Fence Road arterial drainage project

Project development and governance case study report

Looking after all our water needs
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Department of Water

November 2011
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Summary

Effective management of salinity and waterlogging in the Western Australian Wheatbelt is vital to ensure the long-term health and prosperity of our communities and the environment. It is expected that salinisation due to a rising watertable will continue to be a significant management issue in the Wheatbelt and is expected to continue increasing in extent.

Communities in the Wheatbelt are working to improve their land and prevent further degradation from salinity and waterlogging by using a range of catchment and property scale management tools. One such widely used tool is surface water and groundwater management using deep drainage.

The Fence Road arterial drainage project in Dumbleyung is an example of a deep drainage system that has been instigated through a cooperative approach between the local community and local and state government.

The aim of the project was to trial a drainage system that provided an opportunity to safeguard productive agricultural land currently at risk from rising groundwater and salinity. This project would provide an example of rigorous governance including project planning, implementation, management and assessment through monitoring.

The governance process used was the most comprehensive undertaken in the state so far for a drainage project of this size. Hence the evaluation of this project and the knowledge gained from it are crucial for communities and government to better plan for future drainage proposals in the Wheatbelt.

This case study looks at the development of the project and its relationship to wider catchment planning in Dumbleyung.

The study also looks in detail at the specific governance process undertaken for the project including determining management responsibilities, securing approvals, land access and tenure, financial arrangements and longer term management.

A long-term challenge will be to ensure that, through good governance, planning and implementation, drainage projects in Dumbleyung consider and effectively manage the existing social, environmental, cultural and economic values. This can only be achieved by applying knowledge gained from the Fence Road project, previous catchment-wide studies and other drainage projects in the state.

The recommendations from the project are grouped below:

- Implementation of the various studies and projects established and supported by the Dumbleyung Water Management Strategy Steering Committee (DWMSSC) could contribute to the development of a catchment water management plan for the Dumbleyung Landcare Zone (DLZ). However, it has been recognised that the formation of the plan should not be exclusively based on a catchment-wide arterial drainage scenario.

- The governance model selected for drainage projects should be based on the expected scale and complexity of the project. So, low risk drainage projects
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covering single properties or a small group of properties may not require comprehensive governance, while higher risk drainage projects covering numerous properties and those that require significant planning, investigation and assessment may require more comprehensive governance.

- Agreements on responsibilities for long-term management of the project should be completed early in the project planning phase and where possible confirmed prior to drain construction.
- Provision and location of easements should be confirmed early in the project planning phase as they may affect the overall benefit-cost of the project. Drains with easements may take up greater land areas at higher cost than drains without easements.
- A benefit-cost analysis should be carried out for the constructed Fence Road project.
- The requirement for a licence to provide drainage services may be waived where the project is not in a controlled area and where the project proponents are able to effectively carry out that role.
- Proponents of drainage projects when assessing project viability will need to consider the effects their project may have on a number of values (e.g. social, environmental, cultural and economic).
- Proponents of drainage projects will need to identify on-site and downstream assets that may need to be protected and managed from project effects, such as seasonal access requirements, roads, rail and houses, and important groundwater and surface water assets like dams, soak, wells and lakes.
- The location, standard and cost-sharing arrangements for installation of fencing along drainage channels should be confirmed during the planning phase prior to drain construction.
1 Introduction

The Fence Road arterial drainage project constructed between November 2007 and April 2008 was an initiative of the Dumbleyung Water Management Strategy Steering Committee\(^1\).

The committee was established in August 2000 to address salinity and waterlogging problems in the Lake Dumbleyung catchment, known to be at risk from rising groundwater and salinisation, with parts of the catchment already affected.

The objectives of the committee were:

- to support studies and implement salinity management projects that increase the overall knowledge of the local community and state
- to undertake comprehensive planning for deep drainage including consideration of the catchment’s social, cultural, environmental and economic values
- to support the implementation of a whole-of-shire integrated catchment water management plan for the Dumbleyung area, specifically the Dumbleyung Landcare Zone, to address salinity and waterlogging problems in the catchment.

The committee instigated and supported a number of catchment-wide studies that could be used to help develop an integrated catchment water management plan for the DLZ. At the time it was expected that a DLZ-wide arterial drainage project would be a core component of this plan.

The Fence Road arterial drainage project is much smaller in scale than the DLZ-wide arterial drainage project originally scoped by the committee. However, many of the broader studies supported by the committee contributed to the effective planning and implementation of the project.

Specific objectives for the Fence Road project were:

- to initiate a trial arterial deep drainage project that would demonstrate rigorous governance, including project planning, implementation, ongoing management and assessment including monitoring
- to construct an arterial drainage system that would provide landowners with the opportunity to safeguard land areas at risk from rising groundwater and salinity.

During the project life the Wheatbelt Drainage Council was established by government to develop a policy framework for inland drainage in Western Australia.

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\(^1\) The DWMSSC had representation from the Shire of Dumbleyung (the shire), Blackwood Basin Group, The Commonwealth, Scientific and Industrial Research Organisation (CSIRO), the Department of Water (the department), Department of Agriculture and Food WA (DAFWA), Department of Environment and Conservation (DEC), Dumbleyung Landcare Zone Committee, local Land Conservation District Committee (LCDC) and community members including the local Indigenous community.
The planning and governance of the project was periodically assessed against, and aligned well with draft components of this framework, which is yet to be finalised.

The committee disbanded in August 2008 and an ongoing commitment was made by the Dumbleyung Landcare Zone Committee (DLZC) to work with local and state government agencies to establish an integrated catchment water management plan for the DLZ.
2 Catchment planning

A study on suggested governance arrangements for drainage in the Dumbleyung Landcare Zone, completed in 2006 on behalf of the Dumbleyung Water Management Strategy Steering Committee, aimed to develop a model for arterial drainage governance that would be acceptable to the Dumbleyung community and local and state government agencies (URS 2006c).

This study was part of the integrated catchment water management planning for the shire’s local government area under the Rights in Water and Irrigation Act 1914 that included a large catchment-wide arterial drainage system.

The scenarios scoped for the governance model were:

- Department of Water/DWMSSC/local government model
- DAFWA/LCDC/local government model
- Department of Planning/licensed local government model
- Department of Water/licensed local government model.

The preferred model selected was for the Department of Water and the shire to be the primary planning agencies, for the following reasons:

- The department was recognised as the lead agency responsible for catchment planning in Western Australia, and could provide technical support in the planning and implementation stages.
- The shire had the capacity and statutory responsibility under the Local Government Act 1995 to provide community services which would be suited to the delivery of large-scale drainage.
- It was expected that the shire would obtain a licence from the Economic Regulatory Authority (ERA) under the Water Services Licensing Act 1995 for the delivery of drainage services. This would provide assurance to government, the service provider, external investors and the beneficiaries on the long-term management of a catchment-wide arterial system (URS 2006c).

As the Fence Road project was developed at a much smaller scale than the DLZ-wide arterial drainage project originally scoped, the following variations in the governance model for the project were negotiated:

- The DWMSSC, shire and landowners would be project proponents with the department as a member of the DWMSSC providing technical support for planning and implementation.
- The scale of the project was not seen as sufficient to warrant the development of a catchment water management plan.

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2 During the initial years of development there was no state level guidance to assist in project planning or identification and assessment of governance options. The project therefore undertook numerous studies to investigate the best approaches. There has since been progress in developing a policy framework for inland drainage in Western Australia that, when completed, will assist proponents for similar projects in the future.
• It was also recognised that the shire would not require a licence from the ERA to provide drainage services, including maintenance and access for the project.
• The project was considered a low priority for inclusion as a Controlled Area for Drainage\(^3\).

The study determined that the following processes were necessary to effectively manage the project:

• confirming planning approval and obtaining approvals
• setting up the governance structure
• securing land access and tenure
• securing financial arrangements including determining capital and operating costs
• managing risk through effective drainage policy
• reporting and assessment through monitoring (URS 2006c).

