INTERNAL GUIDELINES FOR ASSESSMENT OF DRAINAGE IN THE WHEATBELT REGION

DRAFT

Department of CONSERVATION and LAND MANAGEMENT

Prepared by Regional Hydrologist
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1. GLOSSARY

CALM = Department of Conservation and Land Management
CCWA = Conservation Commission of WA
DAg = Department of Agriculture
DoE = Department of Environment
CLO = community landcare officer
CSLC = Commissioner for Soil and Land Conservation
DM = District Manager (CALM Wheatbelt)
DNCO = District Nature Conservation Officer (CALM Wheatbelt)
ED = Executive Director of CALM
DRS = Director of Regional Services (CALM)
DNC = Director of Nature Conservation (CALM)
LCO = Land Conservation Officer (DAg)
RH = Regional Hydrologist (CALM Wheatbelt)
RM = Regional Manager (CALM Wheatbelt)
LCDC = Land Conservation District Committee
NRM = Natural Resource Management
EEI = Engineering Evaluation Initiative
SIF = Salinity Investment Framework
ARI = average recurrence interval
EC = electrical conductivity
NoID = notice of intent to drain

2. BACKGROUND

There are several different drainage assessment processes going around. The formalised process at the moment applies only to the administrative steps, relating to processing of Notices of Intent to Drain (NoIDs) and does not provide any detail or time frames. There is a more detailed process that has been proposed but not yet adopted, however this is for wetlands (though is probably adaptable to all situations).

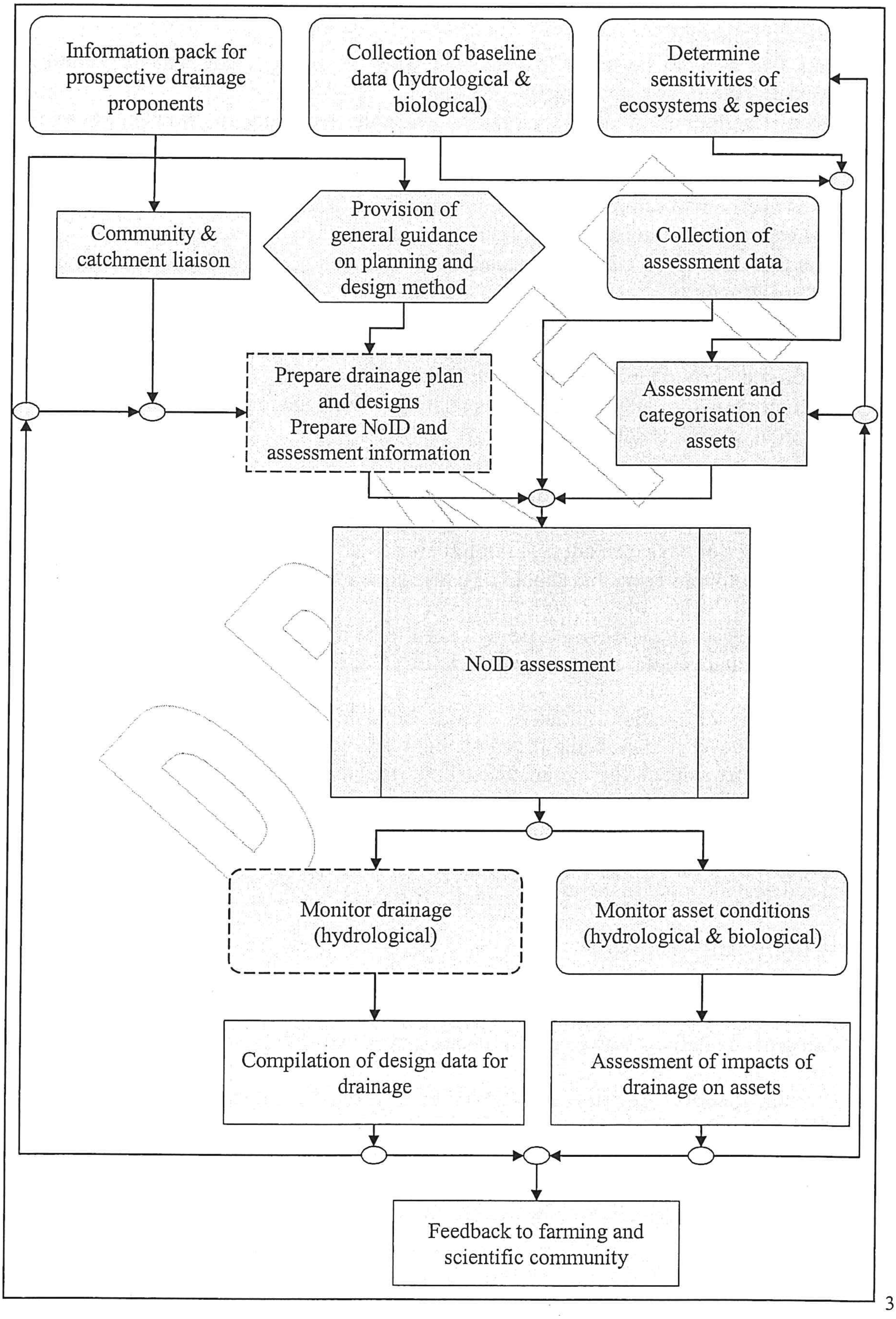
There are a number of issues for CALM that do not just relate to the assessment of NoIDs:

- Typically, insufficient information about the proposal design is provided with the NoID to be able to adequately assess proposals for impact on CALM assets;
- Very few CALM assets have had enough information and baseline data collected that can be used to assess drainage proposals;
- Often CALM has to initially object to NoIDs in order to obtain more information, thereby holding up the process (even if the proposal is eventually approved);
- In many cases, proposals are approved by the other agencies and CALM has to object either due to lack of information or the impact will be too high, thus CALM is seen as being bureaucratic and/or "blockers" of development;
- Control of the drainage proposals in many areas is not in the hands of the land-managers/owners (including CALM) and is lead by vested interests (ie. contractors);
- Independent land management advice for land managers/owners is lacking and the capacity in the community to properly and honestly plan and design drainage is minimal;
- The 90 day NoID process is seen by a significant minority of drainage proponents as too demanding and long, so many drains are constructed without notification.

