Chapter 6
Required flow characteristics

The purpose of this chapter is to:

- identify key flow related ecological and geomorphological values within the plan area
- identify flow characteristics (including key flow events) required to maintain or to restore (where appropriate) these key ecological and geomorphological values, and
- where possible, identify key flow related indicators of the status of these values and the flow characteristics required for their maintenance.

This information is presented in tabulated format below as stipulated in the study terms of reference (refer Appendix 1).

Table 6-1 Links between flows and ecological outcomes

Ecological asset (reach, species, process, etc.)	**Where in catchment**	**Component of flow regime**	**Characteristic of link between ecology and flow** **[e.g., how does the ecology depend on the flow?]**	**Critical requirement to maintain value**	**Potential indicators**	**How to monitor**	**Other issues**
High-integrity low-order stream reaches of upper catchments	PR-1, PR-2, AND-1, AND-2 B-1 H-1 MN-1 F-1 OC–1. Exact extent and locations of stream sections of high integrity has not been mapped, and cannot be from the available datasets. Greatly increased water use is unlikely in these upper catchment reaches, but localised changes to aquifer or pool extraction could become important.	Surface runoff flows Base flow	Initiates filling of pools, biota colonisation or reproduction. Sustains pool and riffle aquatic communities beyond wet season allowing completion of reproduction or recruitment of biota.	Near-natural occurrence with significant rainfall events. Duration extends beyond wet season for period established by upper catchment fractured rock aquifer historical discharge characteristics and rainfall-driven surface flows.	Timing of first filling of channel pools. Duration of base flow beyond wet season. Recession rate of pools. Riffle presence or persistence.	Inspection (aerial photography) of pools following early rainfall events. Monitoring of pools and riffle habitat post-wet season. Late wet and dry season aerial photography of surface water or waterhole extent. Photo point monitoring selected reaches or pools.	Nearby groundwater (base flow) extraction and depletion. Potential for dam construction and water extraction. Catchment run off and recharge characteristics set by ground cover and vegetation condition. Limited catchment alteration, particularly of riparian vegetation, is a key driver of current condition that is not flow related.

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High-integrity low-order stream reaches of upper catchments (continued)	PR-1, PR-2, AND-1, AND-2 B-1 H-1 MN-1 F-1 OC–1. (continued)	Flood flow	Resets (scours) pool depth and moves sediment.	Flow peak (e.g., > 5-year ARI) reaches historical maxima.	Depth of pools and channel bed form.	Impetus for monitoring is primarily improving knowledge of baseline ecological processes and identifying possible long-term changes associated with localised usage changes, climate change or changes in aquifer behaviour.	

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Deepwater habitats of middle reaches of Proserpine River	PR-3, PR-4, PR-5 The exact locations, extent and number of such habitats cannot be mapped from the available datasets.	Base flow	Persistence of deepwater pools provides habitat for larger species and refugia for a wide range of flora and fauna during the dry season. Base flow maintains water level and quality characteristics of these pools.	Current non-natural timing, duration and downstream extent of flow prevents development of eutrophic water quality conditions within deepwater habitats despite some nutrient enrichment in waters near dam outflow and above Proserpine STP.	Dissolved oxygen and nutrient status of selected pools within upper (PR-3) to lower (PR-4/5) mid reaches. Better identification and understanding of the interactions between flow regimes, macrophyte masses (particularly aquatic grasses) and water quality conditions is a key data gap.	Seasonally, depth and diurnally stratified monitoring (increased frequency warm months) of dissolved oxygen status within deepwater habitats. Seasonally stratified water quality monitoring (increased frequency late dry) for nutrients.	Base flow affected by irrigation and other water supply releases and therefore varies in relation to managed interaction between groundwater and surface flows. DO and nutrient levels affected by in-stream vegetation condition. Flow peak maxima impacted by impoundment may require regulated releases coinciding with wet season runoff flows to achieve desired maxima. May not be practically achievable.
		Flood flow	Resetting of channel form, scouring of pools, removal of accumulated organic loads and macrophyte masses, transport of bed load sediment through reaches.	Flow peak of sufficient magnitude to scour pool bottoms and remove in-channel macrophytes moves through all middle reaches on at least annual frequency (estimated to be 100 to 300 m^3s^{-1}).	Extent of ingrowth, and coverage of channel margins and water surface by emergent, submerged and floating macrophytes. Pool depth Organic composition of sediments.	Photo point monitoring of selected pools. Annual monitoring of channel form in selected deepwater reaches. Benthic grab sampling of bottom sediments for PSD and organic content analysis.	

