Lower Gwydir Alluvium (GS24)

INITIAL SDL ASSESSMENT RESULT

The Authority has **identified a risk** that environmental outcomes for this Unit are unlikely to be met, specifically *Groundwater Dependent Ecosystems, surface water – groundwater connectivity* and the *productive base*.

Groundwater take is the leading driver, impacting groundwater levels in this Unit. Further work is required to resolve whether the SDL reflects an environmentally sustainable level of take.

The Authority will continue to consider changes to the SDL. This consideration will be informed by engagement with **New South Wales** to seek confidence and confirmation that the appropriate rules and management arrangements are in place to manage localised and Unit-scale issues.

Figure 1: Lower Gwydir SDL Resource Unit

The Authority is assessing whether the Sustainable Diversion Limit (SDL) for the Lower Gwydir SDL Resource Unit (the **Unit**) continues to support environmental outcomes and reflect an environmentally sustainable level of take (ESLT).

This Assessment Summary provides an overview of the factors which are relevant to that work and the Authority's initial view. The summary draws on three 'Lines of Enquiry', engaging with the likelihood that trends in groundwater levels and salinity support environmental outcomes, the Authority's confidence in that assessment, and the consequence of an at risk finding.

Information on the Lines of Enquiry and methodology used in this assessment is available in the *Summary of Assessment Approach* and the *SDL Assessment and Response Framework*. Information on the *Basin Plan Review Discussion Paper* and the process for making a submission are available on the MDBA website.

About this Unit (as at June 2024)

Aquifer Storage/size (GL)	23,312
SDL as at June 2025 (GL/y)	33
Entitlement volume (GL/y)	33
Recharge estimate range[1](GL/y)	32-47
Average annual take (2012/13–2022/23, GL/y)	30.54
Significant surface connections	None

[1] Recharge estimate range is derived from three estimates of recharge: Modelled 47 GL/y, SY2 39 GL/y and Chloride Mass Balance (CMB) 32 GL/y.

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While an accredited Water Resource Plan (WRP) relating to this Unit is not yet in place, the SDL has applied since 1 July 2019. Water resource management is currently governed by existing rules and arrangements made under NSW state legislation, with SDL accounting undertaken through transitional Blan Plan arrangements.

Utilisation at the time of the review

The Lower Gwydir Alluvium (GS24) comprises alluvial gravel, sand and clay sediments associated with the Gwydir River which form two aquifer systems: a shallow (generally up to 30 m deep) and a highly productive deep aquifer (up to 90 m deep).

The SDL for the unit was based on the Achieving Sustainable Groundwater Entitlements (ASGE) program limit (32.4 GL/y) plus an estimate of stock and domestic (0.61 GL/y).

At the time of setting the SDL, the ASGE program was still being implemented. The MDBA noted that the aquifers were large and had low risk of depleting in the timeframe of the initial Basin Plan. The MDBA decided to allow the ASGE to complete before considering the need for further reductions. This would also allow time for further monitoring and data to be collected and the response to the ongoing ASGE program to be assessed.

NSW has been developing a groundwater level decline operational protocol that is intended to manage long-term declines like those identified in the Lower Gwydir Alluvium. The protocol should provide greater structure and certainty of measures and triggers for restrictions on groundwater take in targeted areas of the SDL resource unit.

NSW have reported long-term declining water levels since the 1980s/90s in some areas of the Lower Gwydir particularly between Moree and Ashley (NSW DPIE, 2022). NSW has identified that the main driver declines in water level is groundwater pumping and noted that they made some adjustments to rules in July 2023 to try and stabilise the levels.

Figure 2 below identifies that annual take shows inter-annual variations due to a higher dependence on groundwater during times of low surface water availability. Average annual take over the period 2012/13 to 2022/23 was 93% of the SDL.

