

Report card for the Bellinger River Coastal Floodplain Alluvial Groundwater Source

Groundwater source description

The Bellinger coastal floodplain alluvial deposits generally consist of fine-grained sand, silts and clays. They occur downstream of the tidal limit of the Bellinger and Kalang rivers and are only moderately connected to their parent stream. Bore yields are generally low to moderate and are typically only suitable for stock purposes, or small-scale irrigation. The water quality of the water source can be variable, with some areas being fresh and others being affected by estuarine environments resulting in higher salinity.

Coastal floodplain alluvial deposits are underlain by potential acid sulphate soils (ASS). Dewatering of potential acid sulphate soils (by groundwater extraction, for example) can have effects including the acidification of groundwater, corrosion of infrastructure and dieback of flora. This water source can be affected by saltwater intrusion if subject to excessive take. Groundwater levels within the coastal floodplain alluvial water source are typically close to the surface, resulting in a higher level of dependence of groundwater-dependent ecosystems.

Area	
2,859 (ha)	Area of the groundwater source (excluding national parks and drains).
Groundwater-dependent ecosystems	
Groundwater-dependent vegetation ecosystems present.	
Recharge	
4,200 ML/yr	The amount of water that percolates into the aquifer: Recharge from rainfall, excluding national parks and drains, based on an infiltration rate of 10% and rounded to a complete mega litre figure.
Planned environmental water	
3,150 ML/yr plus water in storage	The volume of groundwater proposed to be reserved for the environment: <ul style="list-style-type: none"> 100% of recharge generated over lands with high environmental value = 0 ML/yr 75% of recharge generated over remainder of the aquifer area = 3,150 ML/yr The total volume of groundwater in storage.
Upper extraction limit	
1,050 ML/yr	The maximum volume of water available for all licensed and approved extraction including basic landholder rights, based on allowing extraction of up to 25% of recharge from rainfall.
Long-term average annual extraction limit	
350 ML/yr	The volume of water that can be extracted annually. For this water source, the long-term average annual extraction limit (LTAAEL) has been estimated as 350 ML/year being the sum of: <ul style="list-style-type: none"> Current entitlements and rights = 160 ML/yr

	<ul style="list-style-type: none"> Estimated future water requirements = 170 ML/yr, which includes provision for future increases in basic landholder rights (BLR), growth in agricultural groundwater use, and Aboriginal community development licences. A 10% buffer to the estimated future water requirements = 17 ML/yr
Total licensed groundwater entitlement	
<p>The existing volume of groundwater licensed for extraction.</p> <ul style="list-style-type: none"> 44% of this volume is licensed for farming purposes (58 ML/yr), and 56% for irrigation purposes (73 ML/yr). 5 groundwater licences currently exist in the water source. This makes up 100% of the Bellinger River Coastal Floodplain Catchment Extraction Management Unit. 	
Groundwater basic landholder rights	
<p>The volume of groundwater set aside to meet all existing basic landholder rights.</p> <p>This volume may increase during the term of the plan if there is growth in access to basic landholder rights (BLR).</p> <p>Currently 22 ML/yr is licensed under the <i>Water Act 1912</i> for BLR use. Expert opinion indicates that approximately two thirds of BLR is licensed; therefore a third has been added to the volume of licensed take to estimate basic landholder groundwater requirements.</p>	
Aboriginal community development licences	
<p>The volume of entitlement that may be granted as Aboriginal community development licences, subject to assessment.</p> <p>Calculated as approximately 12% of unassigned water.</p> <p>The plan allows for this limit to be increased during the term of the plan. Any increase in this limit will require an equivalent deduction in unassigned water.</p>	
Unassigned water	
<p>The volume of water currently unallocated within the LTAAEL. A proportion of this may be made available through a controlled allocation for future extraction. The volume available will be reviewed periodically, based on updated recharge calculations, environmental needs, and current and future water needs.</p>	

Proposed rules

Draft access rules for alluvial aquifers	
Cease to take	It is recommended that a cease-to-take rule not be established for the Bellinger Coastal Floodplain Alluvial Groundwater Source due to the low level of connectivity to surface water.
Limits to the availability of water	
Assessment of average annual extraction against the long-term average annual extraction limit	Growth in extractions will be assessed against the LTAAEL over a 3 year period with a 5% tolerance.