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Riffles and refugial waterholes in middle reaches of all other streams	MY-1 LE-1, LE-2 TH-1(?) AND-2,AND-3 B-2 H-2 OC-2, OC-3 The exact locations, extent and number of such habitats cannot be mapped from the available datasets.	Base flow or groundwater level	Waterhole duration or permanence provides refuge and population maintenance. Riffle maintenance provides habitat for riffle-dwelling species. Base flow persistence through a substantial proportion of the dry season required for persistence or recruitment of riffle-dependent flora and fauna. Sustained base flow and connection to groundwater sustains water quality during the dry season.	Near-natural (allowing for rainfall variation) waterhole and riffle persistence for at least 25% of naturally occurring waterholes and riffles or equivalent artificial structures. Near natural groundwater levels in fluvial aquifers and parts of Tertiary sediment aquifers connected to surface waters.	Number, distribution, depth and drawdown rates of waterholes. Riffle distribution, extent and persistence determined by ground survey in late dry season on stratified sampling design (i.e., representative, not all riffles). Water levels in fluvial aquifers and parts of Tertiary sediment aquifers connected to surface waters. Base flow hydrograph record analysis. Persistence and diversity of riffle and waterhole dependent flora and fauna.	Late wet and dry season aerial photography of surface water or waterhole extent. Ground surveys of waterhole and riffle extent in late dry survey in stratified design, including fauna and flora assessments.	Interactions between aquifers, windows and extraction poorly understood with extent and value of available information uncertain. Interactions require further assessment to identify needs for maintaining values. Current extent of these habitats with respect to natural occurrence unknown. These ecological assets occur in regulated stream reaches. The extent to which current regulated flow regimes affects their values has not been assessed.
		Flood flows	Scour the stream bed to deepen and create pools and move sediment through bedrock controlled reaches.	Annual peak flows (ARI 5 years and above) and dominant discharge band at near-natural frequency and duration in O'Connell catchment	Number, distribution and depth of water holes and number, distribution and extent of riffles at start of dry season.		

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Goorganga Plain wetland	LE-2, LE-3 G-2, G–3 TH-1 See Section 5.3.1	Base flow	Determines seasonal water level and quality characteristics of channel habitats within complex.	Highly seasonal flow that tapers off following a natural (rainfall-related) decline to cessation in dry season.	Recession rates of channel hosted waterholes. Flow volumes of tributary streams.	Seasonal depth recorded in selected waterholes of main streams within complex. Flow gauging on tributary streams. Flow gauging on streams.	Pool depth and stream flow volume potentially affected by existing overland and surface flow extraction. Tailwater discharge and quality from regulated Kelsey Creek catchment impacts one tributary stream (Lethe Brook). Historical flood patterns have been affected by river levees and dam construction. Invasion by exotic emergent macrophytes (hymenachne) and bank erosion caused by cattle access may be changing stream-channel sedimentation characteristics.
		Flood flow (including lower flood flows producing surface runoff)	Resets channel form and macrophyte community, scours pools, provides overbank supply to floodplain wetlands and shallow aquifers and connects floodplain habitats to lower estuary. Provides passage for fauna and floral propagules in pools isolated during the dry season.	Peak flow needs to have sufficient energy to remove accumulated organic matter and macrophyte chokes and move bed-load sediment (provided rainfall would have produced that naturally). Duration and areal extent of flow needs to allow successful movement and recruitment of aquatic organisms to and from off-stream water bodies to lower estuary and allow for recharge of shallow aquifers.	Flow height and duration in channels of floodplain complex near natural. Channel depth and form near natural and allowed to naturally alter. Seasonal macrophyte cover and composition.	Aerial photography or remote imagery-based mapping of floodplain channel form. Annual aerial flyover photo monitoring of macrophyte community composition and cover. Annual survey of stream channel cross-sections. Annual aerial	