Some other studies that informed the planning of the Fence Road project:

• A social survey in 2006 involving 35 landowners. The survey investigated landowners’ use of and tolerance to a variety of practices to tackle dryland salinity, including views on funding and management of a large ‘catchment-wide’ arterial system. The surveyed community were keenly aware of the issues relating to salinity and waterlogging and viewed drainage as a viable management tool (URS 2006b).

• A detailed Indigenous assets, values and Aboriginal heritage survey was conducted for the DLZ to ensure that Aboriginal values of the area were protected and that any future works relating to implementation of a catchment-wide management strategy for Dumbleyung would not be in conflict with the Aboriginal Heritage Act 1972. The survey investigated the Aboriginal community’s perspectives of dryland salinity, a detailed assessment of the Fence Road catchment and a review of the cultural values of Lake Dumbleyung (Goode & Irvine 2007).

• A benefit-cost analysis examining a range of arterial drainage options in Dumbleyung found there was a positive benefit-cost ratio for a ‘catchment-wide’ arterial drainage system for the DLZ (URS 2006a).

• A salt and water balance study of Lake Dumbleyung and catchment gave a broader assessment of the effects of drainage and other engineering options on Lake Dumbleyung (Bari 2005).

• The Beynon Road deep drainage demonstration site constructed in 2002 under the DWMSSC and later part of the state government’s $4 million

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\(^3\) The Water Services Licensing Act 1995 establishes a licensing regime for the provision of water services in controlled areas in the state. Two examples are Metro Controlled Area (Drainage) and the South West Region Controlled Area (Drainage). Currently there are no Controlled Areas for Drainage in the Western Australian Wheatbelt.
Engineering Evaluation Initiative to establish an effective drainage system that demonstrated design, construction, maintenance techniques and monitoring of downstream effects (Cox 2002).
3 Project description

3.1 Site selection

The location of the Fence Road project in the Lake Dumbleyung catchment and Fence Road subcatchment was selected because the local land areas are at risk from rising groundwater and salinisation, with some parts of the subcatchment already affected.

In Whitfield’s hydrological study of the Dongolocking Reserves in 2001 he describes secondary salinisation in the broad valley floors in the catchment as being predominantly caused by concentration of salts in the soil through evaporation by capillary rise from a shallow, saline watertable (Whitfield 2001).

Salinity risk mapping undertaken through the Land Monitor program has highlighted this risk by modelling historical groundwater trends and predicting future salinisation (Wallace 2002; Figure 1).

The project layout was designed to ensure that groundwater drainage channels aligned with the catchment’s broad valley floors.

As part of site selection groundwater levels and water quality were measured in 26 trial pits in the Fence Road subcatchment. The results helped to locate the drain’s individual drainage alignments and depths.

The average depth to groundwater was 1.3 m, the average water quality was pH 5.1 and salinity 38 900 mg/L TDS (seawater is 35 000 mg/L).

So a 2 m deep drainage system was deemed suitable for the area, ensuring groundwater would be intercepted by most drainage channels. This depth would also provide an opportunity for landowners to connect future paddock-scale and farm-scale drains or drainage networks to the system, effectively safeguarding their land.

3.2 Site characteristics

The Fence Road project is a 58 km long arterial drainage system situated approximately 260 km south-east of Perth in the Fence Road subcatchment.

The drainage system consists of approximately 36.5 km of groundwater drainage channels, 17.5 km combined surface and groundwater drainage channels and 4 km of piped subsurface drainage (Figures 2 and 3).

The drainage system covers an area of approximately 250 km² with a contributing catchment area of 1040 km² comprising the Upper Dongolocking Creek, Kukerin Gully, Harrismith Creek and Tincurrin Creek. The drainage system discharges at Dumbleyung–Lake Grace Road approximately 46 km upstream of Lake Dumbleyung (Figure 4).
The Fence Road subcatchment area is comparable to other landforms in the wider Lake Dumbleyung catchment and is characterised by broad, often saline, valley floors with narrower valleys and alluvial plains in the upper catchment. The valley floors are surrounded by gently undulating slopes with elevations between 280 m and 400 m AHD.

Soil types in the catchment are typically saline wet soils with sandy and loamy duplexes on valley floors, sandy duplexes on slopes and deeper duplexes, sandy gravels and deeper sandy soils on crests (Whitfield 2001).

Regionally, groundwater levels have risen substantially since clearing, remobilising salts stored in the regolith and causing soil salinisation where the watertable is within a few metres of the surface (Whitfield 2001).
Figure 2  Combined surface and groundwater channel

Figure 3  Groundwater only drainage channel

Figure 4  Dumbleyung Landcare Zone 7, showing the Fence Road project area and catchment, and the Beynon Road catchment
4 Project planning

A feature of the project has been the rigour of the planning and approval phase.

The project has complied with all relevant legislation and regulations for this type of infrastructure project, addressing the social, cultural, environmental, and economic values for the catchment.

It was decided during the initial planning phase that the Dumbleyung Water Management Strategy Steering Committee, landowners and the shire would be the proponents of the project and be responsible for coordinating funding, planning approvals, and design.

The shire contributed in areas such as managing project funds, coordinating site investigations, permits, offsets, and contract management. As a DWMSSC committee member the Department of Water provided support throughout the planning and implementation phase. Figure 5 illustrates the project’s planning process.

![Figure 5 Project planning process](image)

4.1 Securing finance

Funding totalling $1 623 000 for planning and construction of the project was obtained through the South West Catchments Council (SWCC) National Action Plan for Salinity and Water Quality.

A large in-kind contribution of $1 129 000 was provided by landowners, the shire and government agencies, including the Department of Water, DAFWA, CSIRO, and DEC.

A total of $309 000 was obtained from other external grants for planning, construction works and governance studies. Table 1 is a summary of project funding and in-kind support for the project.
Table 1  Summary of project funding and in-kind support

<table>
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<th>SWCC funding $</th>
<th>Other external grants $</th>
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<th>Shire in-kind $</th>
<th>Landowner in-kind $</th>
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<td>139 000</td>
<td>115 000</td>
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<td>309 000</td>
<td>709 000</td>
<td>179 000</td>
<td>241 000</td>
</tr>
</tbody>
</table>

4.2 Environmental impact assessment

A project environmental impact assessment report was prepared in June 2006 in accordance with recommendations set out by the Commissioner of Soil and Land Conservation during the notice of intent to drain assessment.

The report was prepared by the department on behalf of the DWMSSC, with advice and input from DEC. The report assessed the potential effects of the project on watercourses, reserves and threatened flora and fauna in the vicinity of the proposed drainage area and downstream receiving environment (DWMSSC 2006).

Three stages of development of the drainage system were assessed:

- potential groundwater discharge and surface water runoff via the arterial drain and subdrains required to safeguard land ‘at risk’
- the expected groundwater discharge and surface water runoff during the construction of the arterial drain
- the expected groundwater discharge and surface water runoff from the completed drain.

The Coleman-Meney model was used to assess the downstream effects of drainage discharge on the immediate receiving watercourse, on the Dongolocking Creek and on the final receiving water body – Lake Dumbleyung (Coleman & Meney 2000).

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4 A Notice of Intent to Drain or Pump Water is required where an owner or occupier of land wishes to drain or pump groundwater for the purpose of controlling salinity, he or she is required to lodge a notice of intention with the Commissioner of Soil and Land Conservation at least 90 days before discharging water (DAFWA 2004).
The assessment was supported by groundwater water quality and discharge volumes collected by DWMSSC and from the Engineering Evaluation Initiative Beynon Road site and groundwater quality data from 26 trial pits across the Fence Road subcatchment. The report concluded that, as the Dongolocking Creek was already heavily affected by secondary salinisation following land clearing, the downstream impacts of drainage water from the proposed Fence Road project would not be significant. In addition, as the proposed drainage area was small compared to the total catchment area of Lake Dumbleyung, it was expected that there would be no significant detriment to the lake (DWMSSC 2006).

The study estimated that the area of influence of the drainage discharge would be no further than 9 km downstream of the discharge point of the system and expected salinity and pH of the discharged groundwater would be 38 900 mg/L TDS and pH 5.1.