The current lack of process and guidelines for assessing drainage within CALM could lead to lack of consistency between districts and proposals in assessment and therefore lack of equitability to proponents. There is also a risk that inappropriate recommendations (or lack of) may be made, leading to impacts on CALM assets.

3. FRAMEWORK FOR DRAINAGE ASSESSMENT

CALM and the region need to adopt a framework to address drainage issues including NoIDs. An overall framework is illustrated in the following diagramme.



3.1. Information Package

At the moment drainage proponents do not know what is required to be provided to CALM to be able to adequately assess drainage proposals, nor do they appear to have sufficient understanding of the issues involved relating to downstream impact. In addition there is insufficient capacity in the community to adequately plan and design drainage, and it is unlikely that proponents will pay the amounts demanded by consulting companies to prepare drainage designs. An information package should be available to farmers and land managers, containing the following:

- Factors that need to be taken into account when assessing a site and determining an appropriate option for addressing the problem;
- Detailed descriptions of different options available, including the how's, where's and when's of establishment (focussing on an integrated approach);
- Factors that need to be taken into account when planning, including site measurements required and how to estimate flows in the catchment (stressing that groundwater drainage cannot be undertaken in isolation, ie. surface water needs to be managed);
- Factors that need to be taken into account when designing, including placement, channel shape and structures;
- Description of potential downstream impacts of drainage, including different ownership, responsibilities and values (the reason why drainage needs to be adequately planned and designed and the NoID process should be followed);
- Brief description of regulations and laws relating to drainage, including penalties;
- Description of what is notifiable;
- Step by step description of the NoID process;
- Information that needs to be supplied to the Commissioner for Soil and Land Conservation (CSLC) in order for the various agencies to be able to adequately assess the proposal;
- List of sources of advice and design information.
- Description of monitoring that should be carried out and why.

The information package and its release will need to be a partnership between CALM, DAg, the CSLC, DoE and various community bodies (LCDCs, regional NRM groups etc.).

The Engineering Evaluation Initiative should be able to provide much of the design information, however it is probable that on-going work will be required to determine the full range of design parameters (eg. groundwater flow rates that could be expected from different soils and profiles).

The Regional Hydrologist will be responsible for working with the relevant agencies to develop and provide input to the information package.

3.2. Community Liaison

There are two aspects to community liaison – firstly with respect to developing the information package and community engagement process and secondly developing and maintaining good relations between the agencies and potential drainage proponents.

It is important to encourage proponents to undertake adequate planning and design, while not dissuading them from undergoing the formal drainage process (NoID). The following messages need to be highlighted:

- Undertaking proper (integrated) planning and design will lead to more effective control of the salinity problems on farms, for a longer period of time;

- Land managers are being provided with greater capacity to keep control over the decisions they make in relation to their land and farming enterprises;
- Downstream land owners/managers will be more supportive and activities are less likely to be "blocked";
- The NoID process will be streamlined.

The process that needs to be undertaken is:

1. Contact all CLOs and NRM project officers that may be dealing with community catchment liaison.

The RH will ask these officers to notify their respective DM of any potential drainage or drainage issues.

2. Identify individuals and groups that may potentially propose drainage, are planning or undertaking drainage, have done drainage, or are undertaking catchment planning.

The RH will identify these people through the CLOs, CALM officers, NRM regional groups etc.

3. Identify and contact drainage contractors to appraise them of the needs to be able to adequately assess proposals (including appropriate design).

The RH and DMs to meet with contractors.

4. Liaise with individuals and groups identified in 2, including attending field days, workshops, meetings etc.

The relevant DM and/or DNCO, and where appropriate the RH will attend meetings etc.

5. Roadshow to raise awareness about NoIDs.

The CSLC is organising this.

Another aspect of community liaison is to identify and access data and information within the community, from community run projects etc.

It may be appropriate to have a stand at the Newdegate and Dowerin Field Days, Wagin Woolorama, and similar larger agricultural shows that attract large numbers of farmers from the whole region.

If agreed, RH to organise displays at various field days and agricultural shows and coordinate with DAg LCOs and CSLC their possible attendance.

3.3. Guidance on Planning and Design

Together with the information package and working with groups or individuals to plan appropriate drainage, it may be appropriate to provide a certain level of support, together with the Department of Agriculture, to the proponents. Considering that in the assessment of proposals, various quantities will need to be determined by the agencies (where there is a lack of community capacity), such as design flows and drainage capacities, it makes sense that this process could be done during the planning so that the proponents have access to the information. Other supports could be:

- Basic site assessment (ie visual observation with advice on appropriate investigations that could be made).
- Basic testing of water and soil samples (ie. soil texture, electrical conductivity and pH).
- Review of design and construction documents and plans.

The RH would be available to undertake these activities, and can train district staff to use and maintain water testing instruments.

3.4. Preparation of Drainage Proposals

The preparation of the actual drain proposal – plans and designs – are the responsibility of the proponent. With adequate liaison, information and guidance, proponents should be providing proposals with detailed designs and adequate realistic (and honest) data on likely drain flows etc.

3.5. Collection of Baseline Data

In order to adequately assess drainage proposals, it is necessary to have some basic data about the assets we are trying to maintain/protect and may be under threat. This information will be essential to determine the following:

- natural flooding levels and capacity of waterways/wetlands;
- natural wetting/drying period of wetlands and flow patterns of waterways;
- recharge/discharge behaviour of wetlands;
- soil and geological characteristics and conditions (eg. sand seams, clay or rock layers or barriers) which could lead to increased recharge or discharge, or are susceptible to erosion;
- location of special vegetation or features;
- salinity and waterlogging risk to the asset;
- erosion risk to the asset.

This will also help to determine the category of asset (Section 3.7).

