section - Urban Residential Areas

The location for the stormwater pipe and subsoil pipe have been added to the above diagram to showing where subsurface water would be intercepted before it can get under the pavement.

Two way crossfall on a road also eliminates water sheeting across the road from house stormwater outlets into the low side drainage network. This is the current situation for Hitchcock Drive.

Finally a road with two way crossfall also makes it much easier to provide for a 1 in 100 year flow path within the road reserve as the roadway will hold significantly more water than a road with one way crossfall (tilted downhill).

5.2. Retaining Walls

The subdivision plans held by the Shire note a “final design subject to independent geotechnical assessment and structural certification”.

Geotechnical assessment has been carried out. Structural Design of the Retaining walls has been obtained by the Developer and approved by the Shire; however the design requires significant additional information in order to be able to adequately assess it. The Shire has now requested further information from the Structural Engineer. It is important to follow through on this matter as the risks arising from unstable retaining walls can be catastrophic.

During the construction phase particular care needs to be taken for the appropriate protection of services entering the property under retaining walls and the owner must ensure that the contractor meets the standards of the authorities for brining the services to their correct finished level.

5.3. Water Management

The Western Australian Planning Commission requires the production of Urban Water Management Plans for subdivisions and this document assesses and addresses the control of water quantity and quality on site using water sensitive design principles.

The Developer should be required to produce an Urban Management Plan to address water and sub-surface water flow and quality issues.

Issues to be addressed in the Urban Water Management Plan include the future drainage outlet past Brockman Hwy. Consideration should be given to placing future drainage into the closed road to give access to the creek.

Onsite detention storage must also be considered. It is standard practice to require 1m^3 of storage per 100m^2 of impervious surface to be detained onsite and released at no greater than pre-development flows. By providing infiltration soak wells this aids recharge of ground waters and helps prevent increased peak flows downstream of a subdivision. It is particularly suited to sandy soils where the infiltration rate is high.

In clay soils, however, the infiltration rate is low and this mechanism becomes less useful in dealing with returning the water to the sub-surface.

This specific site is steep and there are many retaining walls proposed for the subdivision and designing infiltration into the ground above retaining walls adds to the risk that the retaining wall will be subject to water pressure forces.

The following should be addressed in the Urban Water Management Plan, relating to onsite detention:

- a) The geotechnical engineer should determine site infiltration rates given the clayey soils.
- b) The geotechnical engineer should assess the capacity of the soil to infiltrate the retained waters for standard lot impervious areas. If the geotechnical assessment finds that infiltration is not going to be effective, then the Urban Water Management Plan must acknowledge this and take it into account when designing the stormwater system.
- c) Consideration should be given to preventing the use of soak wells on lots with retaining walls in any case. Detention should still be used, with slow release outlets, but not with pervious soak wells.

An Urban Water Management Plan will address all of the water and stormwater issues for the subdivision and ensure that it meets the requirements of the state government and Shire standards.

5.4. Bonds

The use of bonds on subdivision works provides security to the Shire in the event that the Developer is unable to comply with his obligations for safety, repairs, or environmental protection of the subdivision. The "Local Government Guidelines for Subdivisional Development" Edition 2, 2009 provides standard bond arrangements for a series of aspects of the subdivision including soil stabilization, outstanding works, landscape maintenance, streetscape maintenance and a defects liability bond. Typically these bonds are set at the value of the maintenance works plus a margin to allow the Shire to have the work carried out itself if necessary.

The use of adequate bonds is recommended for this and all Shire subdivisions.

5.5. Soil Stabilization Strategy

A soil stabilization strategy is a standard requirement of the "Local Government Guidelines for Subdivisional Development" Edition 2, 2009. Given the terrain and the current state of the subdivision with respect to erosion, the development and implementation of a soil stabilization strategy is recommended.



Figure 11. Stage 3 Erosion



Figure 12. Stage 3 Erosion

5.6. Recommendations

11. Road design should be required to incorporate two way cross fall. Stormwater pipe where required should follow the high side of the road and a subsoil pipe should be placed in the stormwater trench and fed into pits.
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6. Public Open Space

The Public Open Space (POS) has been used by the Developer as a site for depositing excess fill and rubble and not all of the material being placed in the Public Open Space (POS) is suitable to be located under buildings and other structures. Before any further filling is carried out in the Public Open Space, the final landscaping and use of the building must be determined, including the nature and location of buildings, paths lighting and any stormwater detention.