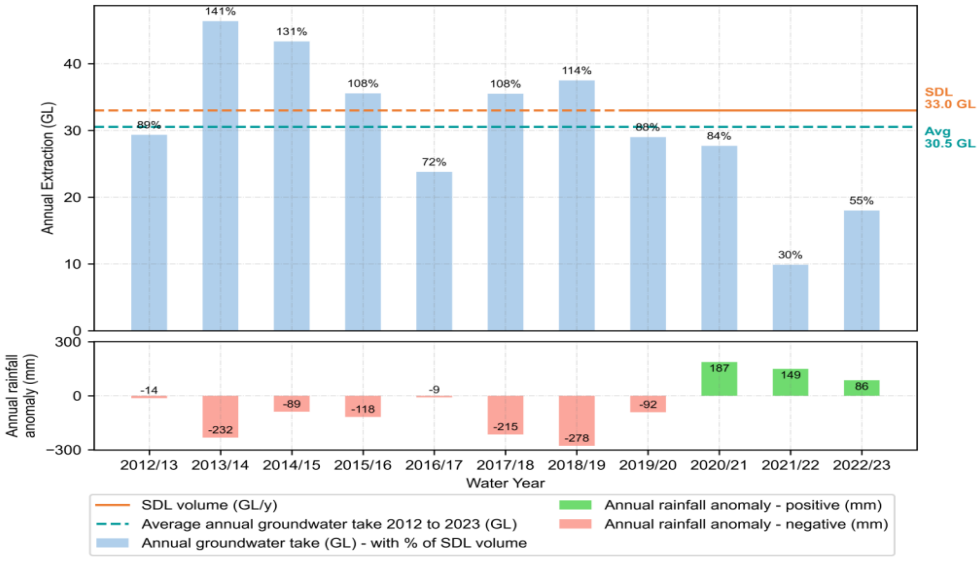

Figure 2: Utilisation for the period 2012/13 to 2022/23

Environmental outcomes at time of the Review

Likelihood and confidence

Groundwater level and water quality (salinity) trends

Table 1 presents a compilation of the groundwater level and salinity trends for this Unit, and the Authority's *confidence* in that assessment (i.e. low (L), medium (M) or high (H) surety of the finding).

Understanding the groundwater level and salinity trend assessment (Table 1)

For those characteristics informed by groundwater level: The table lists the *percentage of monitoring bores* that are exhibiting either a rising or declining trend in water levels (the remainder refer to bores for which a statistically significant trend could not be detected). A percentage of 30% or greater in the *declining* category indicates a risk to groundwater levels supporting the relevant assessment characteristic.

For those characteristics assessed by reference to water quality: The table lists the *percentage of monitoring bores* that are exhibiting either a rising or declining trend in water quality (the remainder refer to bores for which a statistically significant trend could not be detected). A rising/stable trend means that water quality (salinity) is improving.

Regarding confidence: a single dot indicates low confidence in the trend data, two dots indicate moderate confidence, and three dots indicate high confidence.

The percentages are based on number of monitoring bores providing data over the short and long-term periods. In some Units the number of monitoring bores has decreased over time, and this is accounted for in the percentages. Also, when necessary, a Unit assessment will further explore the detailed data under the assessments to determine if localised declining trends persist.

Productive base is defined as the capacity of an aquifer to provide a sustainable supply of water for environmental and consumptive uses (domestic, agricultural, and industrial) without compromising the long-term health and function of the resource and dependent ecosystems.

Assessment characteristic	Short term trend (Past 12 years)			Long term trend (Past 40 years)		
	Rising/ stable	Declining	Confidence	Rising/ stable	Declining	Confidence
Groundwater Dependent Ecosystems (GDEs)	20%	38%	●●○	16%	43%	●●○
Surface water – groundwater connectivity	20%	40%	●●○	20%	42%	●●○
Productive base	24%	36%	●●○	22%	41%	●●○
Water quality	0%	0%	●○○	38%	3%	●●○

Table 1: Groundwater level and salinity trend assessment over the past 12 and 40 years.

As can be seen, three of the four groundwater characteristics informed by groundwater level assessment have been identified as having a **declining trend** in more than 30% of monitoring bores across the Unit:

- *The productive base* (moderate confidence)
- *Surface water-groundwater connectivity* (moderate confidence)
- *GDEs* (moderate confidence)

The short-term and long-term data shows low to moderate rates of decline across the areas where the majority of take occurs at a sub-unit scale. This is particularly concentrated in the Ashley, Moree area, impacting on the *productive base*.

The short-term trends show partial stabilisation in select locations, but declines predominantly continue despite the ASGE program, the higher rainfall since 2020 and the associated decrease in groundwater take.

Long term and short term trends do not indicate a risk to *water quality* (low confidence for trend over the past 12 years – moderate confidence for trend over the past 40 years), noting that there is limited monitoring data regarding salinity changes.

Recharge and utilisation information

Tables 2 and 3 below provide a summary of recharge information, and an assessment of the likelihood of full utilisation of the SDL. This information is relevant because it enables a comparison of recharge relative to take (current and by reference to the SDL) and how sensitive the Unit is to change in recharge (i.e. variability in conditions year to year) and increases in actual take.