In response to this assessment a decision was made to monitor the drain’s effect on receiving environments, including the possible impacts on intact downstream vegetation and reserves.

### 4.3 Notice of intent to drain

A concept design for the Fence Road project was completed in September 2006 by Newholstien Conservation and Landcare Pty Ltd on behalf of the DWMSSC and 12 landowners who had drainage channels planned for their properties.

The concept design was provided with a notice of intent to drain application from all involved landowners on 17 January 2006 and was assessed by the Commissioner of Soil and Land Conservation under the *Soil and Land Conservation Act 1945*. The commissioner recommended that critical areas of the drainage infrastructure identified as susceptible to the effects of drainage water (including flooding and erosion) be addressed in the final design.

The relevant components of the drain design were improved and the design resubmitted. The commissioner had no objections to the final design on 17 November 2006.

Initial investigations of soil structure stability from 10 pits across the Fence Road subcatchment had shown that clay and silt in the pit walls were universally dispersive, increasing the potential for erosion and collapse of parts of the drain structure.

The final design minimised the potential for erosion and sediment transportation but as these would remain risks, requirements for sediment capture and removal were detailed in a maintenance plan for the system.
The design policies intended to reduce the effects of erosion were (Newholstien 2006):

- Preserve natural surface water channels and construct parallel groundwater drainage channels, effectively removing or reducing surface water flow from the groundwater channels.
- Construct the combined surface water and groundwater drainage channels with gently sloping banks to reduce the risk of sides undercutting.
- Use culverts within channels to reduce flow rates and the associated erosion risks.
- Provide all culverts with a silt trap upstream of crossings to minimise the effects of sediment being transported through the system, and provide defined maintenance points.

Flow characteristics for the catchment, including expected channel velocities for design storms of 1-year, 5-year, 20-year, 50-year and 100-year average recurrence interval, were estimated using the Index Flood Method (Pilgrim 2001). Drainage infrastructure such as culverts, crossings, levee banks and floodways were designed to withstand these flows.

Examples of construction drawings for the two types of drainage channels are shown in Appendix A.

4.4 Planning approval

Application was made by the Dumbleyung Water Management Strategy Steering Committee and landowners to the shire in April 2007 for planning permission under the *Planning and Development Act 2005* and the Shire of Dumbleyung Town Planning Scheme No.1 for construction of the arterial system.

The application was supported by each of the 12 landowners involved in the project and statutory declarations were signed to allow access for contractors and for the shire to construct the drain. Planning approval for the project was granted in June 2007.

A condition of the shire planning approval was that the Department of Water assist in developing a memorandum of understanding, ‘Governance arrangements for the Fence Road drainage system’, between the shire and landowners on specific aspects of long-term governance required for the project (Department of Water 2007). The terms of the memorandum would remain in operation until legally binding land tenure arrangements were agreed upon and implemented by all parties.

The memorandum was endorsed by landowners and the shire in October 2007, prior to the contract award for construction of the drainage system. Further details on the long-term governance arrangements for the project are provided in Section 5.
4.5 Clearing

In August 2007 a clearing permit for the project was granted to the shire under section 51 E of the *Environmental Protection Act 1986*.5

The permit imposed a number of conditions:

- Flora and fauna communities in the project area had to be assessed.
- Ecological communities affected by the project had to be managed correctly or avoided.
- An environmental offset had to be established to ensure native vegetation removed during construction of the drain was replaced to an equal or better standard.

The shire undertook a flora assessment to identify the species, including any rare or priority flora, at vegetated sites close to the proposed drain. While no rare or priority flora were found, an extensive species list was compiled and used for replanting six priority areas identified as appropriate for an environmental offset (Astbury 2007).

A fauna impact assessment was completed in November 2007 in accordance with conditions of the clearing permit. Six remnant vegetation sites close to the proposed drain were investigated for their suitability for use by the following known threatened or endangered species:

- Carnaby’s black-cockatoo (*Calyptorhynchus latirostris*)
- Malleefowl (*Leipoa ocellata*)
- Red-tailed phascogale (*Phascogale calura*)
- Southern carpet python (*Morelia spilota imbricata*)
- White-browed babbler (*Pomatostomus superciliosus ashbyi*)

A nesting site of the white-browed babbler was found in an open woodland site containing flora species *Callistemon phoeniceus*, *Melaleuca pauperiflora* and *Melaleuca lateriflora*. Relocation of the nests would have caused abandonment so the drain alignment was moved 50 m from the site to protect this vulnerable species. The fauna assessment did not identify any other priority fauna species affected by the project (Gilfillan 2007).

Throughout 2008 and 2011 the shire, landowners and the local Landcare facilitator undertook rehabilitation of priority environmental offset sites by planting, and providing ongoing pest and weed control. The shire and Landcare facilitator are responsible for overseeing the success of the offset program and are required to report to DEC annually on progress.

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5 Application for the clearing permit was made in February 2007 and notification of the proposal was made available to the public on the DEC website and in the public notices section of the West Australian newspaper. Landowners involved in the project also provided a letter of support for the purpose of land clearing on their properties.
4.6 Aboriginal heritage

A comprehensive Aboriginal heritage survey was completed as a planning response to the project proposal under section 18 of the *Aboriginal Heritage Act 1972* \(^6\). The potential effects on Lake Dumbleyung were addressed with consultation of the Native Title Claimants and all community members. Goode and Irvine (2007) stated that:

> All parties considered that the project would have a greater environmental value for the region rather than any diminishment of the heritage values associated with Lake Dumbleyung due to salinity and that the lake has now been saline for many years.

A number of previously recorded sites of significance defined under the *Aboriginal Heritage Act 1972* and five new sites were recorded during the survey, though none of these sites were seen to be affected by the project.

However, three observation bore locations proposed for monitoring downstream impacts of the drainage system were moved in accordance with a survey recommendation to ensure a significant scar tree was not affected when installing water monitoring infrastructure.

A recommendation was made to the Department of Indigenous Affairs to assess the five newly reported areas of significance, with a view to placing these sites on the permanent register for the protection of the heritage values (Goode & Irvine 2007).

\(^6\) Application for approval under Section 18 of the *Aboriginal Heritage Act 1972* was made in April 2007. Details of the application were made available to the public on the Department of Indigenous Affairs (DIA) website and in the West Australian newspaper. Approval for the project was obtained in August 2007.
5  Securing long-term management

Prior to drain construction the Dumbleyung Water Management Strategy Steering Committee, shire and landowners approached the Department of Water to assist in identifying suitable governance arrangements that would provide effective long-term management of the drainage system.

In 2007, the department conducted a landowner survey to investigate the desired approach for governance. It was agreed that the shire, as a statutory body, would be responsible for administration of the project including managing contracts, establishing a funding mechanism and providing maintenance services.

It was also recognised that legally binding land tenure agreements between the shire and landowners would assist long-term management of the drain.

A cooperative approach was to be taken to manage the system through landowner participation in reporting maintenance needs and hazards. It was also decided that a Land Drainage Advisory Committee (LDAC), a subcommittee of the shire, would provide this link to the community.

5.1  Project officer

To assist implementation of the governance structure the department provided a $100 000 one-off grant to the shire to assist in the employment of a project officer for a 12-month period beginning in October 2007. These funds were to enable the shire and project officer to:

- liaise with landowners on all aspects of governance
- establish agreements between the landowners and the shire on construction, access, connecting new drains, maintenance and management
- establish the Land Drainage Advisory Committee
- assist with applications for approvals for works.

The project officer made substantial progress in establishing a governance structure for the shire, particularly in facilitating environmental approvals and the offset program, establishing the LDAC and procuring and managing contracts relating to surveying easements and fencing construction.

5.2  Land access and tenure

Establishing drainage easements in favour of the shire was recognised as an effective land tenure arrangement which provides the shire access for maintenance and to restrict certain activities within the drainage area.

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7 The Western Australian Land Information Authority’s Land Titles Registration Practice Manual provides a simple definition of an easement as ‘A right attached to a parcel of land which allows the proprietor of the parcel to use the land of another in a particular manner or to restrict its use to a particular extent’ (Crane 2007).
Project proponents understood that, where no accurately defined and legal boundaries were established, problems, misunderstandings and disputes in relation to future responsibilities for maintenance, liabilities, and access may occur, and may have detrimental effects on the long-term performance of the drainage system.