3.5.1 Physical Characteristics

The following physical characteristics of reserves should be collected and documented for larger or high priority assets and/or assets which are highly likely to be drained into (or are already being drained into):

Waterways/terrestrial

General

- area, perimeter and shape – GIS
- location – map
- reserve status/tenure – CALM records
- uses – facilities and records

Hydrological

- natural waterway flow capacity – survey cross sections
- slope– survey longitudinal sections
- soil profiles – soil pits/drilling
- geology – maps/drilling
- presence of unique hydrological or geological characteristics

Biological

- vegetation types – mapping with ground truthing
- presence of threatened/rare flora and/or fauna and/or communities/ecosystems

Social

- presence of socially or culturally significant features or sites - consultation

Wetlands/aquatic

- area – GIS

- type of wetland (ie. in-stream/off stream, perennial/annual/intermittent etc.)
- bathimetry (stage-volume relationship) – survey when dry or sound when wet
- capacity and flow levels of entry/exit points – survey location/levels
- high water marks – survey levels

A number of current and past projects within CALM have collected physical attributes of assets in the region:

Project	Sites	Characteristics measured
Wetland Monitoring Project	Ardath, Bryde, East Bryde, Campion, Dumbleyung, Mears, Mollerin, North Wallambin, Yenyening Lakes	bathimetry
Recovery Catchment	Toolibin & Bryde	bathimetry, EM, surveys, soils (drilling), veg.
Projects	Lake Campion, …	surveys

> The RH is responsible for obtaining existing and acquiring new hydrological and physical information and data, and coordinating collection of all existing data.
> The DNCO is responsible for obtaining existing and acquiring new biological information and data.
> The DM is responsible for obtaining existing and acquiring new social information.

3.5.2 Asset Condition and Behaviour

Most assets in the Wheatbelt have been modified to some degree, especially by catchment hydrological changes as a result of clearing, with the symptoms of salinity appearing in most valley floor reserves. It is important to identify the current condition of assets and the trend – whether they are stable or getting worse. In addition, it is important to evaluate the impacts that current and new drainage has on the assets. The following monitoring will be required to do this:

Waterways/terrestrial

Hydrological

- mean annual rainfall and evaporation
- stream flood and baseflow water levels and flows – gauging*
- stream water quality (EC, pH) – sampling at different flow levels/weekly or monthly
- water table and piezometric levels – regular (usually quarterly) measurement
- groundwater quality (EC, pH) – sampling 4 times in 1st year, then twice per year

Biological

- vegetation structure and condition – transects/plots surveyed annually to every 5 years depending on asset class
- presence/number of animals – trapping

Wetlands/aquatic

- wetland water levels – gauging (6 monthly
- water quality (EC, pH, nutrients) – sampling annually
- frequency of overflow
- condition of fringing vegetation (transects across slope)
- number/diversity of invertebrates (water sampling every 2 to 5 years)
- number of waterbird, breeding (observations every 2 to 5 years)

* stream gauging can be an intensive and/or expensive activity to be able to obtain suitable data. Data requirements and resources available will need to be considered at each site to determine method and monitoring frequency.

A number of current and past projects within CALM have collected physical attributes of assets in the region:

Project	Sites	Parameters	Frequency	Period	Comments
Wetland Monitoring Programme	varies over time from 65 to 119 wetlands	water depth, water quality, some shallow groundwater, vegetation, waterbirds, invertebrates, water chemistry	various	1979 onward	data in 1980s corresponded to waterbird survey, monitoring ceased in mid 1990s for a while
Recovery Catchments	Toolibin & Bryde	ground water levels, surface flows, vegetation	various	1990s onward	
Waterbird survey	up to 100 wetlands	waterbirds	2 monthly	1981-85	
Biological Survey	220 sites	water chemistry, soil texture vegetation, waterbirds, vertebrates	once only	1997-2004	
WA Museum surveys	?	?	once only?	1970s	data may be included in the Bio. survey

The RH is responsible for obtaining existing and acquiring new hydrological data and coordinating collection of all existing data.
The DNCO is responsible for acquiring new biological information and data.

3.5.3 Asset History

The history of the asset should be compiled – from CALM records as well as collection of local verbal histories. This will help to determine the natural baseline condition of the asset and the social values of the asset. Histories should include what the asset was like in the past, how it was used and how it has changed over time.

The DMs are responsible for obtaining existing and acquiring new social information.

3.6. Determining Sensitivities

Different ecosystems and communities have different resilience towards change, especially hydrological change. Some wetland systems are naturally brackish and contain waterlogging and salt tolerant species that are less sensitive to inundation or secondary salinity. It is important to determine the overall sensitivity of the assets to different forms of change – hydrological (inundation, salinity, waterlogging, drought etc.), disturbance (erosion, trampling, uprooting etc.) and competition/predation (weed invasion, feral animals, grazing). Sometimes the sensitivity to one pressure may influence the susceptibility to another (eg. hydrological change may make an asset more susceptible to weed invasion).

PUT IN SHAT STUFF IS ALREADY BEING DONE – CALM SCIENCE BRANCH ETC.

3.7. Assessment and Categorisation of Assets

M Cooke has suggested classification of wetlands into three categories, based on their current condition and suitability for receiving drainage. This could be broadened out to all assets and could provide the basis for determining the priority of the asset and thus the level of assessment required.

The DM and DNCO will identify the assets and their priority for classification, with input from relevant sources.

The asset category could be determined based on the current condition, threats to the asset and the value of the asset, in a matrix similar to the example below:

Current condition	Threat	high			medium			low			Value
		low	med	high	low	med	high	low	med	high	Resilience
good	low	1	1	2	1	2	2	2	2	3	Asset category
	moderate	1	1	1	1	1	2	1	2	2	
	severe	1	1	1	1	1	1	1	1	2	
moderate	low	2	2	3	2	3	3	3	3	4	
	moderate	1	2	2	2	2	3	2	3	3	
	severe	1	1	2	1	2	2	2	2	3	
poor	low	2	3	4	3	3	4	4	4	4	
	moderate	2	3	4	3	3	4	3	4	4	
	severe	2	2	3	2	3	4	3	3	4	
		Asset category									

The highest level of assessment would be required for class 1 assets, while class 4 assets would only require a very basic assessment.

The NRM groups will have determined some kind of threat-value matrix for their ecological assets through their strategic planning processes. These may be of use in determining the classes for individual assets in addition to the broad SIF prioritisation.

A further consideration that should be taken into account is the likelihood of drainage occurring in the catchment of each asset to enable prioritisation of assets to obtain baseline data for.

Consideration will need to be taken of the linkage of each asset to other assets as drainage may influence downstream assets in all or some years. For example, Coyrecup Lake is upstream of the Coblinine Nature Reserve and Dumbleyung Lake and these are connected by the Coblinine River. If there was a proposal to drain into a category 4 asset upstream (say Kwobrup Swamp), there needs to be a flag to indicate that there are higher category assets that may be influenced downstream. Therefore, each asset will have two categories – that for the asset on its own, and a system category reflecting the categories of all the assets within a hydrological system.