Figure 13. POS Uncontrolled Fill

6.1. Recommendations

17. The Developer should provide the development plans for the POS to the Shire's requirements. The development plans should incorporate the requirements of the Urban Water Management Plan should there be a requirement for water detention, sediment removal or filtering within the POS area.
18. Following approval of a POS development plan the Developer should be required to relocate or remove unsuitable material and to construct the POS to the approved plans.

7. Conclusions and Recommendations

This report provides details and costings for the repair of the existing stage of the Askino subdivision that has been handed over to the Shire. The damage has been categorized into 3 severity groups. Severity group 1, only requires general inspections to monitor deterioration, but is not severe enough to warrant repairs at this stage. Severity group 2 repairs valued at \$21,225 + GST are those which need to be programmed for work in the coming two years. Severity group 3 works are in need of immediate repair and these works are \$27,866 + GST.

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8. Reference List

Austroads, 2003, *Rural Road Design, A Guide to the Geometric Design of Rural Roads*, 8th Ed.

IPWEA, 2009, *Local Government Guidelines for Subdivisional Development*” Edition 2

Appendices

Appendix A – Dilapidation Survey

<p align="center">Shire of Nannup Lot 23 Brockman Highway Subdivision Askino Pty Ltd - Developer</p> <p align="center">Dilapidation Survey - Drainage</p>						
Brockman Highway						
Item No.	Description	Location	Comment	Severity	Cost	
1	Subsidence near pit	Cnr Brockman and Road 1 south side	Possible pit integrity issues	3	\$500	
2	Siltation around pit	About 55m south of Cnr of Brockman and Rd 1	Entry silting	2	\$1,200	
3	Settlement around pit	About 100m south of Cnr of Brockman and Rd 1	Ground settling/scouring under rockwork	2	\$300	
			Total	Severity 1	\$0	
			Total	Severity 2	\$1,500	
			Total	Severity 3	\$500	
NOTES						
Inspection excludes internal stormwater pipe or subsoil pipe assessment.						
Severity Interpretation						
Level	Description	Action Required				
1	Minor defects	None - routine maintenance inspection only required				
2	Intermediate defects which will lead to safety hazards or failure to perform	Program for repair - carry out programmed maintenance over the next two years				
3	Defects causing immediate hazard to pedestrians or vehicles or performance failure	Immediate repair required				

Shire of Nannup
Lot 23 Brockman Highway Subdivision
Askino Pty Ltd - Developer

Rate to remove
and replace (\$/m) \$ 70

Dilapidation Survey - Kerb

Item No.	Description	Location	Severity	Length (m)	Rate (\$/m)	Cost (\$)
Hitchcock Drive						
1	Cracking	RHS; Commencing from Brockman Hwy	1	8.7	-	\$ -
2	Cracking	RHS	1	6	-	\$ -
3	Cracking	RHS	1	30.6	-	\$ -
4	Cracking	RHS	1	236.3	-	\$ -
5	Cracking	LHS; Top of hill	2	6	\$ 70	\$ 420
6	Cracking and Chipping	LHS; 5 to 15m north of pit near top of hill	2	4	\$ 70	\$ 280
7	Cracking and Movement	LHS; about 20m uphill of 2nd top pit	2	4	\$ 70	\$ 280
8	Cracking and Movement	LHS; about 5m downhill from 2nd top pit	2	2	\$ 70	\$ 140
9	Cracking and Chipping	LHS; across and near driveway of house	3	24	\$ 70	\$ 1,680
10	Cracking and Chipping	LHS; high side of kerb return at Diggers Green	2	2	\$ 70	\$ 140
11	Cracking	Full length expect where greater severity	1	200.4	-	\$ -

Diggers Green

12	Cracking	LHS; cul-de-sac head clockwise from light pole	1	10	-	\$ -
13	Cracking	RHS; cul-de-sac head clockwise from midpoint at end	2	7	\$ 70	\$ 490
14	Cracking	RHS; most segments from cul-de-sac end	1	207.6	-	\$ -