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		Groundwater levels	Sustain water levels within deeper channel-hosted pools. Maintain hydraulic head to prevent landward intrusion of seawater wedge.	Groundwater remains at levels that intersect channel and sustain surface deepwater habitats to near-natural levels. Landward migration of seawater wedge halts at historically established interface (allowing for rainfall variability).	Recession rates and aerial extent of perennial freshwater pools within habitat complex. Groundwater depth and salinity.	flyover photo monitoring of perennial pool extent. Seasonal depth recorded in selected waterholes of main streams within complex. Seasonally stratified monitoring of groundwater bore depth and salinity. Tide gauge in lower floodplain reaches.	Groundwater system not in equilibrium. Substantially increased groundwater extraction may impact shallow aquifer levels as could alterations to flood flows (see above). Extent and impact of existing extractions not understood.
		Tidal flow and salinity-gradient mosaic	Maintains brackish salinity regime in lower reaches of floodplain stream channels providing a habitat mosaic of national significance (including brackish sedge swamps that provide essential estuarine crocodile breeding habitat), resets macrophyte community composition and provides opportunity for recruitment of marine larvae (including key fishery species, e.g., barramundi) into floodplain wetlands (spring tides)	Flow extends inland as far and as frequently as tidal prism and freshwater flows would naturally dictate.	Tide-induced water level variation in lower stream reaches. Salinity of lower stream reaches of floodplain habitat complex. Macrophyte community composition and dynamics.	Seasonally stratified salinity measurement at selected sites. Annual aerial flyover photo monitoring of macrophyte community composition and cover.	Tidal flow within some lower streams of the complex has been impacted by constructed bunds and will be increasingly impacted in the future by sea-level rise (~4mm y^{-1}).

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Proserpine and O'Connell river estuarine and coastal marine habitat complex	PR-6; OC-4 (and intervening coastline and shallow marine waters) LE-3 G–3 TH-1 (lower)	Base flow	Maintains salinity regime that varies from the upper to lower estuary, creating conditions favourable for a diverse mangrove species assemblage (Proserpine River) and fish and crustacean larval production.	Freshwater influence within estuary persists seasonally and downstream to the extent established historically.	Seasonal salinity profile within estuary reach. Mangrove community composition and structure.	Seasonally and depth-stratified salinity monitoring at fixed points distributed through estuarine reaches. Quantitative surveys of mangrove species composition and distribution within estuary.	No salinity data to establish historical baseline conditions within estuary. Sediment supply affected by trapping efficiency of dam, catchment erosion rates and channel vegetation condition as well as flood flows. Extent of impact of this on current sedimentation patterns not able to be determined.
		Flood flow	Transports sediment and nutrient loads to the marine environment, which form the basis for food chains and coastal geomorphological processes and resets estuary channel form.	Peak flow energy and duration sufficient to maintain estuary channel form and depth and export required annual nutrient loading to lower estuary and marine ecosystem.	Flood hydrograph in upper estuary and channel geomorphology within estuary.	Flood-flow hydrographic measurement in upper estuary (gauging station). Aerial photography to satellite-imagery monitoring of estuarine geomorphology, including comparison with historical records.	Sea-level rise and changing channel morphology also affecting tidal prism within estuary.
		Tidal flow	Provides daily flushing of estuaries, reworks bottom sediments and connects supra-tidal habitats (on spring tides).	Tidal prism retains historically established characteristics (allowing for rainfall) throughout estuarine reaches.	Landward extent of tidal inflows.	Tide height or salinity gauging on upper stems of estuary.	Uppermost limits in Proserpine River managed by temporary bunding for irrigation supply.

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Diverse and native-dominated macrophyte communities	Not well established. Following reaches are included at least: LE-1 AND-2, AND-3 OC-2, OC-3 H2	Base flows	Required for persistence or adequate development of riffle, glide and run-dependent assemblages.	Near natural particularly for riffle assemblages with long natural persistence over dry season.	Distribution, abundance and assemblage structure of macrophytes by habitat type in mid dry season.	Presence, diversity and assemblage structure of macrophytes by habitat type. Base flow persistence or frequency from hydrographic records.	Nutrient loading. Extent of riparian vegetation shading or clearing will alter distribution.
		Pool persistence	Required for persistence of pool assemblages and to serve as seed sources for other habitats.	Good representation of natural perennial pools required in each reach (see above).	Maintenance of groundwater level, base flows and base flow periods after allowance for annual rainfall patterns.	Perennial pool persistence as indicated above.	Stock access to watercourses. These ecological assets occur in regulated stream reaches, though the extent to which current regulated flow regimes affects their values has not been assessed.
		Flood flows	Required for scour and reset of macrophyte bed structure, seed dispersal across floodplain and longitudinally.	Near natural frequency of flood flows (ARI 5 years and higher).	Number, distribution and depth fluctuation or recession rates of perennial pools during late wet season.	Flood flow persistence or frequency from hydrographic records.	