Initially, only public assets would be classified, but eventually private assets (ie. large areas of significant remnant bush and wetlands on private land) would also be included over time.

3.7.1 Asset Condition

The asset condition would be derived from the analysis of data acquired in section 3.5.2. It would take into account the level of degradation relative to pristine and reflects the historical change, for example:

	Good	Moderate	Poor
Vegetation	pristine to slightly modified – only local modification in structure or species mix or decline in health	modified – general change in structure, loss of one or two species, moderate decline in health of individual plants	highly modified – generally only a small number of species remaining, structure significantly changed, overall health decline
			continued next page

	Good	Moderate	Poor
Habitat	a number of good habitats suitable for a range of species present	a few good habitats and some modified habitats present, suitable for more than one species	few habitats present
Hydrology	water quality within 10 % of pre-clearing levels, no change in hydroperiod, no erosion	seasonal or year round moderate increase in salinity/nutrients and/or change in pH, hydroperiod	significant year round change in water quality, significant change in hydroperiod, sedimentation/erosion occurring
Soil	less than 5 % of area effected by waterlogging or salinity	5 to 20 % of area effected by waterlogging or salinity	more than 20 % of area effected by waterlogging or salinity
Other	weeds only very localised and few, no pigs, few feral animals present, no grazing	moderate or bad local weed infestation, feral animals present, possibly historic grazing	high weed prevalence, grazing, pigs may be present, feral animals major threat

Asset condition will be determined by the RH and DNCO in consultation with relevant experts.

3.7.2 Threats to the Asset

Almost all Wheatbelt assets are under some form of current threat. Threats can be determined from visual inspection, mapping, measurement and historical information. The level of threat can be described as below:

	Low	Medium	High
Overall viability	large area with low perimeter to area ratio, covers a large range of vegetation types and landscapes	medium area and/or medium perimeter to area ratio, covers a moderate number of vegetation types or landscapes	small area or large perimeter to area ratio, covers few vegetation types or landscapes
Fire (see viability)	well established fire breaks and fire management programme	some fire breaks and some fire management	no fire management programme, poorly maintained fire breaks
Contamination, disturbance & disease (see viability)	predominantly grazing on surrounding land, little visitation (remote from towns), tracks closed to vehicles/managed, catchment not likely to be drained	mixed cropping/grazing on surrounding land, moderate visitation, uncontrolled traffic in some areas, some drainage may be used in catchment	predominantly cropping on surrounding land, high visitation (close to towns), many tracks open to vehicles, drainage in catchment
Grazing	fences in good condition, moderate number of kangaroos, no rabbits	fences in reasonable condition, moderate number of kangaroos, some rabbits	fences in poor condition, high number of kangaroos, high number of rabbits
			continued next page

	Low	Medium	High
Salinity	generally higher in the landscape	in smaller or upper valley floors with some rising water tables or smaller catchments, on or below slopes subject to some seepage, on geological formations (eg. dolorite dikes) in the presence of subsurface water flows	in valley floor subject to rising water tables, on or below slopes subject to significant seepage, on complex geological formations in the presence of saline subsurface water flows, clay soil profiles under higher or rising water tables
Flooding & waterlogging	generally higher in the landscape	downslope of medium sized cleared catchments with lower runoff thresholds or higher runoff than under natural vegetation	downslope of large cleared catchments with lower runoff thresholds or higher runoff than under natural vegetation, around or on geological formations with high volumes of fresh water present (eg. granite outcrops)
Erosion /sedimentation	well vegetated catchment, low erodible soils, flat terrain	some exposed erodible soils in catchment, waterways from largely cleared catchments entering asset	large areas of erodible soils exposed in catchment, waterways from largely cleared catchments entering asset, steep slopes in and into asset

Threats to the asset condition will be determined by the RH and DNCO in consultation with relevant experts.

3.7.3 Asset Values

Assets are valued for a range of different attributes, for example:

	High	Medium	Low
Environmental	high diversity, good habitat (especially if for rare/threatened fauna), unique/rare flora, fauna, geology, hydrology and/or landscape; high scientific & educational potential	moderate diversity, some good habitat, locally unique flora, fauna, geology, hydrology and/or landscape; moderate to high scientific &/or educational potential	little diversity, poor habitat, no unique/rare flora, fauna, geology, hydrology and/or landscape; minimal scientific or educational potential
Social	state/regional iconic status, unique features, a range of recreational activities can be undertaken (accessible)	local iconic status, some recreational activities can be undertaken	no iconic status, few recreational activities can be undertaken (accessibility may be restricted)
Economic	unique or interesting features (tourism), good timber resources, good vegetation resources (eg. flowers, honey)	no interesting or unique features, some resources	no interesting or unique features, no resources

Often the social and economic values conflict with environmental values or can create the threat to the asset. Low value can also be synonymous with poor condition.

Asset values will be determined by the RH and DNCO in consultation with relevant experts and using information from earlier public consultation (eg. regional NRM group strategies).

3.8. Collection of Assessment Data

Some specific information and data will need to be collected for each drainage assessment in addition to that described above. These are:

- catchment to be drained – type (ie. loamy or lateritic), total area, areas with surface water management and proportion cleared – measured off GIS;
- rainfall – obtained from local projects, farm records or Bureau of Meteorology;
- evaporation or climate data used to estimate evaporation – obtained from local projects or Bureau of Meteorology;
- streamflow and water quality records – obtained from local projects or DoE;
- water table and groundwater levels in the catchment to be drained (if available) – obtained from local projects, community monitoring (CLO) or DAgBores;
- soil depth and texture measurements;
- detailed vegetation type and condition – obtained from previous projects or surveyed.

3.9. NoID Assessment

This is described in detail in section 4.

3.10. Monitoring Drainage

Apart from determining for the proponent whether the drainage works have done what they were supposed to do or not, monitoring of drainage is important to increase and improve the general knowledge about drainage options and suitability to different landscapes and soils, drain hydrology and provide additional design information for future proposals. Parameters that the proponents should be encouraged to monitor are:

- productivity of land adjacent to the drains – yield, pasture growth measurements;
- flow rates in homogenous sections of drain (ie. similar soils) – fortnightly flow depth measurement at known cross section;
- basic water quality of drain discharge – samples collected monthly and sent to landcare/CALM/DAg to be tested for pH and EC;
- sediment depth in drain and shape of drain at several points (to identify erosion) – photos and/or measurements;

All of these measurements could be obtained at the same locations on the drain to combine measurements.