Understanding modelled recharge information (Table 2)

The 'proportions' can also be interpreted as a percentage. For example, a proportion of 1.29 indicates that the SDL is 129% of (or 29% above) the recharge rate.

If the SDL as a proportion of recharge is 1:1 they are equal, and if it is **more than 0.9**, risk is indicated because take is approaching the level of recharge.

'Buffering' relates to how big total aquifer storage is compared to recharge. An aquifer with a very large total storage will offer high buffering because it will take a long time for changes in recharge to affect overall groundwater levels. In that scenario, the aquifer is described as having 'low' sensitivity to changes in recharge. The reverse applies where total aquifer storage is relatively small. In that case it would have 'high' sensitivity to changes in recharge. Buffering has been categorised using the *proportion of aquifer storage to recharge estimate* as follows: Low buffering = 29 to 111, moderate buffering = >111 to 333, and high buffering = >333.

Recharge information					
Status of recharge knowledge base (modelled)	Proportion of SDL to recharge (modelled)	Proportion of aquifer storage to recharge estimate			Proportion of average annual take to recharge (modelled)
		Modelled	Buffering	Sensitivity	
Best available	0.70 No risk indicated	495	High	Low	0.65

Table 2: Modelled recharge estimates as a proportion of the SDL, total aquifer storage and average annual actual take

Potential *likelihood* of full utilisation of the SDL						Current % Average annual take
Very unlikely	Unlikely	About as likely as not	More likely than not	Likely	Very likely	
					●	93

Table 3: Likelihood of take increasing to the SDL

Annual groundwater take is 93% of the SDL, and it is assessed that use of the full SDL is **very likely**. Under both scenarios (i.e. a continuation of existing take, or an increase of take to the SDL), the proportion of take to recharge is less than 0.9, and hence there is no additional risk to assessment characteristics if use were to increase to the SDL.

The aquifer storage indicates that there is **high buffering** and that the total resource will have a relatively **low sensitivity** to an increase in use or changes in recharge.

Consequence assessment

The risk assessment has detected declining trends in water levels at more than 30% of monitoring bores, hence a consequence assessment has been undertaken which describes the nature of potential impact, the likely spatial scale of impact and the potential impact on key values. Table 4 presents the outcome of the consequence assessment.

Long term monitoring data indicates potential risks to the assessment characteristics of *GDEs, surface water – groundwater connectivity* and the *productive base*.

Understanding the consequence assessment (Table 4)

Potential nature of impact describes the potential impact of groundwater level or water quality decline on connected GDEs (including whether the GDEs support significant sites or communities), connectivity and/ or impacts on the productive base.

Spatial scale is assigned as either: Low, site specific/local; Moderate, sub-unit; or High, SDL unit to Basin scale impacts.

Key values include: impact on connected GDEs and connected surface water, and, if known, the significant sites or communities they support (Ramsar, TLM Icon sites, EPBC-listed values). Impact on the productive base which may include impacts to provisioning and other ecological services.

Final rating: a low rating requires no further action. Medium or High ratings will require a response.

Characteristic	Nature of impact	Spatial scale of impact	Impact on values	Final rating
GDEs	Potential to reduce discharge to surface water systems, which could lead to compromised condition of vegetation.	**Moderate** Sub-unit scale	**High** • supports high ecological value GDEs, particularly Ramsar wetlands in the western area and riparian vegetation	**MEDIUM**

Surface water groundwater connectivity	Potential increase in losing streams, (therefore increase in loss of surface water to groundwater). Potential reduction in base flows and low flows in surface water systems, which are important for supporting ecological values such as native fish.	**Moderate** Sub-unit scale	**High** • groundwater connectivity with the Gwydir River, Mehi River, and Carole Creek from 2000 to 2019 has identified this as 'always losing'. • The Gwydir surface assessment identified a strong connection with groundwater; these provide baseflows to upper reaches, with some trees being more dependent on groundwater than surface water floods.	**MEDIUM**
Productive Base	Potential impacts on provisioning services. Structural integrity of aquifer potentially compromised.	**Moderate-** Sub-unit scale	**High** • Some low - moderate rates of decline in current groundwater level observed, short-term trends show partial stabilisation in select locations but predominantly declines • Ratio of recharge to take does not indicate significant risk but full use of SDL is very likely	**MEDIUM**

Table 4: Outcome of consequence assessment

Whilst there has been stabilisation in some areas, the area with highest utilisation has an established history of decline over the historical record. These declines in areas of high utilisation in conjunction with the importance of *surface water – groundwater connectivity* for providing baseflows and the potential impact on *GDEs*, have pointed to higher consequence in this unit.