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Fish fauna without exotic species and good representation of migratory species	All Andromache and O'Connell catchment Some sections of Proserpine catchment at least PR-3 and possibly PR-4, PR-5, and the Goorganga Plain wetland. Extent of absence of exotics needs to be confirmed by greater temporal and spatial range of sampling	Flood flows Perennial pool persistence	High flows required for overtopping higher passage barriers, and for scouring or resetting of habitat complexes, removal of vegetation overgrowth, etc. Lower level flood flows in lower rainfall years required to enable dispersal between pools and past lower level passage barriers. Actual flow levels required are not known at present. Diverse and abundant permanent refugia required to enable persistence of full fish species diversity.	Annual flood peak required for fish dispersal. Near natural frequency of higher flows (ARI 5 years and higher) and dominant discharge band required for habitat resetting. Near natural frequency of flows required to provide passage past barriers. Minimal change to persistence of permanent pool habitat extent.	Absence of exotic fish. Distribution and abundance of migratory fishes, particularly juvenile stages during each dry season. See above. Note that pools greater than 1 m depth at end of dry season are required for maintenance of larger fish species.	Pool extent monitoring as indicated above. Flood flow frequency from hydrograph and comparison with predicted natural frequency from rainfall-runoff modelling. Duration of flows above levels required to flood out identified natural and artificial fish passage barriers (as determined by survey and modelling). Distribution of migratory fish species during the dry season, particularly juvenile stages.	Habitat structure and quality. Fishing pressure, especially on key migratory species such as barramundi and mangrove jack. Water quality drivers of habitat change that may favour exotic species. Construction of further fish passage barriers. Further introductions of translocated and exotic species. Further spread of existing exotic and translocated species already in the plan area.

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At-risk fringing regional ecosystems [RE 8.3.1 & 8.3.1a]	Scattered occurrence within PR-3, PR-4, PR-5 (lower reaches only), LE-1, LE-2, LE-3 (upstream reach only), AND-1, AND-2, AND-3, OC-1, OC-2, OC-3	Aquifer fed perennial base flow	Provides year-round moisture upon which the complex vegetation type depends.	Persistence of year-round base flows from aquifers (see above).	Occurrence of perennial flows from aquifers without significant departure from natural flow rates.	Baseline survey of Tertiary terrace aquifers required then ongoing monitoring of aquifer levels. Streamflow monitoring of key reaches under the influence of fractured rock aquifers in mid to upper catchment areas.	
At-risk frontage regional ecosystems [RE 8.3.5, 8.3.6, 8.3.6a]	Scattered throughout the plan area	Some of these alluvial areas may no longer be active and subject to overbank flows, and are therefore unlikely to be affected by water resource use. For active floodplain settings, overbank flows are the key flow components.	Overbank flows replenish alluvial soils and nutrients and in some cases trigger establishment of juvenile canopy trees.	Near natural frequency of higher flows subject to prevailing rainfall conditions (ARI 10 years and higher).	Natural occurrence of high flows above ARI 10 years (subject to prevailing rainfall conditions).	Stream-flow monitoring that adequately indicates overbank flow events where these alluvial plain REs occur.	The absence of in-stream storages on the Andromache and O'Connell suggests that the return interval and extent of higher flow events will not be affected by current modes of water extraction.

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At-risk frontage regional ecosystems in near-coastal areas [RE 8.3.13a,c,d]	PR-6 LE-3 OC-4	Wet season flow frequency and volume (overbank flows)	The extent of these areas is determined by the balance between the frequency and volume of wet season surface freshwater flows from upstream and inundation from the estuary channels. There is also likely to be a significant association between the persistence of these REs and the possibility of intrusion of saline groundwater. Wet season flow characteristics will be significant in terms of recharge of coastal aquifers and maintaining the status quo with respect to the balance between mainland freshwater aquifers and saltwater intrusion.	Sufficient flows reach the bottom end of the catchment to maintain the current status quo between fresh and saline surface water and groundwater (see above).	Maintenance of natural bottom-end catchment flows. Monitoring of the condition and spatial extent of these REs. Seasonal salinity regimes and level fluctuations in shallow near coastal aquifers.	Monitoring of flows to this part of the catchment will be difficult given the complex network of distributaries and inter catchment linkages. Use of aerial imagery and ground surveys to monitor regional ecosystems may prove more achievable. Monitoring bores located in shallow near coastal aquifers used to monitor seasonal and inter-annual water and salinity level fluctuations.	Modification of surface flows and shallow aquifer recharge characteristics due to levees, drains and bunds could modify the extent of suitable habitat and distribution patterns for these REs. Current fresh or saline status quo should be defined and, if necessary, additional monitoring implemented.