All the data could be sent to the local CLO or directly to DAg or CALM at regular intervals. Hopefully, this is already being done for the EEI.

LIST WHAT EEI IS COLLECTING & WHERE.

RH set up a process for collection of drain monitoring data with CLOs and DAg officers.

3.11. Compilation of Design Data for Drainage

Despite a large number of drains having been installed over the past ten years, very little evaluation of drains has been undertaken, and no design data has been compiled. In order for drainage proponents to be able to properly design drainage and provide honest data for their assessment, the following values should be compiled, from the data collected in Section 3.10, over a wide range of drains:

- groundwater discharge rates for different depths of drain and soil types/formations (both short term and long term),
- shallow water table and aquifer salinities and pH levels,
- shallow soil buffering capacity,
- change in salinity and pH over time in a drain in different soil types/profiles.

These should be tabulated so that proponents can determine discharge rates and salinities and pH from their soil types.

The EEI is currently monitoring a number of drainage sites, however, many existing drains could be monitored to provide data for the whole region.

EEI RELEVANT PROJECTS.

In addition to temporal data, it will be important to determine basic drain information such as date constructed, basic design (depth, length, longitudinal slopes, batter slopes, soils) and location. This will be needed to be able to determine existing impacts on assets which are currently monitored (Section 3.13). The CSLC has set up a database of notified drains and is currently checking data with LCOs etc.

RH to liaise with EEI/CSLC/CLOs etc. to collect and compile data, encourage drain monitoring and data collection and coordinate its storage and distribution.

3.12. Monitoring Asset Conditions

Very little monitoring has been undertaken to evaluate the actual impacts of drainage on reserves, wetlands and other assets. However, monitoring that has been undertaken under the Wetland Monitoring Project will be useful. Parameters listed in Section 3.5.2 will need to be monitored on an on-going basis to identify trends after drainage has been into the asset. In addition, the basic characteristics/baseline conditions as per Section 03.5. will be required from before drainage intervention to determine trends or changes.

PUT IN HERE THE WORK THAT EEI HAS DONE/IS DOING.

RH set up a process for collection of drain monitoring data with CLOs and DAg officers.

3.13. Assessment of Impacts of Drainage on Assets

Where existing data and information is available for condition in assets over time, with a baseline before drainage and knowing when drainage intervention occurred, the impact of drainage should be assessed. An on-going programme should also be set up to continually assess drainage impacts, using data collected in the above section. Simple reports may be prepared for each asset as data is collected, but it is important to undertake a detailed review say every 10 years. Obviously available resources will be a restricting factor on the amount of assessment that can be undertaken.

LIST EEI PROJECTS ASSESSING D/S IMPACTS

RH identify assets where assessment can be done now and set up assessment and reporting process in consultation with DNCOs and DMs.

3.14. Feedback to Farming and Scientific Community

An important process for identifying the impacts of drainage is community education – so that there is heightened awareness of the need for integrated catchment planning and management, and proper design and assessment of drainage. The outcomes of Section 3.13 will need to be actively publicised and interpreted for the general community.

In addition, all of the information, data and analysis will be useful to the scientific community. A regular bulletin (say once per year) may be useful to be sent to relevant agencies and programmes (ie. CALM Science, EEI, CDI, DAg, DoE), summarising the information and outcomes.

RH put together reporting framework in consultation with DNCOs and DMs.

4. ASSESSMENT of NoIDs

4.1. Handling of Notices

The assessment of NoIDs through the CSLC follows a set process. The CSLC has a maximum of 90 days after submission of a proposal (completed to the satisfaction of the CSLC) to respond to the proponent. They may respond by giving no objection to drainage (in which case the proponent has 2 years in which to construct the drainage as specified in the proposal). Alternatively, the CSLC may reject the proposal or ask the proponent to resubmit the proposal with changes. Where a proposal is referred to the EPA, this allows a further 30 days for an assessment plan to be developed by the EPA, which will then identify the time frame by which a response can be made to the proponent.

The CSLC usually allows 30 days for other agencies to submit comments on proposals, though this can be extended by up to another 30 days in most instances if required. An internal process is required to make sure that a suitable response is provided to the CSLC within this period and to ensure an adequate assessment is made. The steps that should be followed and timeframes are shown in the following diagramme.

4.1.1 Documentation

Once the NoID is received, it will be put onto a register held by the RH.

The districts have their own filing system which has a file for NoIDs. Larger catchment scale systems will have their own file. The Region will have files for each district for small NoIDs and individual files for large proposals. The regional file numbers are as follows:

4. Environmental Protection
   - 4.3. Salinity and Drainage
     - 4.3/1 Blackwood and SW Catchment – regional proposals in the Blackwood and Peel basins could be put under here
     - 4.3/5 Drainage – Narembeen/Seagroatt
     - 4.3/6 Avon Regional Drainage Project – other Avon regional proposals (eg. Yenyenning) could be put in here
     - 4.3/10 NoIDs – 10.1 = Avon/Mortlock, 10.2 = great Southern, 10.3 = Yilgarn, 10.4 = other regions.

4.1.2 Information and Data

The minimum information that the proponent will need to provide for adequate assessment is:

- location (location numbers, grid coordinates, and/or relationship to roads etc.),
- length of drain,
- type and size of drain (leveed/unleveed, deep drain/pump, depth, width etc.),
- description of where discharge will be made.

In addition the following information is also needed, but will most likely be obtained only through a site visit:

- soil type through which the drain will be excavated,
- expected discharge rates, water quality etc.,
- management of surface water.

The assessor will also require the following information:

- Average monthly evaporation (obtained from Bureau of Meteorology website)
- Average monthly and annual rainfall (obtained from Bureau of Meteorology website)
- Monthly or daily streamflow data, preferably at least 10 year's worth (obtained via DoW River Monitoring website)
- Soil landscape units (obtained from GIS section)
- Geology (obtained from GIS section)
- Contours/aerial photography (obtained from GIS section)
- Extent of salinity (obtained from GIS section – landmonitor)
- Vegetation Associations (obtained from GIS section)
- Records of location and description of DRF, threatened and priority fauna, threatened and priority ecological communities (obtained from GIS section and local district flora and fauna databases).
- Location of current and potential natural diversity recovery catchments or other landscape recovery areas, and RAMSAR or DIW wetlands (obtained from GIS section).
- Location of Land for Wildlife sites, Covenanted sites, Nature Reserves (current or future) and other DEC managed estate, and Crown Land and Reserves (obtained from GIS section, district records, Covenanting branch and LfW officers).