A number of possible land tenure and management options for the drainage area were investigated:

- the shire leasing the land from landowners
- compulsory acquisitions and resumptions of land by the shire
- vesting management responsibility in the shire through the Local Conservation District Committee as set out under the *Soil and Land Conservation Act 1945*
- creation of drainage easements and restrictive covenants by deed.

Project proponents viewed the creation of drainage easements as most desirable because:

- the easement can be registered on the title of the land and, as the easement is an interest in land, the burden of the easement runs with the land
- a number of obligations are attached to the registration of an easement
- a relevant easement could be registered for rights to install and operate drains and drainage works
- through a contract between the shire and current landowner a restrictive covenant\(^8\) can be adopted, providing conditions applying to the easement.
- there are no monetary considerations, the actions of the parties entering into the deed is sufficient.

The Department of Water and Shire of Dumbleyung provided support and information to landowners to ensure they were satisfied with the details of the easement and restrictive covenant agreement, including reasons for the easement and covenants, easement location, dimensions and the activities restricted in the drainage area.

The process for facilitation of the easement and restrictive covenant agreement is shown in Figure 6. An example of an easement and restrictive covenant document is provided in Appendix B.

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\(^8\) A restrictive covenant is a covenant restricting land use. Section 129BA of the *Transfer of Lands Act 1893* permits the creation of restrictive covenants that would benefit the shire in whose district the land is situated. A restrictive covenant may refer to the drain area without the benefit of a defined easement; however, it was seen as practical to clearly define the drainage area through the use of an easement.
### 2007-08
- Department of Water undertakes landowner survey on appropriate governance
- MoU between shire and landowners complete
- Shire Project Officer contracted
- Surveying of easements commences

### 2008-09
- Survey of easements complete
- Deposited plans drawn up and provided in draft form to landowners
- Most recent title search completed
- Final deposited plans lodged with Landgate
- Draft easement document and restrictive covenant provided to landowners and mortgagees for comment/consent

### 2009-10
- Easement document review and final document provided to landowners and mortgagees for consent
- Undertake pre-registration title search
- Easement document prepared in form ready for registration
- Easement document executed by shire and landowners
- Where possible all easement documents are lodged with Landgate for registration at the same time. (In order to effect registration original title also to be produced).

### 2010-11
- Any outstanding easement documents to be registered with Landgate.

---

**Figure 6 Process for facilitating registration of easement and restrictive covenants**

### 5.3 Surveying

After drain construction was complete a surveying contractor was appointed by the shire in May 2008 for a full survey of the drainage area. The survey identified the spatial extent of the constructed drainage channel and helped establish an easement boundary for the drainage area. In most cases newly constructed fences along the drainage system were defined as the easement boundary or monument, with the easement boundary and fences situated a minimum of 4 m from the outside of the drain levee (Figure 8).

This 4 m distance was seen by landowners and the shire as a practical width to allow vehicle access along drainage channels for maintenance and to ensure minimal encroachment of the drainage area on productive agricultural land. In some instances the easement boundary is further from the drain where landowners have retained existing fencing.

---

9 The survey used information from a combination of ground survey using a real time kinematic global positioning system, (Figure 7) and desktop survey using data from aerial photography coordinated through the Western Australian Land Information System’s State Land Information Capture Program and updated Spatial Cadastral Database for Dumbleyung as at August 2008.
Where there are no fences an easement distance has been noted and specified on the corresponding deposited plan\textsuperscript{10}. For example, a 6 m wide easement has been located over 4000 m of buried subsurface pipe in the western part of the Fence Road subcatchment.

Eighteen interest-only deposited plans covering freehold land over the project area were established from the survey. Draft plans were provided to landowners and the shire for deliberation prior to final plans being drawn up and lodged with Landgate in November 2009.

Statutory drafting and lodgement procedures were followed with separate deposited plans drawn up for individual landowners to facilitate the registration process (Figure 9).

A map showing the extent of drainage infrastructure and shire drainage interests is provided in Appendix C.

\textbf{Figure 7} Surveying for easements using a Rover differential GPS \hspace{0.5cm} \textbf{Figure 8} Fencing marking the easement boundary along a groundwater only channel

\subsection*{5.4 Operating costs}

It was necessary to establish ongoing funding mechanisms for the project to ensure the shire had adequate finance to maintain the drain over the long term.

The shire council held a special budget meeting in August 2008 establishing the Fence Road drainage reserve account. This account would be made up of monies obtained from an annual maintenance fee of $75 per km to be charged to landowners who have the Fence Road drainage easement on their property.

Under the \textit{Local Government Act 1995}, the shire may recover a fee or charge for any goods or service it provides or proposes to provide. The service and required fees for

\textsuperscript{10} An interest-only deposited plan is used to show the spatial extent of an interest for a lot on an existing plan and must be prepared by a licensed surveyor (Crane 2007).
maintenance have been formalised through agreement between landowners and the shire.

The maintenance fee was based on the shire completing a target of 100% mechanical cleaning and grade correction for 55 km of drains over a seven-year cycle. In the first year an initial budget of $4125 would be available from the Fence Road reserve account for maintenance and a further $20,000 would be available from a general drainage reserve account used for both urban and rural drainage maintenance in Dumbleyung.

If in the future the arterial drainage system is extended or there are any ongoing issues relating to recouping the fees for maintenance the shire may consider obtaining a licence from the ERA for the delivery of drainage services. Through this process the shire would have a general statutory duty to provide the service as per the requirements of the licence and have greater authority and ability to recover costs for providing that service.

There have now been three consecutive years of maintenance fees paid by landowners to the Fence Road drainage reserve account.

5.5 Advisory committee

In November 2007 the shire established the Land Drainage Advisory Committee to provide an advisory role to the council, providing recommendations and advice on
matters relating drainage in the local government area, including ongoing management of the project\textsuperscript{11}.

The terms of reference for the committee defined the committee’s roles and responsibilities as:

- assisting the council in the management of shire managed drainage systems in the local government area including surface and groundwater drainage
- developing draft policies on drainage management that may be endorsed by the council
- collating information on drainage systems that may assist in the long-term maintenance of those systems
- collate and disseminate information relating to future drainage sites in the Dumbleyung local government area
- assist in the collation and dissemination of information relating to monitoring (bores, surface water and rainfall)
- identifying management priorities and provide advice to the council regarding its maintenance programs for the drainage systems in the local government area
- determine and provide recommendations to the shire regarding maintenance requirements, inspections, problems or hazards
- determine and assist the shire in the drainage inspection process, and coordinate inspections of drainage infrastructure as required (Shire of Dumbleyung 2009).
- assist the shire in determining and promoting health and safety requirements for landowners and shire employees when working within drainage areas
- carrying out any power or duty that has been delegated by the council to the committee with respect to shire property (Shire of Dumbleyung 2009).

The committee provided open and transparent communication between the shire and landowners in matters relating to the ongoing management of the project.

5.6 New drainage policy

The shire adopted a number of drainage policies for the day-to-day management of the drainage system and defined roles and responsibilities for the shire and current and future landowners looking to connect to the Fence Road system.

Through the early governance arrangements (i.e. the memorandum of understanding) aspects of the agreement not attached or encumbered in an

\textsuperscript{11} The subcommittee was formed by council under the Local Government Act 1995 with terms of reference endorsed in May 2009. Membership of the committee consists of council members and other persons including community members from both upstream and downstream of the Fence Road drainage system and is open to all community members.
easement agreement or as restrictive covenants would need to be adopted as shire policy once an easement agreement was in place.

Shire drainage policies set out in the shire’s Council Policy Manual were adopted on 15 April 2010 and include:

- planning guidelines for new drainage
- shire service standard for drain maintenance
- establishing and connecting new drains
- taking water
- constructing levee banks
- constructing farm crossings
- fencing of drainage easements
- burning in the drainage easement.