Drivers of impact

In this Unit, *GDEs, surface water – groundwater connectivity* and the *productive base* have been identified to be at risk. The initial assessment has identified declining groundwater levels due to groundwater take as a driver, with the rate of recharge (which encapsulates climate change impacts to date) an exacerbating factor. The Authority will test this assessment and the relative contribution of different drivers to this result.

Environmental outcomes under a fully utilised SDL and climate impacted future

Full use of the SDL

Many groundwater units across the Basin experience water take which is substantially less than the SDL, but it is important that the work of the Basin Plan Review is conducted with awareness of the effects of a fully utilised SDL — it is the SDL that must reflect an ESLT.

As summarised in Tables 3 and 4, the initial assessment has considered a scenario where take increased and use reached up to the SDL. This analysis considered new information about diffuse recharge as a proportion of the SDL, our knowledge of total aquifer storage, and average annual actual take. The analysis used an SDL to recharge proportion of 0.9 or more as an indicator of potential risk to

maintaining groundwater levels within resource condition limits that support assessment characteristics.

Climate change through to the 2036 Basin Plan Review and 2050

Table 5 presents a summary of the anticipated environmental impacts of climate change for the Unit by reference to the future recharge estimates.

SY2 climate scenario	Trend towards 2036		SY2 climate scenario	Trend towards 2050	
	Recharge greater than SDL	Recharge less than SDL		Recharge greater than SDL	Recharge less than SDL
	Low Risk	**High Risk**		**Low Risk**	**High Risk**
Warmer and slightly wetter	●		Hotter and slightly wetter	●	
Warmer and drier	●		Hotter and drier	●	
Warmer and much drier		●	Hotter and much drier		●

Table 5: Risk to assessment characteristics at full use of SDL using estimates of future recharge under future climate

The comparison of SDL to recharge under a range of plausible climate futures indicates additional risk to assessment characteristics under the 'warmer and drier' and ‘hotter and much drier’ scenarios. At the level of the SDL, the potential existing risks to the *productive base* would further increase.

Initial Assessment

On the balance of all 3 Lines of Enquiry, the Authority’s initial assessment has found that the SDL **may not be supporting the Basin Plan’s environmental outcomes** under current conditions with *GDEs, surface water – groundwater connectivity* and the *productive base* being impacted at a sub-unit scale.

This risk may further increase under a much drier future climate, or should water take increase towards the SDL. **Hence this initial assessment identifies a risk that environmental outcomes for this Unit are not being met, and further work is needed to consider whether the SDL reflects an environmentally sustainable level of take. The Authority is proposing to work further with the New South Wales government through 2026 and will recommend the most appropriate response to address this risk.**

Other relevant factors include planning by the New South Wales government in developing a groundwater level decline operational protocol that is intended to manage long-term declines like those identified in the Upper Namoi Alluvium. The Authority will seek further understanding from NSW about the drivers of the risks and the management that may be appropriate to address this.

Consideration of Response

Given this initial assessment identifies that groundwater level decline in the Unit poses a risk to the *GDEs, surface water – groundwater connectivity* and the *productive base*, the Authority will continue to consider changes to the SDL, seeking further confidence and confirmation from **New South Wales**

that the appropriate rules and management arrangements are in place to manage localised and Unit-scale issues.

High-level response options currently under consideration for this Unit include:

- Targeted changes to rules or management settings
- Change the Sustainable Diversion Limit

The risk of a changing climate continues to be actively considered in the Basin.

Evidence summary

In addition to the standard evidence sources presented in the *Summary of Assessment Approach* on the MDBA website, the following specific evidence sources were used for this Unit:

- NSW Department of Climate Change, Energy, the Environment and Water (2024) Lower Gwydir Groundwater Source Groundwater annual report 2024, Lower Gwydir Groundwater Source PUB24/1043
- NSW Government: website including information regarding changes to groundwater management rules in the Lower Gwydir from 1 July 2023: Managing decline in groundwater levels | Water
- NSW Department of Planning and Environment (2022) Lower Gwydir Groundwater Source – Groundwater level review. PUB22/28
- NSW Department of Planning and Environment (2021) 2021 review of groundwater levels in alluvial groundwater sources of inland NSW. PUB22/15

The Authority utilised the best available evidence. Through the Basin Plan Review 12-week public consultation process, and the subsequent consideration of submissions and engagements over the course of the 2026 Basin Plan Review, the Authority will continue to build on the evidence used through the initial SDL Assessments to address uncertainties and knowledge gaps.