4.2. Desk-top Assessment

The desk-top assessment will determine the location and scale of the proposal, obtain necessary data, estimate hydrological factors and identify assets potentially impacted and their value. Sometimes the desk-top assessment may not be able to be completed until the site assessment is done.

4.2.1 Estimating Extent of Potential Impact

Firstly, the RH will identify the location and catchment upstream of the proposed discharge point. Catchment area can easily be determined using orthophotos and contour data (or often the sub-catchment dataset) on GIS. Usually linework will be created on the GIS for the drainage and the catchment.

The RH will then need to estimate the downstream extent to which drain discharge could potentially reach. A reasonably accurate estimation of this will require daily or monthly streamflow data. Typically this is not available, but can be approximated from measured flows measured in a catchment of similar landscape and roughly similar size, factored by the ratio of average annual rainfall and catchment area:

$$Q_c = Q_m \times R_c/R_m \times A_c/R_m$$

Where Q = catchment flow, R = average annual rainfall and A = catchment area; subscript c refers to the catchment above the drain discharge and m refers to the measured catchment.

Drain discharge tends to be very high during construction, as the water table is initially de-watered, and in mid to late winter when water tables are highest and evaporation low. These are the periods when maximum potential downstream impact is most likely to occur.

Average monthly stream flow for the catchment above the discharge point is determined, for the month with lowest average evaporation and the summer month with lowest average evaporation (assuming that drainage is likely to be constructed in shoulder summer periods, ie. Oct-Nov and Mar-Apr), when the soil is drier and likelihood of fire bans is reduced). The DoW EEI and a very small number of monitoring projects have estimated drain discharge values for a range of drains across the Wheatbelt (tabulated below). These can be used to estimate total drain discharge. Initial construction discharge can typically be up to 2 times the long term winter discharge.

For groundwater pumps, typically a pump test will have been conducted on bores into the same groundwater system, which will give an estimate of the amount of discharge.

TABLE OF MEASURED DRAIN DISCHARGE VALUES

Downstream impact distance is estimated by the following (quantities are in following units – metres, months) for the two months determined above:

1. Amount of discharge from drain = length x (discharge rate – evaporation rate x bed width)
2. Add discharge from catchment to (1)
3. Divide (2) by average width of downstream waterway (estimated from orthophotos on GIS) and evaporation rate = length of stream impacted.

4.2.2 Biological Asset Identification

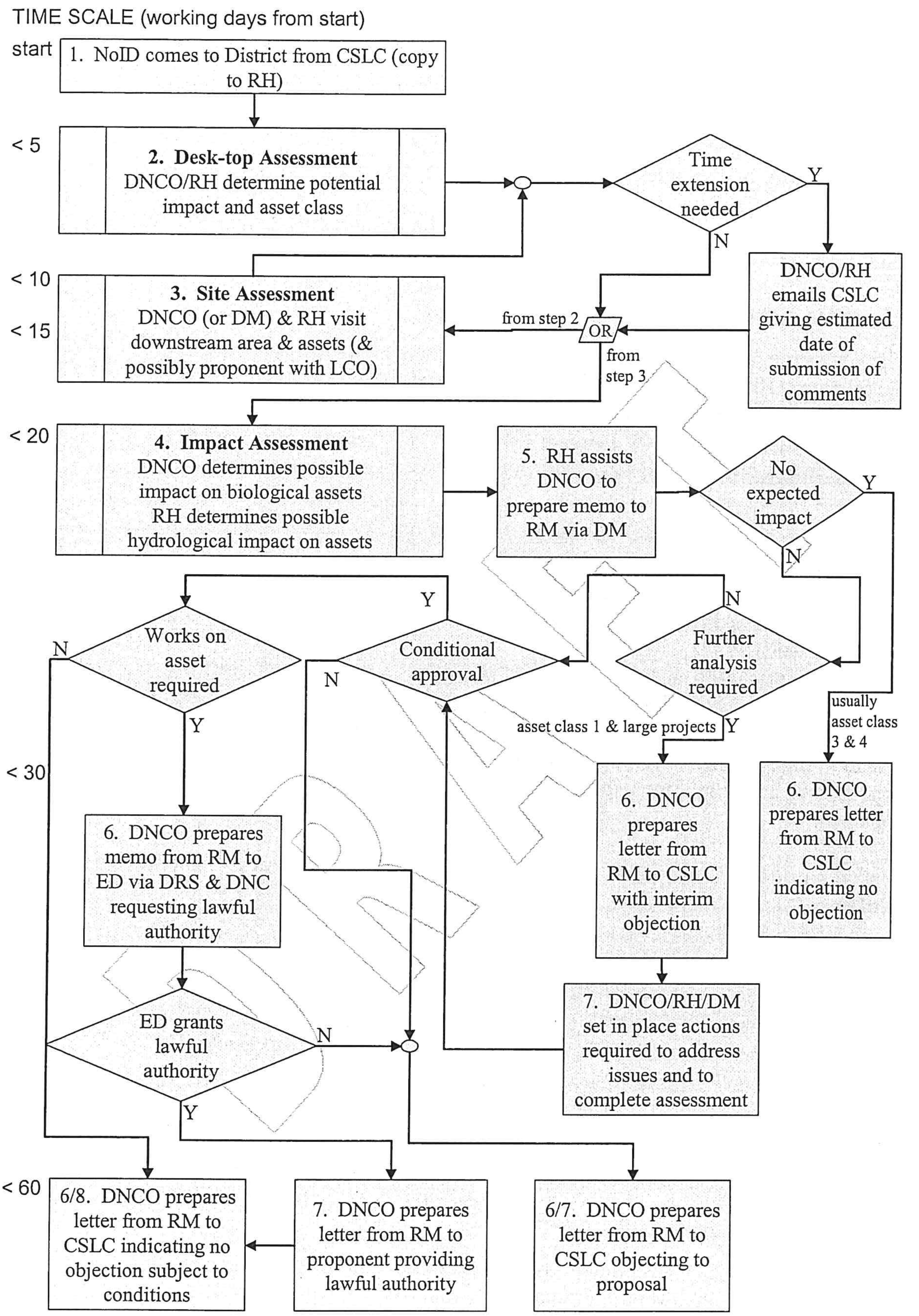
If any of the assets listed in 4.1.2 are found within the distance downstream calculated in 4.2.1 (following the waterway), then they are at potential risk of impact. This is generally done by the DNCO.