Some existing council policies that provided adequate coverage of possible issues arising from managing the drainage system included council’s current complaint handling process, the general fencing standard and shire occupational health and safety standards.

For further information on shire drainage policies see Appendices E and F or contact the Shire of Dumbleyung.

5.7 Maintenance

The shire has adopted an agreed service standard for maintenance of the project. The service standard has four main delivery components aimed at ensuring a coordinated approach to maintenance.

The service standard ensures that risks, hazards and maintenance requirements are identified promptly and managed appropriately allowing the system to perform as designed over the long term. The shire service standard for maintenance is provided in Appendix D.

The majority of maintenance carried out on the drain will be undertaken by the shire or a suitably qualified contractor. However, landowners will be able to provide maintenance activities within the drainage easement, including weed control, fencing repairs, construction and alterations to contour banks, drains, compensating basins or artificial lakes and planting and cultivating vegetation.

All maintenance activities carried out by landowners must be based on advice from the shire and with its consent. The shire may also impose conditions on the proposed works, including seeking formal planning approval for those works.

The drainage system is a dynamic system that will require an adaptive management approach for maintenance. The type, quantity and costs of maintenance activities will vary over time.
The shire will provide a summary of maintenance and monitoring carried out throughout the year as part of its annual report to the community. These records will help with future management responses.

Two common maintenance problems are shown in Figures 10 and 11.

![Figure 10 Roly poly Salsola tragus collecting in a groundwater channel](image1)

![Figure 11 Rill erosion of sodic and dispersive soils on channel bank](image2)

**5.8 Managing risks**

There are a number of risks associated with the Fence Road drainage system and these require appropriate management. They include effects on private and public property from flooding, poor quality discharge water and access by vehicles, stock and pedestrians.

The shire is managing these risks by:

- ensuring the drainage system has been designed to specific standards to reduce the effects of drain failure and flooding
- adopting a drainage policy that provides mechanisms for hazard identification, maintenance and monitoring, and that outlines requirements for safe operation
- establishing the Land Drainage Advisory Committee to allow easy communication between landowners and council on drain performance, problems and hazards
- fencing the system and providing designated access points for vehicles, stock and pedestrians
continuing with a long-term monitoring program assessing in-drain and downstream water quality.

A number of features of the drain infrastructure help to manage the effects of poor quality drainage water.

Property owners identified freshwater soaks, dams and wells that could be close to the drainage area and potentially affected by it. It was seen as important to safeguard these assets while still providing opportunities for other landowners to connect to the system.

Freshwater areas were characterised by deeper sandy and permeable soils and were located in isolated areas in the subcatchment with currently little or no evidence of salinisation. The main risks to these assets were:

- Susceptible areas of good quality groundwater close to the surface in soaks and wells may be lost through subsurface flow on a gradient to the drainage channel.
- Poor quality drainage water moving past these sites may contaminate soaks, wells and dams through infiltration of the saline and acidic water.

Techniques to safeguard these sites included relocating or re-aligning drainage channels, and diverting water through subsurface pipes and bypass systems (Figure 12).

It was also recognised that the acidic and saline nature of discharge water affected drainage infrastructure, particularly pipes and culverts. It was decided that rigid polyethylene pipes would be the most suitable material to convey water through shire road reserves and farm crossings (Figure 13).

Figure 12 Low-flow bypass system redirects water around productive land

Figure 13 Polyethylene pipes being laid across Fence Road
6 Monitoring

The Dumbleyung Water Management Strategy Steering Committee and the shire were assisted by the Department of Water in preparing and implementing a monitoring program adopted by the committee in April 2007.

The objective of the program was to collect sufficient data to assess whether the interaction of drainage discharge with the receiving environment was as anticipated in the environmental impact assessment (Department of Water 2009). Surface water and discharged groundwater flow rates and qualities were monitored.

The three-year program was completed in December 2010, after which the structure of the program was reviewed by the department and recommendations were made for the future management of the program by the shire. The monitoring program has been adopted as part of the shire’s agreed service standard for maintenance.

Nineteen monitoring sites were set up within the drainage system and on associated tributaries upstream and downstream of the project site.

The environmental impact assessment was used to set the following trigger levels for the monitoring program:

- expected area of influence of drainage water, 9 km downstream of the discharge point of the system
- expected salinity of the discharged groundwater 38 900 mg/L TDS
- expected pH of discharge water pH 5.1.

When the trigger levels were exceeded, a further six sites, up to 37 km downstream of the discharge point, were monitored to assess how far the influence of drainage water could be measured, and at what point water quality returned to trigger level values.

On a number of occasions during the monitoring program, discharge drainage water was observed to increase in-stream acidity and reach further downstream than had been anticipated in the environmental impact assessment. The results showed that salinity was estimated within tolerance but the pH was significantly underestimated. In addition, there was significantly less surface water contribution from the Fence Road subcatchment than expected.
Because the Dongolocking Creek is a highly degraded system, it is difficult to estimate the significance of the impact that the higher acidity (lower pH) is having on the downstream ecological environment (Department of Water 2008). However, the following recommendations to lessen the effects of the drainage system on the downstream environment have been provided by the department to the project proponents (Department of Water in 2011):

- Treat the drainage water by installing an in-drain treatment train to reduce the acidity of discharge water.
- Install a detention basin at the discharge point of the drainage system to detain and treat acidity in the discharge water.
- Allow sections of the drainage system contributing the poorest quality water to be opened only when there are significant surface water flows.
- Decommission the drainage system or sections contributing the worst quality water.

Treating the drainage water through in-drain treatment measures was seen as the most practical option as this required minimal additional land and the portions of the drainage system contributing the poorest water quality could be targeted.

For a detailed analysis of results and recommendations from the monitoring program please see Fence Road drainage system: Interim assessment of monitoring data (Department of Water 2010) and the Fence Road drainage system – monitoring program assessment, conclusions and recommendations (Department of Water 2011).
7 Conclusions and recommendations

The Fence Road project is an example of how comprehensive governance including planning, implementation, assessment and management of an arterial drainage project can be successfully achieved in the Western Australian Wheatbelt.

This achievement only came about through the commitment of the local community, and local and state governments over the last 10 years.

The Dumbleyung community is well aware of the effects of salinity and waterlogging and may continue to view deep drainage as a viable management tool for salinity and water management.

A long-term challenge will be to ensure that, through good governance, planning and implementation, drainage projects in Dumbleyung consider and effectively manage the existing social, environmental, cultural and economic values. This can only be achieved by applying knowledge gained from the Fence Road project, previous catchment-wide studies and other drainage projects in the state.

The shire will continue to manage the project and has established appropriate funding, maintenance, assessment and reporting processes that will guarantee the system performs into the future.

The recommendations from the project are grouped below:

• Implementation of the various studies and projects established and supported by the Dumbleyung Water Management Strategy Steering Committee could contribute to the development of a catchment water management plan for the Dumbleyung Landcare Zone. However, it has been recognised that the formation of the plan should not be exclusively based on a catchment-wide arterial drainage scenario.

• The governance model selected for drainage projects should be based on the expected scale and complexity of the project. So, low risk drainage projects covering single properties or a small group of properties may not require comprehensive governance, while higher risk drainage projects covering numerous properties and those that require significant planning, investigation and assessment may require more comprehensive governance.

• Agreements on responsibilities for long-term management of the project should be completed early in the project planning phase and where possible confirmed prior to drain construction.

• Provision and location of easements should be confirmed early in the project planning phase as they may affect the overall benefit-cost of the project. Drains with easements may take up greater land areas at higher cost than drains without easements.

• A benefit-cost analysis should be carried out for the constructed Fence Road project.
• The requirement for a licence to provide drainage services may be waived where the project is not in a controlled area and where the project proponents are able to effectively carry out that role.

• Proponents of drainage projects when assessing project viability will need to consider the effects their project may have on a number of values (e.g. social, environmental, cultural and economic).

• Proponents of drainage projects will need to identify on-site and downstream assets that may need to be protected and managed from project effects, such as seasonal access requirements, roads, rail and houses, and important groundwater and surface water assets like dams, soaks, wells and lakes.