Available water determinations	<p>Available water determinations (AWDs) will be made at the commencement of each water year for:</p> <ul style="list-style-type: none"> • Specific purpose access licences—100% of share component. • Aquifer access licences—1 Unit/ML of share component or lower amount as a result of a growth in use. <p>Note: In critical water shortages, AWDs for domestic and stock (subcategory domestic) specific purpose access licences may be reduced below 100%.</p>
Draft rules for managing access licences	
Water allocation account management rules	<p>No carryover of account water from one water year to the next is permitted. The maximum amount of water permitted to be taken in any one water year is the water allocation accrued in the water access licence account for that water year, adjusted for allocation assignments (trades) into or out of individual accounts.</p>
Draft trading rules	
INTO water source	Not permitted.
WITHIN water source	Trades are permitted within the groundwater source, subject to assessment of potential impacts on other users and the environment.
Rules for granting aquifer access licences	
Specific purpose access licences	Permitted, subject to assessment, under clause 10 of the Water Management (General) Regulation 2018. May include local water utility, major water utility, town water supply, and domestic and stock licences.
Specific purpose access licences (Aboriginal cultural)	Permitted, subject to assessment, up to a total of 10 ML per year per licence for the water source.
Aquifer access licences (Aboriginal community development)	Permitted up to a total of 100 ML, subject to assessment
Aquifer access licences	<p>Permitted, subject to assessment, in line with controlled allocation orders made in relation to unassigned water in this water source.</p> <p>Note: Prior to any controlled allocation, the following matters must be considered: maximum volumes representing the total share components of access licences in the groundwater source, future priority requirements, including BLR and specific purpose access licences, and exemptions under clause 18 of the Water Management (General) Regulation 2018 that do not require an access licence.</p>

Draft rules for granting or amending approvals for groundwater supply works	
<p>Rules to minimise interference between bores</p>	<p>Water supply works (bores) are not to be granted or amended within the following distances of existing bores:</p> <ul style="list-style-type: none"> • 200 m from a bore that is nominated on an aquifer access licence on another landholding. • 200 m from a bore that is used to extract basic landholder rights on another landholding. • 500 m from a bore nominating a local or major water utility access licence. • 100 m from a bore that is used by the Department for Planning, Industry and Environment for monitoring purposes (unless agreed to in writing by the department). • 100 m from a property boundary (unless negotiated in writing with neighbour). <p>These distance restrictions do not apply if:</p> <ul style="list-style-type: none"> • the bore is used solely for basic landholder rights, • the bore is a replacement bore, • the bore is used for monitoring, environmental management or remedial works, or • a hydrogeological study submitted by the applicant—and assessed as adequate by the minister—shows that the location of the bore at a lesser distance will have no more than minimal impact on existing extraction from the water source.
<p>Rules to protect groundwater-dependent, culturally significant sites</p>	<p>Water supply works (bores) are not to be granted or amended within the following distances of groundwater dependent cultural significant sites:</p> <ul style="list-style-type: none"> • 100 m for bores used solely for pumping water pursuant to a basic landholder right • 200 m for bores not used solely for extracting basic landholder rights. <p>These distances restrictions do not apply if:</p> <ul style="list-style-type: none"> • the bore is a replacement bore, the bore is used for monitoring, environmental management or remedial works • the bore replaces an existing bore that is part of a network for a major or local water utility used for the purpose of town water supply • a hydrogeological study submitted by the applicant and assessed as adequate by the minister shows that the location of the bore at a lesser distance will have no more than minimal impact on these water source and their groundwater-dependent, culturally significant sites. <p>Note: Culturally significant sites will not be specifically identified in the plan. However, a provision requiring a procedure whereby the Department of Planning, Industry and Environment undertakes to identify these during the process of assessing and granting works approvals will be included in the plan.</p>