4.2.3 Determining Assessment Level and Information Required

The DNCO will determine what level of assessment is required for the proposal. This will mainly depend on the size of the proposal and the classification of the assets potentially impacted (from 3.7). Any proposal larger than 10 to 20 km length of drainage (or equivalent) and on more than three or four farms should generally have an EIA prepared, as should any proposal where there is potential for drainage impacts in a class 1 asset. Another tool that can be used to indicate if more detailed assessment is required, is the Coleman-Meney spreadsheet model, where wetlands are involved. If the proposal fails any of the criteria in this tool, it indicates that further assessment may be required. The level of information and detail in assessment needed will depend on each particular case.

In most cases, a site assessment to obtain some basic data and inspect the potential downstream impact area will be sufficient.

A factor that may be important in assessing the proposal is the political environment in the area.



4.2.4 Time Extension

It will often be possible at this stage to know if a time extension will be required – especially in any of the following circumstances:

- A class 1 asset is likely to be impacted on,

- an EPA EIA is likely to be required,
- works are proposed on DEC managed land
- works may be required on DEC managed land to mitigate impacts of the proposal,
- information and/or data is required to be obtained (including measurements) – usually in the case of a higher class asset or larger proposal,
- one of more of the assessing officers (DNCO, RH, LCO) is unavailable for a period of time.

In most instances, an extension of 30 days can be obtained by contacting the office of the CSLC.

4.3. Site Assessment

Where possible, a site visit should be made to coincide with the assessment by the DAg LCO. The following should be determined for the actual drainage site:

- history, context and objectives,
- existing surface water management,
- measurements of pH and EC,
- soils,
- indication of groundwater discharge rate and quality (hopefully the proponent will have done test holes and some investigation),
- observation and measurement (discharge , pH, EC, extent dewatered) of existing nearby drainage if it exists (hopefully the proponent can also provide some physical monitoring data as well),

The proponent should be made aware of the assets that are potentially subject to discharge from the proposal, to make sure they understand the issues relating to drainage. They (and other landowners in the catchment) will also have a good knowledge of the hydrology in the system. Improvements to the proposal can be suggested to help alleviate any potential impacts and any conditions that DEC may place on the proposal can be indicated to the proponent.

In addition, the catchment and assets likely to be impacted should be visited to determine the following:

- where discharge water will flow and/or be stored
- existing flow paths and conditions – inundation, hydroperiods etc.
- condition of downstream areas that may impact on flow and storage
- measure flow and water quality, high water marks
- determine channel and wetland capacities (including waterway widths)
- observation and measurement (discharge , pH, EC, extent dewatered) of existing drainage on nearby properties if it exists and downstream waterways, lakes etc.

RH to coordinate site visit with LCO, DNCO (and DM if required) and the proponent.

4.4. Impact Assessment

A copy of the LCO assessment report should be obtained to assist in the assessment, especially if a site visit on the drainage site cannot be made. In general, the higher the class of assets potentially impacted, the more detailed the assessment required. EPA assessment may be requested in class one assets.

4.4.1 Hydrological Calculations and Modelling

In smaller proposals or where only lower class assets have the potential to be impacted, then only some ground-truthing of the data used in step 4.2.1 may be required (eg. Waterway widths and waterway channel capacities) before making the final assessment (step 4.4.3). However, depending on the characteristics of the asset, a number of values may need to be estimated under current conditions and with proposed drainage. These are as follows.

4.4.1.1 Channel and Floodplain Hydraulic Characteristics

Values of conveyance or surface roughness, cross section and slope will need to be determined for where drainage water will pass through or into the asset. This may require a site survey. These values are used to determine drain design capacity and for flow modelling.

4.4.1.2 Design Drain Capacity

Usually the 1:20 year ARI is used with simple runoff formula to calculate design flows to determine channel dimensions for farm or sub-catchment scale conservation earthworks. These will be needed where either the drains are expected to carry surface water or will be influencing where surface water flows. The LCO will normally be determining these to assess land degradation.

4.4.1.3 Groundwater Discharge

Where inundation occurs in an asset (ie. in a floodplain or wetland), or the proposed drainage area is quite large, the increased groundwater discharge will need to be estimated in order to estimate the increase in residence time and inundated water level.

4.4.1.4 Flow Modelling

In category 1, 2 or 3 assets containing floodplains, wetlands or other areas where water can be stored for periods of time, simple models should be employed to estimate water levels over time. The following data will be needed to model these water levels:

- rainfall,
- evaporation – measured (pan) or estimated from climate data,
- starting water level in the wetland or floodplain,
- depth-volume relationship for the inundated area,
- outflow relationship (storage level vs. flow),
- water table and groundwater levels and relationship to surface water.

Measured inflows would also be useful, otherwise they will need to be estimated from rainfall and catchment characteristics. For larger catchments, a runoff routing model may be needed to estimate flows from the catchment. In addition, measured water levels and outflows would be useful to calibrate the model used.

Timesteps for modelling of inundation on a flat or floodplain may be daily, but into a wetland would only need to be weekly or monthly.

RH to acquire or develop, and test, simple models and calculators to estimate runoff, calculate drainage capacities and determine flood and wetland water levels.

4.4.2 Water Quality Calculations and Modelling

In assets where inundation of any form occurs (if it does not, then there may be an asset downstream where it does), water quality will be an issue. The main parameters of interest will be acidity and salinity. In category 1 and 2 assets with wetland or inundation areas, nutrients may also be an issue (eutrophication).