• The location, standard and cost-sharing arrangements for installation of fencing along drainage channels should be confirmed during the planning phase prior to drain construction.
Appendices

Appendix A – Example drawings for combined and separated drainage channels
Plan of Piped Farm Crossing on Combined Drain

Section AA - Open Drain Profile

Section BB - Farm Crossing

NOTES:
1) This drawing covers both 12m and 24m farm crossings for combined drains with a base width of 2, 3 and 5m.
2) Cross section CC and associated notes detailing rock pitching and protection are provided in DWG No. FR-KS-007-AC01.
3) All rock pitching and protection has been concrete stabilised.
4) Plastream Stormwater Pipes supplied by Calibre Pipelines have been installed, pipes of 1050mm dia have been encased in cement stabilised gravel to 100mm above the top of the pipe.
5) The fall on the pipe is not less than 0.5%.
6) The external batter of all spoil banks is 1:5.
7) Drains with 2m wide bases are increased to 3m wide over 50m. Drains with 3m and 5m wide bases are to be kept at 3m & 5m wide respectively.
8) The berm is narrowed down to nothing over a distance of not less than 50m.
9) The internal toe of the spoil banks are trained towards the external edge of the rock pitching over a distance of not less than 50m.
10) The spoil banks, rock pitching and protection have been shaded for clarity.

TITLE: As Constructed Details - Piped Farm Access Crossing on Combined Drains
Fence Road Drainage Scheme

DWG NO: FR-KS-004-AC01

Scale: 1:250 @ A3 (do not scale from drawing)
Date: 10 June 2008
By: K Seewraj - Department of Water
For: Shire of Dumbleyung
Appendix B — Easement and restrictive covenant document

FORM B 2
FORM APPROVED
NO. 82980

WESTERN AUSTRALIA
TRANSFER OF LAND ACT 1893 AS AMENDED

BLANK INSTRUMENT FORM

EASEMENT AND RESTRICTIVE COVENANT

(Note 1)

THIS DEED dated 2008

SHIRE OF DUMBLEYUNG of Harvey Street, Dumbleyung, Western Australia ("the Shire");

The person or persons described in Item 1 of the Schedule ("the Grantor");

RECITALS

A. The Grantor is the registered proprietor of the Land.
B. The Land is within the district of the Shire.
C. The Grantor has as agreed to grant the Drainage Easement to the Shire and to make the Restrictive Covenants for the benefit of the Shire.

OPERATIVE PROVISIONS

1. INTERPRETATION

1.1 Definitions

In this Deed unless the contrary intention appears:

"Drainage" means any drain and any drainage pipe, culvert, ditch, channel or conduit;

"Drainage Easement" means the easement granted by the Grantor to the Shire under clause 2;

"Easement Area" means that portion of the Grantor’s land shown as ______ on Deposited Plan ______;

"Land" means the land described in Item 2 of the Schedule;

"Personnel" means any employee, agent, contractor or workman;

"Restrictive Covenants" means the covenants made by the Grantor for the benefit of the Shire under clause 3.

1.2 Interpretation

In this Deed, unless the contrary intention appears:

(a) words suggesting the singular include the plural and vice versa;

(b) words suggesting any gender include any other gender;
(c) reference to a person include a company, corporation, and unincorporated or incorporated association or statutory authority;

(d) references to clauses, paragraphs, subparagraphs and Schedules are to clauses, paragraphs, and subparagraphs of, and schedules to, this Agreement as amended from time to time in accordance with the terms of this Agreement;

(e) headings used for clauses, paragraphs, subparagraphs, Schedules and the table of contents are for ease of reference only and are not to affect the interpretation of this Agreement;

(f) references to any agreement or instrument are to that agreement or instrument as amended, novated, supplemented, varied or replaced from time to time;

(g) references to laws include any modification or re-enactment of those laws, or any legislative provisions substituted for such laws, and all orders, local laws, planning schemes, by-laws, regulations and other statutory instruments issued under those laws;

(h) where the words “includes” or “including” are used, they are to be taken to be followed by the words “without limitation”, unless the contrary intention appears;

(i) a reference to any body is:

   (i) if that body is replaced by another organisation, deemed to refer to that organisation; and

   (ii) if that body ceases to exist, deemed to refer to the organisation which most nearly or substantially serves the same purposes or objects as that body; and

(j) all dollar amounts specified in this Agreement are in Australian dollars;

(k) a reference to a month is to a calendar month.

2. **EASEMENT**

2.1 **Grant of Easement**

The Grantor grants to the Shire and the Shire’s Personnel, the full and free right at all times to enter upon, with or without vehicles, plant and machinery, the Easement Area and to use, dig, disturb, trench, break, excavate, remove soil, earth and gravel from, the Easement Area for the purpose of installing, operating, altering, inspecting, maintaining, repairing, replacing and removing (at the Shire’s discretion) any Drainage and to remain upon the Easement Area for so long as is necessary for the Drainage Easement, together with those purposes incidental to the use of the Drainage Easement and at all times to use the Easement Area to transmit and drain water.

2.2 **Effect of Drainage Easement**

(1) The Drainage Easement does, and is intended to:

   (a) burden the Land;

   (b) run with the Land;

   (c) bind the Grantor and every successive proprietor of the Land; and

   (d) benefit the Shire as the local government in whose district the Land is situated.
(2) The Drainage Easement is granted under and by virtue of section 195 of the Land Administration Act 1997.

3. **RESTRICTIVE COVENANT**

3.1 **Restrictive Covenants**

The Grantor covenants not to:

(a) construct, install or erect on the Easement Area any building, structure or improvement;

(b) dig or excavate the Easement Area or remove anything from the Easement Area;

(c) place or deposit any thing on the Easement Area;

(d) damage any drain, pipe, fence, sign or other improvement on the Easement Area;

(e) leave any gate on the Easement Area open;

(f) set fire to the Easement Area or any vegetation or other thing on the Easement Area;

(g) permit or suffer any livestock including any cattle or sheep to enter or remain upon the Easement Area except for the purpose of the Grantor transferring, herding or driving the livestock across the Easement Area and only for so long as is necessary for the purpose;

(h) alter or disturb the present grades and contours of the surface of the Land within the Easement Area except with the prior written consent of the Shire on each occasion;

(i) construct, erect, setup, improve, enlarge, or alter any contour bank, drain, compensating basin or artificial lake without the prior written consent of the Shire, which the Shire will be under no obligation to grant and then upon those terms and conditions, if any, which the Shire may determine;

(j) grow, cultivate or maintain any vegetation within the Easement Area;

(k) stack, place or store any plant or material within the Easement Area;

(l) bring within the Easement Area any vehicle or machinery which together with any attachment, exceeds a width of 20 metres;

(m) park or leave stationary within the Easement Area any vehicle or machinery; or

(o) bring onto the Easement Area any explosive, flammable or unstable substance or material.

3.2 **Permitting others**

(1) The Grantor covenants not to permit or suffer any other person to do any of the things set out in clause 3.1.

(2) The Grantor must not permit or suffer any livestock to stray or wander upon the Easement Area.

3.3 **Effect of Restrictive Covenants**

(1) The Restrictive Covenants do, and are intended to:

(a) burden the Land;
(b) run with the Land;
(c) bind the Grantor and every successive proprietor of the Land;
(d) benefit the Shire as the local government in whose district the Land is situated.