Dilapidation Survey and Subdivision Engineering Report

15	Chipping	RHS; about 25m from intersection TP	2	2	\$	70	\$	140
16	Cracking	LHS; about 8m from intersection TP	2	2	\$	70	\$	140
17	Cracking	LHS; many segments	120	1		-	\$	-
			Total	Severity 1	\$	-		
			Total	Severity 2	\$	2,030		
			Total	Severity 3	\$	1,680		

NOTES

Assessment was carried out for each kerb segment which is 2m long, so 10m equals 5 segments.

Severity Interpretation

Level Description Action Required

1 1 to 3 minor cracks or chips per 2m kerb segment

None - routine maintenance inspection only required

2 > 3 cracks, or large crack, or large chipping or slight movement in kerb segment

Program for repair - carry out programmed maintenance over the next two years

3 Damage to kerb presents pedestrian tripping hazard, or allows water penetration to pavement, or dislodgement risk

Immediate repair required

Cost

Costs are GST exclusive
Cost allow for demolition, disposal and replacement of kerb

Shire of Nannup
Lot 23 Brockman Highway Subdivision
Askino Pty Ltd - Developer

Rate to
remove
and replace
(\$/m²) \$
120

Dilapidation Survey - Footpath

Item No.	Description	Location	Severity	Length (m)	Width (m)	Area (m ²)	Rate (\$/m ²)	Cost (\$)
Brockman Highway								
1	Missing	nth west cnr Brockman and Hitchcock	3	3	2	6	\$ 120	\$ 720
2	Cracking & minor movement	nth west of item 1	2	10	2	20	\$ 120	\$ 2,400
3	Missing	nth west of item 2	3	6	2	12	\$ 120	\$ 1,440
4	Cracking & minor movement	nth west of item 3	2	2	2	4	\$ 120	\$ 480
Hitchcock Drive								
5	Missing	RHS at start of hill	3	22.3	2	44.6	\$ 120	\$ 5,352
6	Cracking and/or deformation	RHS above missing section, item 6	3	4	2	8	\$ 120	\$ 960
7	Cracking and/or deformation	RHS above item 7	2	2	2	4	\$ 120	\$ 480
8	Cracking	RHS above item 8	1	4	2	8	\$ -	\$ -
9	Cracking and/or deformation	RHS above item 9	2	4	2	8	\$ 120	\$ 960
10	Cracking	RHS above item 10	1	4	2	8	\$ -	\$ -
11	Cracking	RHS above item 11	1	4	2	8	\$ -	\$ -
12	Cracking and/or deformation	RHS above item 12	2	8	2	16	\$ 120	\$ 1,920

Dilapidation Survey and Subdivision Engineering Report

13	Cracking and/or deformation	RHS above item 13		3	8	2	16	\$ 120	\$ 1,920
14	Cracking	RHS above item 14		1	2	2	4	\$ -	\$ -
15	Cracking	RHS above item 15		1	8	2	16	\$ -	\$ -
16	Cracking and/or deformation	RHS above item 16		2	4	2	8	\$ 120	\$ 960
17	Cracking	RHS; high side of 2nd house		1	10	2	20	\$ -	\$ -
18	Cracking	RHS; up from item 18, opposite light pole		2	10	2	20	\$ 120	\$ 2,400
19	Cracking	RHS; up from item 19		1	2	2	4	\$ -	\$ -
20	Cracking	RHS; up from item 20, near top of hill		2	2	2	4	\$ 120	\$ 480
21	Cracking	RHS; up from item 21		1	12	2	24	\$ -	\$ -
22	Cracking	LHS; near Diggers Lane, next to pit		1	1	1.2	1.2	\$ -	\$ -
Diggers Green									
23	Cracking and chipping	RHS; at pram ramp		2	1.5	1.2	1.8	\$ 120	\$ 216
24	Cracking	RHS; over whole length		1	10	1.2	12	\$ -	\$ -
								Total Severity 1	\$ -
								Total Severity 2	\$ 10,296
								Total Severity 3	\$ 10,392

NOTES

Assessment was carried out for each footpath segment which is 2m long, so 10m equals 5 segments.