Draft rules for granting or amending approvals for groundwater supply works	
<p>Rules for bores located near contamination sources</p>	<p>Water supply works (bores) are not to be granted or amended within:</p> <ul style="list-style-type: none"> • 250 m of the plume associated with a contamination source identified within the plan • between 250 m and 500 m of the plume associated with a contamination source identified within the plan unless no drawdown of water will occur within 250 m of the contamination • 250 m of an onsite sewage treatment system • 500 m of a contamination source identified in the plan. <p>These distances restrictions do not apply if:</p> <ul style="list-style-type: none"> • the minister is satisfied that the bore is used for monitoring, environmental management or remedial works • a hydrogeological study assessed as adequate by the minister shows that the distance is adequate to protect the water source, the environment and public health and safety. <p>Contaminated sources may be added to or removed from the plan by the minister, based on results of a site inspection or other relevant information provided to the minister on a contamination source.</p> <p>Note: Due to the nature of managing contaminated sites, bores may be subject to restrictions as a result of local impact management.</p>
<p>Rules for bores located near sensitive environmental areas</p>	<p>Water supply works (bores) are not to be located within the following distances of high-priority GDEs as identified within the plan:</p> <ul style="list-style-type: none"> • 100 m of a high-priority, groundwater-dependent ecosystem (GDE) listed in the plan • 200 m for bores used for all other aquifer access licences • 500 m of karsts • 40 m from the top of the high bank of a river. <p>These distance restrictions do not apply if the minister is satisfied that:</p> <ul style="list-style-type: none"> • no draw-down of water will occur at the perimeter of any GDE listed in the plan (excluding the 40 m from the high bank of a river and 100 m from an escarpment rules, which still apply) • the bore is a replacement bore • the bore is used for monitoring, environmental management or remedial works • the bore replaces an existing bore that is part of a network for a major or local water utility used for the purpose of town water supply, or • a hydrogeological study assessed as adequate by the minister shows that the distance is adequate to protect the water source and its dependent ecosystem, and no more than minimal draw down would occur. <p>High-priority GDEs may be added to or removed from the plan following further studies of groundwater ecosystem dependency undertaken by the minister.</p>

Draft rules for granting or amending approvals for groundwater supply works	
Rules for the use of existing bores within restricted distances	<p>An existing water supply work (bore) may continue to take groundwater, with the maximum annual amount extracted equal to the unit share of the access licence that nominates the bore at the commencement of the plan.</p> <p>Note: The water quality from any bore can be affected by land use activities and inherent water quality in the aquifer. Water quality cannot be guaranteed and may be unsuitable for human consumption and other uses. The quality of water taken should be tested before use and treated appropriately. Such testing and treatment is the responsibility of the licence holder.</p> <p>Note: If the distance criteria in the plan are amended, the maximum amount of water that may be taken by a bore within the new criteria in one water year is equal to the sum of shares of access licences nominating that bore at the time of amendment.</p>
Rules to mitigate the impacts of disturbing potential acid sulphate soil	<p>New bores cannot be located in an area classed as having a high probability of occurrence of acid sulphate soils (as shown on an Acid Sulphate Soil Risk Map maintained by the Department of Planning, Industry and Environment—Biodiversity and Conservation) if it is thought there is significant risk of acidification of this groundwater source.</p>
Rules to protect coastal wetlands	<p>Not permitted where there is more than minimal harm to Coastal Wetlands mapped under the <i>State Environment Planning Policy (Coastal Management) 2018</i>.</p>

Background information

Determination of the ‘sustainability factor’ and the upper extraction limit

The risk assessment (Table 1 and Figure 1) is used to determine the sustainability factor and is derived using the groundwater risk assessment methodology.¹ The risk assessment considers environmental and socioeconomic factors and actions to mitigate risks to the groundwater source. The sustainability factor is used to determine the upper extraction limit. The upper extraction limit is determined by multiplying the sustainability factor by the volume of water that percolates into the aquifer from rainfall. The upper extraction limit is the maximum volume of water available for authorised take.