(2) The Restrictive Covenants are made under and by virtue of section 129BA of the Transfer of Land Act 1893.
Appendix C – Shire of Dumbleyung drainage interests

This plan must not be reproduced without the permission of WHELANS. All Cadastral dimensions are subject to survey.
Appendix D — Shire of Dumbleyung adopted service standard for drain maintenance

<table>
<thead>
<tr>
<th>Service standard</th>
<th>Requirements</th>
<th>Activity</th>
<th>Timing and responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage system performance is reliable and efficient</td>
<td>Maintain hydraulic efficiency and eliminate obstructions by undertaking inspections and preventative regular maintenance. Complete target of 100% of 55 km mechanical cleaning and grade correction over seven years (i.e. 8 km per year). Inspect all infrastructure within drainage easement.</td>
<td>Regular maintenance</td>
<td>LDAC with Manager of Works and Services – annual.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mechanical cleaning and grade correction</td>
<td>LDAC with Manager of Works and Services – annual, 5-yearly, 7-yearly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disposal of collected debris/silt</td>
<td>LDAC with Manager of Works and Services – annual.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Removal of silt from silt traps on separated system</td>
<td>LDAC with Manager of Works and Services – annual, 5-yearly, 7-yearly.</td>
</tr>
<tr>
<td>Cooperative approach with landowners for drain maintenance</td>
<td>Landowners report maintenance requirements to the shire by phone (08) 9863 4012 or in writing PO Box 99 Dumbleyung 6350, WA. Shire will provide maintenance service through prioritisation process.</td>
<td>Occasional maintenance</td>
<td>Shire – as required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Removal of debris/silt from channel, culverts, pipes and silt traps, and burning if required</td>
<td>Shire – as required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disposal of debris/silt</td>
<td>Shire – as required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stabilisation of rock protection</td>
<td>Shire – as required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weed control</td>
<td>Landowners – as required</td>
</tr>
<tr>
<td>Drainage system is safe with hazards and risks managed</td>
<td>Hazards and risks will be identified through regular monitoring of the system and reports from landowners. The shire will respond to any faults by undertaking a site inspection and providing any required remedial work within an appropriate time period.</td>
<td>Remedial maintenance</td>
<td>Shire – as required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repair of rock protection (head, side, base)</td>
<td>Shire – as required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repair external/internal levee banks</td>
<td>Shire – as required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incorporate additional infrastructure including chutes, culverts, pipes, confluence</td>
<td>Shire – as required</td>
</tr>
<tr>
<td>Service standard</td>
<td>Requirements</td>
<td>Activity</td>
<td>Timing and responsibility</td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td></td>
<td>Erosion control, including bed and bank stabilisation</td>
<td>Shire – as required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sediment/debris removal (includes pipe infrastructure)</td>
<td>Shire – as required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Realignment of drains</td>
<td>Shire – as required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repairs to fencing</td>
<td>Landowner – as required (on advice from the shire)</td>
</tr>
</tbody>
</table>

**Monitoring**

<table>
<thead>
<tr>
<th></th>
<th>LDAC with Manager of Works and Services – annual</th>
<th>Landowner – as required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify areas of erosion and scour.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify areas of sediment deposition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determine health of nearby vegetation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify areas of ponding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed and bank stability and integrity of infrastructure (includes crossings and pipes)</td>
<td>LDAC with Manager of Works and Services – annual</td>
<td>Landowner – as required</td>
</tr>
<tr>
<td>Hazard identification, (inspection of all infrastructure)</td>
<td>LDAC with Manager of Works and Services – annual and as required</td>
<td></td>
</tr>
<tr>
<td>Water quality monitoring including grab sample monitoring for pH, total acidity, dissolved oxygen and conductivity</td>
<td>LDAC with Manager of Works and Services – regular monitoring and event monitoring as required</td>
<td></td>
</tr>
<tr>
<td>Service standard</td>
<td>Requirements</td>
<td>Activity</td>
</tr>
<tr>
<td>------------------</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Landowner visual assessment of drainage system and information on rainfall, groundwater levels, flow and hazards</td>
</tr>
</tbody>
</table>

**Reporting**

Shire will provide reporting on all maintenance undertaken throughout the year including regular, remedial, occasional maintenance and monitoring as part of its annual process of reporting to the community.

Details of monitoring results will be provided on the shire website.

Land Drainage Advisory Committee meetings will be held on a regular basis and may be attended by the community.

The shire will notify landowners prior to accessing properties and the drainage easement when undertaking maintenance.

The shire will observe any biosecurity requirements of properties on entering and leaving these properties.

The shire will also notify landowners of any hazards or risks identified in the drainage system that require maintenance, and or pose risk to the integrity of the drainage infrastructure, or health and safety of persons and stock.
## Appendix E – Shire of Dumbleyung adopted drainage policies

<table>
<thead>
<tr>
<th>Drainage policy area</th>
<th>Drainage policy detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establishing and connecting new drains</td>
<td>Shire administers planning provision for connection to the Fence Road arterial drainage system and all new drainage in the LGA (template for planning provision and design of connections provided).</td>
</tr>
</tbody>
</table>

Proponents for new drainage should be advised that:
- New drains should be established where clearing of native vegetation is not required.
- The shire may assist the proponent in determining appropriate locations for new connections to existing Fence Road arterial drainage system.
- The shire may require detail of proposed new drains including length, depth, alignment and profile.
- New drains connecting Fence Road arterial drainage system should be no more than 2 m deep and graded to paddock level.
- All new drains will require details of surface water management, chutes, confluences, interceptor banks or levees banks.
- All new drains will require detail of soil and sediment control and removal or disposal of soil.
- The shire may request that the proponent undertake on-site water quality testing and provide an indication of likely drainage water volumes that will be discharged from site.
- Construction should be undertaken by a skilled contractor.
- There may be limitations to new connections to the Fence Road arterial drainage system where those new drains may affect the integrity of the receiving drain.
- Where proponents establish new connections to the Fence Road arterial drainage system, the proponent will be responsible for the costs for construction and ongoing maintenance of the new section of drain.
- The shire may seek to take responsibility for the care and control of new drains that connect to the Fence Road arterial drainage system where those drains may have a public benefit; i.e. more than one owner or where those drains are having an effect on the existing Fence Road arterial drainage system.
<table>
<thead>
<tr>
<th><strong>Drainage policy area</strong></th>
<th><strong>Drainage policy detail</strong></th>
</tr>
</thead>
</table>
| **Taking water**         | • Landowners wishing to take water from the Fence Road arterial system will be responsible for associated costs to take water including construction of levee banks, new dams and pipe and pump supply.  
• Landowners will be responsible for any damage caused to drainage infrastructure through taking water.  
• Landowners must advise the shire prior to taking water.  
• Landowners are advised that the Fence Road arterial drainage water quality can be poor (very acidic and very saline) and may pose risks to stock and should not be used for human consumption. Landowners should determine water quality prior to taking water.  
• Landowners wishing to take water should only do so from the combined system by temporarily impeding water flow with manual placement of sluice boards on the upstream side of culverts in the combined surface and groundwater system.  
• Landowners are to check weather forecasts prior to taking water, ensuring there will be no large flows and resultant flooding while temporarily impeding flow at culverts.  
• Landowners must remove obstruction to flow once pumping is complete.  
• Planning permission may be required if landowners want to divert surface water from modified surface water channels adjoining separated groundwater drains. |
| **Constructing levee banks** | When constructing levee banks to divert surface water from the Fence Road arterial drainage system landowners will need to:  
• inform the shire of proposed locations for construction of levee banks  
• seek advice from the shire regarding design and construction of levee banks  
• obtain any required planning approvals (conditions for design and construction of levee banks may be provided by the shire at that stage)  
• levee banks should be constructed using a skilled contractor. |
| **Farm crossings** | Shire administers planning provisions for construction of new farm crossings on the Fence Road arterial drainage system.  
Proponents for new drainage should be advised that:  
• The shire may assist the proponent in determining appropriate locations for new farm crossings on the existing Fence Road arterial system.  
• Any additional works proposed on the Fence Road arterial drainage system or future connections to the system that relate to incorporating, maintaining or replacing crossings or any other ancillary work will need to be undertaken on advice from the shire.  
• Construction should be undertaken by a skilled contractor.  
• Where proponents want to establish new farm crossings on the Fence Road arterial drainage system or on future drainage connections to the Fence Road arterial system, the proponent will be responsible for the costs for construction of those crossings.  
• Where there is a public benefit; e.g. the proposed crossing is on a new connection to the Fence Road arterial system that crosses multiple properties, the costs for construction of that crossing may be negotiated between the shire and relevant landowner. |
<table>
<thead>
<tr>
<th>Drainage policy area</th>
<th>Drainage policy detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fencing</td>
<td>The type of fencing should be in accordance with existing council policy; however, the location and alignment of fencing should be in accordance with the recommendations below:</td>
</tr>
<tr>
<td></td>
<td>• The shire recommends that all new drains (including new connections to the Fence Road arterial drainage system) are fenced.</td>
</tr>
<tr>
<td></td>
<td>With relevance to the Fence Road arterial drainage system:</td>
</tr>
<tr>
<td></td>
<td>• All access points to the Fence Road arterial drainage system will require modified drop down fences.</td>
</tr>
<tr>
<td></td>
<td>• Landowners must prevent stock from entering the drainage easement except for the purposes of transferring stock across the easement by erecting a suitable standard of fencing and aligning fencing with, or as close as is reasonably practical with, the easement boundary.</td>
</tr>
<tr>
<td></td>
<td>• Existing fencing not currently located on the easement boundary when replaced will need to be erected to a suitable standard and aligned with, or as close as is reasonably practical with, the easement boundary.</td>
</tr>
<tr>
<td></td>
<td>• New fencing along the Fence Road arterial system shall not impede vehicular access to provide maintenance and must be at least 4–5 m from the outside toe of the bank for both combined and separated systems.</td>
</tr>
<tr>
<td></td>
<td>• Where alternative access points are required across the Fence Road arterial system the landowner will be responsible for the costs of constructing new crossings, including costs for fencing.</td>
</tr>
<tr>
<td></td>
<td>• Landowners will be required to undertake ongoing minor maintenance of fences aligning the Fence Road arterial drainage system.</td>
</tr>
<tr>
<td>Burning in the drainage easement</td>
<td>The shire will undertake removal of debris including burning in the drainage easement as part of its service standard for occasional maintenance.</td>
</tr>
<tr>
<td></td>
<td>The shire will ensure when burning in the drainage easement that:</td>
</tr>
<tr>
<td></td>
<td>• deposited material is removed from culverts to a distance of 10 m or greater from the end of the culvert pipes</td>
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<tr>
<td></td>
<td>• debris is removed manually whenever possible (burning in the drain as a last resort).</td>
</tr>
</tbody>
</table>
# Appendix F – Shire of Dumbleyung adopted planning guidelines for new drainage