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At-risk frontage regional ecosystems incorporating wetlands [RE 8.3.2, 8.3.11]	PR-6 LE-3, LE-2 OC-4	Overbank flow	Overbank flows inundate floodplain wetlands, replenish alluvial soils and nutrients and in some cases trigger establishment of juvenile canopy trees. Some of these wetland REs will also become inundated as a result of local runoff.	Near natural frequency (subject to prevailing rainfall conditions) of higher flows (ARI 10 years and higher).	Natural occurrence of high flows above ARI 10 years (subject to prevailing rainfall conditions).	Stream flow monitoring that adequately indicates overbank flow events where these alluvial plain REs occur.	The absence of in-stream storages on the Andromache and O'Connell suggests that the return interval and extent of higher flow events will not be affected by current modes of water extraction.

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At-risk frontage regional ecosystems incorporating wetlands in near-coastal areas [RE 8.3.13b]	PR-6 LE-3 OC-4	Overbank flow frequency and volume	The extent of these areas is determined by the balance between the frequency and volume of wet season surface freshwater flows from upstream and inundation from the estuary channels. There is also likely to be a significant association between the persistence of these REs and the possibility of intrusion of saline groundwater. Wet season flow characteristics will be significant in terms of recharge of coastal aquifers and maintaining the status quo with respect to the balance between mainland freshwater aquifers and saltwater intrusion.	Sufficient flows reach the bottom end of the catchment to maintain the current status quo between fresh and saline surface water and groundwater (see above).	Maintenance of natural bottom-end catchment flows. Monitoring of the condition and spatial extent of these regional ecosystems. Seasonal salinity regimes and level fluctuations in shallow near coastal aquifers.	Monitoring of flows to this part of the catchment will be difficult given the complex network of distributaries and inter-catchment linkages. Use of aerial imagery and ground surveys to monitor regional ecosystems may prove more achievable. Monitoring bores located in shallow near coastal aquifers used to monitor seasonal and inter-annual water and salinity level fluctuations.	Modification of surface flows and shallow aquifer recharge characteristics due to levees, drains and bunds could modify the extent of suitable habitat and distribution patterns for these REs. Current fresh or saline status quo should be defined and, if necessary, additional monitoring implemented.

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At-risk grasslands on alluvium regional ecosystems [RE 8.3.12]	LE-2, LE-3 TH-1	Some of these alluvial areas may no longer be active and subject to overbank flows, and are therefore unlikely to be affected by water resource use. For active floodplain settings, overbank flows are the key flow components.	Overbank flows replenish alluvial soils and nutrients.	Near natural frequency (subject to prevailing rainfall conditions) of higher flows (ARI 10 years and higher)	Natural occurrence of high flows above ARI 10 years (subject to prevailing rainfall conditions).	Stream-flow monitoring that adequately indicates overbank flow events where these alluvial plain REs occur.	The absence of in-stream storages on the Andromache and O'Connell suggests that the return interval and extent of higher flow events will not be affected by current modes of water extraction.

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At-risk estuarine regional ecosystems [RE 8.1.2, 8.1.3, 8.1.4, 8.1.5]	PR-6 LE-3 TH-1 OC-4	Wet-season flow frequency and volume (overbank flows)	The extent of these areas is determined by the balance between the frequency and volume of wet-season freshwater flows from upstream and inundation from the estuary. Freshwater flows also play a role in delivering nutrients to these areas and moderating salinity levels (see above).	Sufficient flows reach the bottom end of the catchment to maintain the current status quo between fresh and saline surface water and groundwater.	Maintenance of natural bottom-end catchment flows. Monitoring of the condition and spatial extent of these REs. Seasonal salinity regimes and level fluctuations in shallow near-coastal aquifers	Monitoring of flows to this part of the catchment will be difficult given the complex network of distributaries and inter-catchment linkages. Use of aerial imagery and ground surveys to monitor regional ecosystems may prove more achievable. Monitoring bores located in shallow near coastal aquifers used to monitor seasonal and inter-annual water and salinity level fluctuations.	Modification of surface flows and shallow aquifer recharge characteristics due to levees, drains and bunds could modify the extent of suitable habitat and distribution patterns for these REs.