Tied to the water volume calculations above (Section 4.4.1), loads and concentrations of salt and nutrients can be calculated along with acidity. Additional data that will be required are:

- current salt (and nutrient) concentrations and acidity in the wetland (floodplains would be assumed to be dry),
- salt (and nutrient) concentrations and acidity of inflows

- salt concentration in rainfall – can be estimated from distance from coast (pH of rainfall assumed = 7),
- salt and nutrient concentration and acidity of water table/groundwater (both in the drained catchment and in the asset)

If inflow salt and nutrient concentrations are not measured, they will need to be estimated from the area of discharge in the catchment and concentrations in the water tables/groundwater, for both the drained and current scenarios. Evaporation rates are needed to determine the amount of salt accumulation at the soil surface. A simple empirical model would be needed to estimate the rate of salt wash off from surface salts into runoff.

PROCESS FOR ESTIMATING ACIDITY

RH to acquire or develop, and test, simple models and calculators to estimate water quality parameters in runoff and storage areas.

4.4.3 Assessment Questions

The detailed assessment entails attempting to answer a series of questions. Consideration in answering the questions must be given to:

- the area to be drained compared with the potential total future area that could be drained into the asset;
- how much the asset is currently impacted by drainage;
- how much buffering capacity the catchment soils and the asset has to moderate the effects of acidity;
- the length of time that the impact could be expected to occur and if the asset has a good chance of recovery after a short period of impact (eg. drainage discharge may only be saline at the start then gradually become fresh over a couple of years; note also that initial dewatering may discharge large quantities of water compared to longer term drainage);
- the current trend in salinity in the catchment without any further action.

Data collected and observations made during the site visit together with subsequent hydrological analysis and the initial desk-top assessment should enable an adequate assessment to be made.

4.4.3.1 Inundation and Flooding

Will there be inundation and/or flooding, or will the duration and/or depth of inundation/flooding change as a result of the proposal? Will the inundation water be saline and/or acidic or become more saline and/or acidic than current as a result of the proposal (therefore increasing the soil salinity and acidity)?

The acceptable expected change in inundation and/or flooding will depend on the asset in question, but generally acceptable impact will be less in category 1 and 2 assets.

4.4.3.2 Wetlands

Will the water levels in the wetland be increased for any amount of time as a result of the proposed drainage, and how long for? Will the wetland have water in it for more or less time than currently as a result of the proposed drainage?

Will the quality of the water in the wetland at any time decline as a result of the proposed drainage (or will it improve)? Will the drainage water increase salt/nutrient loads by a significant amount in the wetland?

Acceptable increments of change in water quality can be provided for different asset categories. Coleman and Meney proposed a maximum of 10 % (factored by the ratio of area drained to total catchment area) for there to be no objection to a drainage proposal. This factor may vary between different types of wetland or asset categories.

RH, with input from DNCOs and CALM Science, to determine appropriate acceptable change increments in water quality for different category assets.

4.4.3.3 Flow Velocity and Erosion

Will the velocity of flow in waterway(s) be higher than acceptable as a result of the proposal? Will the drainage import greater quantities of sediment into the asset, or reduce flow velocities such that greater sedimentation occurs?

Maximum flow velocities are well described for different soil types. Threshold flow velocities for carrying different size sediment are also well known.

4.4.3.4 Recharge and Discharge

Will recharge increase in the catchment, leading to increased discharge in the asset as a result of the proposal? Will recharge increase in the asset, leading to increased discharge at a different time or elsewhere in the asset as a result of the proposal? Will baseflows in the waterway(s) be increased or continue for longer as a result of the proposal (leading to greater recharge or repressing discharge)?

The acceptable expected change in recharge and/or discharge will depend on the asset in question, but generally acceptable impact will be less in category 1 and 2 assets.

4.4.3.5 Vegetation Impacts

Will vegetation and/or habitat be disturbed or removed through the construction of the drainage? Will disturbed vegetation recover or regrow in the same form? Will hydrological or water quality changes as a result of the proposal lead to new or further vegetation decline or loss (thereby decreasing the asset's capacity to lower water tables, provide a carbon sink and protect soils from erosion)? Will hydrological or water quality changes as a result of the proposal lead to a loss of species? Will hydrological or water quality changes as a result of the proposal lead to new or further habitat decline or loss?

Acceptable levels of vegetation impacts will depend on the asset in question, but generally acceptable impact will be less in category 1 and 2 assets.

4.4.3.6 Physical Barriers

Will the proposed drainage works create physical barriers to native animals and/or to management or service activities (eg. fire management, visitor access)?

Acceptable dimensions of earthworks etc. to prevent it being a barrier will depend on the asset in question.

4.4.3.7 Aesthetics

Will the proposed drainage works detract from the aesthetics of the asset? Will the proposed drainage works interfere with conservation, educational and/or recreational values of the asset (eg. will it interfere with long term monitoring sites or influence the data collected, will it provide a counter message to interpretation at a site)?

Acceptable works that detract from aesthetics will depend on the asset in question, but generally acceptable impact will be less in category 1 and 2 assets or assets subject to high exposure (eg. adjacent to a main road).

4.4.4 Reporting

A report will be prepared by the DNCO with assistance of the RH, typically in the form of a memo to the RM (via the relevant DM). A template for this report is attached; it follows a similar format to reserve assessment reports and requires similar information for those assets identified to be at risk of impact.

4.5. Approval and Recommendations

Depending on the outcome of the assessment, a number of different approvals or recommendations may be made. The following is a brief description of the steps to be taken in case of different outcomes (more than one option may be required):

- No or acceptable impact expected – prepare a letter from RH to CSLC indicating no objection.
- No or acceptable impact expected provided certain conditions are met – prepare a letter from RH to CSLC indicating no objection provided conditions are met, explaining the issues requiring the conditions, and listing the conditions.
- Require more information, data and/or analysis – prepare a letter from RH to CSLC indicating interim objection to the proposal and reasons why. The actions required that will enable the objection to be lifted need to be described.
- Proposal will directly impact on a significant asset – prepare a letter from RM to CSLC providing objection(s) and reasons. In these cases the CSLC will usually send an objection to the proponent and refer the proposal to the EPA.
- Proposal will require works on DEC managed land – prepare a memo to ED (via DRS and DNC) explaining works required and reasons and support for them (if they are not supported, an objection would be given to the CSLC), requesting lawful authority to undertake works on DEC estate. Once this is provided, prepare letter from RM to CSLC informing of lawful authority (and conditional no objection to proposal); prepare a letter from RM to the proponent providing lawful authority. If lawful authority is not provided by the ED, prepare a letter from RM to CSLC objecting to the proposal (providing reasons).

Example letters are attached.