<table>
<thead>
<tr>
<th>Planning requirement</th>
<th>Activity</th>
</tr>
</thead>
</table>
| Preliminary planning | - Proponents to identify available information i.e. salinity mapping, previous monitoring (water quality, crop yields etc.)
|                      | - Proponents to obtain advice from skilled contractor
|                      | - Proponents to undertake concept design
|                      | - Proponents to determine funding source and identify available funding. |

| Long-term feasibility | - Proponents to consider at-site and downstream maintenance issues
|                       | - Proponents to consider any on-site and downstream access issues
|                       | - Proponents to complete draft design (the shire has standard designs available for design of connections)
|                       | - Proponents identify building, road or rail infrastructure that could be affected
|                       | - Proponents to consider cost versus benefit of the proposed drainage works. |

| The following approvals may be required when planning for new connections to the Fence Road arterial drainage system | - Proponents may require planning permission in accordance with the Planning and Development Act 2005 and town planning system. Contact the shire for further information.
|                                                               | - Proponents may require approval under section 18 of the Aboriginal Heritage Act 1972.
|                                                               | - Where clearing native vegetation the proponent may require a clearing permit under section 51E of the Environmental Protection Act 1986. It is preferable that native vegetation is avoided when planning for the location of drainage works.
|                                                               | - Where the proposal has the potential to have significant effects on a matter of national environmental significance, including effects on world or national heritage sites, wetlands deemed significant, flora and fauna deemed significant, Commonwealth or state land or reserves, the proponent may require approval under the Environmental Protection and Biodiversity Conservation Act 1999.
|                                                               | - Proponents will be required to enter a Notice of intent to drain or pump water under the Soil and Land Conservation Act 1945, administered by the Commissioner of Soil and Land Conservation.
|                                                               | - Depending on the potential level of environmental effect from the proposed drainage works, the proponents may need to produce an environmental impact assessment report as a requirement under the Environmental Protection Act 1986 or the Environmental Protection and Biodiversity Conservation Act 1999. |

| Project planning | - Proponents may be required to undertake topographic survey.
|                 | - Proponents may be required to dig trial holes.
|                 | - Proponents may be required to measure and test groundwater quality.
|                 | - Proponents may be required to undertake catchment hydraulic modelling to test possible flow rates.
|                 | - Proponents may be required to prepare monitoring plans. |
### Fence Road arterial drainage project

<table>
<thead>
<tr>
<th>Planning requirement</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proponents to complete final design.</td>
<td></td>
</tr>
</tbody>
</table>

### Governance
- The shire may seek to include drainage works as part of an existing drainage easement.
- Proponent and the shire are to determine appropriate funding mechanism for long-term maintenance.
- The shire may request fencing of new drainage works.

### Contract details (where shire is the proponent)
- The shire to consider appropriate tender process
- Complete tender request document
- Advertise tender
- Visit site
- Submit tenders and undertake formal tender evaluation.

### Pre-construction
- Identify buried services *Dial before you dig* 1100.
- Prepare site
- Provide traffic management plan where required
- Hold start-up meeting
- Install any required monitoring infrastructure and undertake sampling.

### During and post construction
- Contractor is to provide adequate site supervision.
- The shire is to provide site inspections.
- Variations to contract must be provided in writing to the proponent and the shire.
- Significant variations must also be notified in writing to the Commissioner of Soil and Land Conservation.
- The shire and proponents are to tour completed works.
- As-constructed plans must be provided to stakeholders and Commissioner of Soil and Land Conservation.
## Shortened forms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>AHD</td>
<td>Australian height datum</td>
</tr>
<tr>
<td>DAFWA</td>
<td>Department of Agriculture and Food</td>
</tr>
<tr>
<td>DEC</td>
<td>Department of Environment and Conservation</td>
</tr>
<tr>
<td>DIA</td>
<td>Department of Indigenous Affairs</td>
</tr>
<tr>
<td>DLZ</td>
<td>Dumbleyung Landcare Zone</td>
</tr>
<tr>
<td>DLZC</td>
<td>Dumbleyung Landcare Zone Committee</td>
</tr>
<tr>
<td>DWMSSC</td>
<td>Dumbleyung Water Management Strategy Steering Committee</td>
</tr>
<tr>
<td>ERA</td>
<td>Economic Regulatory Authority</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic information system</td>
</tr>
<tr>
<td>LCDC</td>
<td>Land Conservation District Committee</td>
</tr>
<tr>
<td>LDAC</td>
<td>Land Drainage Advisory Committee</td>
</tr>
<tr>
<td>SWCC</td>
<td>South West Catchments Council</td>
</tr>
</tbody>
</table>
References

Note: All the unpublished reports are available from the Department of Water South West Region office in Bunbury, email bunbury.admin@water.wa.gov.au.


Crane, M 2007, *Land titles registration practice in Western Australia* (8th edition), Western Australia Land Information Authority, Perth.

Department of Agriculture and Food 2004, Notice of Intent to Drain or Pump Water, as per the *Soil and Land Conservation Regulations 1992*.


Dumbleyung Water Management Strategy Steering Committee 2006, *Fence Road arterial drain environmental impact assessment*, Dumbleyung, Western Australia.


Goode, B & Irvine, C 2007, *Supplementary consultation of an Indigenous assets and values Aboriginal heritage survey for the Blackwood Basin Zone 7, Dumbleyung, Western Australia*, prepared for the Department of Water and the Department of Indigenous Affairs, Western Australia.
Newholstien Pty Ltd 2006, *Fence Road arterial drain project – Notice of intent to drain application*, unpublished, Western Australia.


——2006b, *Community views about salinity management for the Dumbleyung Zone*, prepared for the Shire of Dumbleyung, URS, Western Australia.


Further reading


Shire of Dumbleyung 2003, *Shire of Dumbleyung, Town Planning System No. 1 (District Zoning system)*, Version 1, Department of Planning and Infrastructure, Western Australia.