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Wetland birds	LE-2, LE-3 PR-6 TH-1 OC-4	Wet season flow frequency and volume (overbank flows)	The current wet season flow regime maintains the complex system of wetland habitats that support these species (see EFOs and links identified for Goorganga Plain wetland).	Sufficient flows reach the bottom end of the catchment to maintain wetland habitats.	Maintenance of natural bottom-end catchment flows. Maintenance of wetland complexes.	Monitoring of flows to this part of the catchment will be difficult given the complex network of distributaries and inter-catchment linkages. Use of aerial imagery and ground surveys to monitor the extent and condition of wetlands may prove more achievable.	

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Receiving marine ecosystem assets; i.e., waders and shorebird habitats; marine fauna; Great Barrier Reef Marine Park and Northern Repulse Bay Dugong Protection Area	Lower end of LE-3 PR-6 TH-1 OC-4 and adjoining coastline and adjacent near-shore marine areas	Wet season flow frequency and volume, including high flows	Deposition of sediment (carrying nutrients) from seasonal flows provides substrate for wader prey, and seagrass and other marine macrophytes. Maintenance of coastal and marine geomorphology and primary productivity linked to river basin sediment and nutrient export characteristics.	Maintain sufficient flows to deliver sediment and organic matter to estuarine and marine coastal ecosystems.	Spatial extent of marine habitat features including seagrass beds, inter-tidal flats, mangrove communities, coastal wetlands. Spatial extent, duration and water quality characteristics of wet season river-discharge plumes to marine environment.	If the type of water resource utilisation adopted has the potential to affect sediment yields to the bottom end of the catchment (e.g., in-stream storages), then monitoring of shoreline and tidal habitats using aerial imagery should be undertaken to ascertain any changes to the spatial extent of these ecosystems. Although changes to shoreline and tidal habitats may be caused by a range of factors not necessarily related to water resource use upstream, the detection of any significant changes would prompt investigation of the extent to which water resource use is contributing to the change.	

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Black ironbox (*Eucalyptus raveretiana*)	LE-1, LE-2 AND-2, AND-3 OC-2, OC-3 H-2 B-2	Peak flow level and frequency, and base flow periodicity	Black ironbox usually grows on stream banks where it gains access to moisture delivered by stream flows.	Black ironbox is a fairly adaptable species and would most likely accommodate changes to annual flow regimes that resulted in small reductions in the frequency and volume of flows.	Condition of black ironbox individuals.	Because the exact relationship between changes to flow regime and health of black ironbox is not known, the only useful monitoring approach for the wellbeing of the species is direct monitoring of the species in catchments where water resource use modifies annual flow regime.	If changes to annual flow regime occur in the O'Connell and Horse Creek systems, the areas where black ironbox occurs in stands on the floodplain should be one of the target areas for monitoring.
Relatively extensive riparian habitat corridors with high functionality for fauna movement and fauna refugial values Lethe Brook/Kelsey Creek/Slater Creek riparian habitat corridor	Examples include LE-1, LE-2, LE-3, AND-2, AND-3	Peak flow level and frequency, and base flow periodicity Peak flow level and frequency, and base flow periodicity Inflow from fractured rock aquifers	The functionality of the riparian habitat corridor depends on the persistence of a healthy fringing vegetation community as supported by peak flows that maintain floristic and structural vegetation diversity; and base flows that maintain high substrate moisture levels through the dry season. The functionality of the riparian habitat corridor depends on the persistence of a healthy fringing vegetation community as supported	Maintenance of base-flow periodicity, and peak flow levels and frequency. Maintenance of base flow periodicity, and peak flow levels and frequency.	Condition and vigour of riparian vegetation. Peak flow and base-flow characteristics. Condition and vigour of riparian vegetation. Peak flow and base-flow characteristics.	Stream flow gauging. Periodic (5-year?) monitoring of riparian vegetation condition at representative sites down the system. Stream flow gauging. Periodic (approx. 5-year) monitoring of riparian vegetation condition at representative sites down	The system receives artificial flows as part of the Kelsey Creek Irrigation Scheme. While this may have produced some changes it is unlikely to have significantly changed the functionality of the riparian corridor for fauna.

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			by peak flows and base flows. The base flow characteristics of these reaches depend on continuation of inputs to the system from fractured rock aquifers in the mid to upper reaches.			the system.	
Springs and seepage areas fed from Tertiary terrace aquifers	OC-2 H-2	Tertiary terrace aquifers	The perennial availability of moisture provided by the springs and seeps supports the denser, moisture dependent vegetation types.	Persistence of year-round base flows from aquifers.	Occurrence of perennial flows from aquifers without significant departure from natural flow rates.	Baseline survey of Tertiary terrace aquifers required then ongoing monitoring of aquifers.	