Table 1. Groundwater risk assessment

Aquifer risk	
Risk to groundwater-dependent ecosystems (GDEs) from declining groundwater levels	HIGH
Risk to GDEs from altered patterns of groundwater level fluctuations	HIGH
Risk of increasing frequency and duration of low flows in rivers	LOW
Risk of reducing water quality in the aquifer	HIGH
Risk of contamination of (fresh) groundwater from sea or estuary water	MODERATE

¹ The risk assessment process is detailed in the *Macro water sharing plans—the approach for groundwater—a report to assist community consultation* (November 2015, NSW Office of Water).

Risk to beneficial use of the groundwater	MODERATE
Risk of structural damage of the aquifer	MODERATE
Overall risk to aquifer from groundwater extraction	MODERATE
Socio-economic risk	
Relative importance of groundwater supply (due to lack of alternative water sources)	LOW
Risk to ongoing groundwater usage	LOW
Risk to dependence of groundwater for town water supply	LOW
Risk to dependence on groundwater for irrigation and industry	LOW
Risk to economic investment in agriculture/groundwater industry	LOW
Risk to employment in agriculture and industry	LOW
Overall community dependence on groundwater extraction	LOW
Mitigation actions—potential acid sulphate soils	
<p>Strategies to manage risks to ecological and water quality assets to ensure groundwater extraction is sustainable are to be included in the water sharing plan (WSP). Provisions will require works to be installed in a manner that does not disturb potential ASS including:</p> <ul style="list-style-type: none"> no excavations permitted in areas of high probability ASS excavations to be limited in depth with no new works below the level of the aquifer bores to be constructed in a manner that prevents potential corrosion impacts by grouting to below any high risk level, and strong setback rules from GDEs required. 	

Environmental risk	High	5%	25%	50%
	Moderate	Bellinger Coastal Floodplain Alluvial 25%	50%	60%
	Low	50%	60%	70%
		Low	Moderate	High
		Socio-economic risk		

Figure 1. Risk assessment matrix

Sustainability factor	
25%	The Bellinger Coastal Floodplain Alluvial Water Source is assessed as subject to moderate environmental risk and low socio-economic risk and has a sustainability factor of 25%. This means that 75% of the recharge outside of high conservation value areas is reserved as environmental water.

Surface water and groundwater connectivity	
Limited connectivity	While the Department of Planning, Industry and Environment recognises that all aquifers are connected to surface water to some degree, connectivity is only being actively managed for those groundwater sources where 70% or more of groundwater pumped within an irrigation season is derived from stream flow. Advice from the department's hydrogeologists is that the water source should not be considered highly connected due to the fine nature of the sediments and reduced potential for water exchange with the river, the minimal risk to the water source from extraction due to the small level of entitlement held in the water source, and the application of standard groundwater rules.

Key factors for decisions

Access rules

A cease-to-take rule is not recommended in this water source since groundwater is not considered to be highly connected to surface water due. The low connectivity is due to the fine nature of the sediments that reduce the potential for water exchange with the river. Also, low volumes of entitlement held in the water source are a small risk to the water source from extraction.

Trading rules

The minister's Access Licence Dealing Principles Order 2002 currently prohibits the trade of entitlement from a groundwater source to a surface water source and also requires hydrologic connection between water sources. Consequently, no trades are allowed into this water source.

Distance rules for water supply works approvals

These rules are based on statewide guidelines, which have been modified for local application in this groundwater source.

Acid sulphate soils

Acidification of groundwater may occur in the water source as the result of the construction and operation of bores and the disturbance of potential acid sulphate prone soils. Acidification of groundwater may lead to the mobilisation and speciation of contaminants such as heavy metals (for example aluminium and chromium). A provision to manage the risk of disturbing potential acid sulphate soils is therefore recommended (refer to rules to mitigate the impacts of potential acid sulphate soil disturbance on water quality and ecological assets in this report card).

Groundwater-dependent ecosystems

A groundwater-dependent ecosystem (groundwater-dependent vegetation ecosystem) occurs in this water source. The take of groundwater during the construction and operation of water supply works (bores) may lead to fluctuations in groundwater levels and thereby affect groundwater-

dependent ecosystems. These ecosystems, however, by and large occur in national parks and other public lands.

Public exhibition

The Department of Planning, Industry and Environment—Water seeks feedback from the public on the suitability of the proposed rules.

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