Severity Interpretation Level

Action Required

None - routine maintenance inspection only required

1 minor cracks per 2m footpath segment

2	> 3 cracks, or large crack or slight movement in footpath segment Missing footpath. Damage to kerb presents pedestrian tripping hazard, or allows water penetration to pavement, or dislodgement risk	Program for repair - carry out programmed maintenance over the next two years
3		Immediate repair required

Rate to install subsoil pipe (\$/m)	\$ 100
Rate to remove and replace pavement (\$/m ²)	\$ 150

	(\$/m ²)	\$
150		

Total	Severity 1	\$ -
Total	Severity 2	\$ 12,900
Total	Severity 3	\$ 11,950

NOTES

Location RHS refer to the right hand side standing at the intersection of Brockman Hwy and Hitchcock Drv looking up Hitchcock Drv.

Severity Interpretation

Level	Description	Action Required
1	Minor deformation	None - routine maintenance inspection only required
2	Minor cracks, or moderate deformation	Program for repair - carry out programmed maintenance over the next two years
3	Damage to pavement presents vehicle hazard, or allows water penetration to pavement	Immediate repair required

Shire of Nannup									
Lot 23 Brockman Highway									
Subdivision									
Askino Pty Ltd - Developer									
Dilapidation Survey - Landscape									
Rate to repair and install enviromat or similar (\$/m ²) \$ 15									
Item No.	Description	Location	Severity	Length (m)	Width (m)	Area (m ²)	Rate (\$/m ²)	Cost (\$)	
Brockman Hwy									
1	Embankment erosion	South side of road, east of Hitchcock	2	20	2.1	42	\$ 15	\$ 630	
Hitchcock Drive									
2	Verge erosion	RHS; behind footpath	3	150	1.1	165	\$ 15	\$ 2,475	
Total							Severity 1	\$ -	
Total							Severity 2	\$ 630	
Total							Severity 3	\$ 2,475	
NOTES									
Location	RHS refer to the right hand side standing at the intersection of Brockman Hwy and Hitchcock Drv looking up Hitchcock Drv.								
Severity Interpretation Level	Description	Action Required							
1	Valleys no deeper than 50mm, greater than 0.5m apart	None - routine maintenance inspection only required							

2	Valleys 50mm to 200mm, or less than 50mm and less than 0.5m apart	Program for repair - carry out programmed maintenance over the next two years
3	Valleys in excess of severity 2 and damage presents pedestrian or vehicle hazard	Immediate repair required

Shire of Nannup

Lot 23 Brockman Highway Subdivision

Askino Pty Ltd - Developer

Dilapidation Survey - General

Item No.	Description	Location	Severity	Length (m)	Width (m)	Area (m ²)	Rate (\$/m2)	Cost (\$)
Hitchcock Drive								
/Units								
1	Missing Street Name	cnr Brockman and Hitchcock	2	0	0	1	\$ 500	\$ 500
2	Sand and Soil deposition on Road	RHS; adjacent to first house	2	20	2	40	\$ 1	\$ 30
3	Sand and Soil deposition on Road	RHS; adjacent to 2nd house	2	50	2	100	\$ 1	\$ 75
4	Missing end of road warning sign	end of asphalt	3	-	-	1	\$ 700	\$ 700
Diggers Green								
5	Sand and Soil deposition on Road	high side of bend; No 4	3	15	15	225	\$ 1	\$ 169
6	Sand and Soil deposition on Road	Cul-de-sac head	2	20	2	40	\$ 1	\$ 30
7	Weeds growing on footpath	RHS, full length	2	210	1.2	252	\$ 2	\$ 504
Total							Severity 1	\$ -
Total							Severity 2	\$ 1,139
Total							Severity 3	\$ 869

NOTES

Severity Level	Interpretation Description	Action Required
1	minor damage/omission	None - routine maintenance inspection only required
2	moderate damage/omission	Program for repair - carry out programmed maintenance over the next two years

Dilapidation Survey and Subdivision Engineering Report

3	Damage to presents pedestrian tripping hazard or vehicle hazard	Immediate repair required
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