Lower Namoi Alluvium (GS29)

INITIAL SDL ASSESSMENT RESULT

The Authority has **identified a risk** that environmental outcomes for this Unit are not being met, specifically 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.

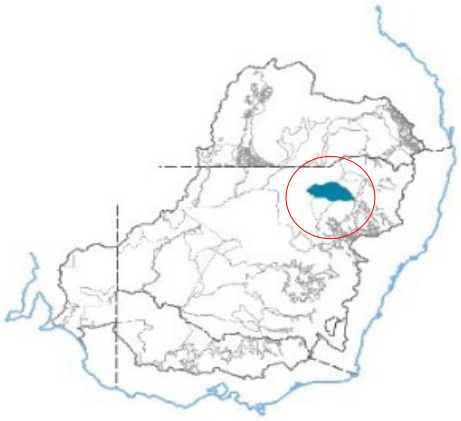

Figure 1: Lower Namoi Alluvium SDL Resource Unit

The Authority is assessing whether the Sustainable Diversion Limit (SDL) for the Lower Namoi Alluvium 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):	86,608
SDL as at June 2025 (GL/y):	88.3
Entitlement volume (GL/y):	86
Recharge estimate range (GL/y)[1]	60 - 99
Average annual take (2012/13–2022/23, GL/y):	76
Significant surface connections:	None

[1] Recharge estimate range is derived from three estimates of recharge: Modelled 68 GL/y, SY2 (diffuse) 99 GL/y and Chloride Mass Balance (CMB) 60 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 Namoi Alluvium consists of unconsolidated Cenozoic sediments and is broadly divided into two main aquifer systems: a shallow aquifer system (up to 40 m deep), and a deep aquifer system (up to 120 m deep). The assessment reflects that there are no significant connections to surface water resources in this Unit.

The SDL for the Unit was originally based on the Achieving Sustainable Groundwater Entitlements (ASGE) program limit (86.0 GL/y) plus an estimate of stock and domestic use (2.25 GL/y).

At the time of setting the SDL, the ASGE program was still being implemented. The MDBA noted that while there was evidence of a decline in water levels since the 1980s/90s over the eastern part of the Unit (where most of the groundwater take occurs), the aquifers were large and at low risk of material depletion within the first 10 years of the Basin Plan. It was therefore decided to allow the ASGE to complete before considering change. This allowed time for further monitoring and data to be collected and the response to the ongoing ASGE program to be assessed.

NSW has since reported that water levels have continued to decline over time, including during years with wetter conditions and lower usage. For this reason, groundwater characteristics in this Unit are subject to a relatively high degree of monitoring.

NSW has advised that management of the resource in this Unit could be improved through the development of an improved model to better understand and track the characteristics of the aquifer and allow a more effective application of restrictions.

Figure 2 below identifies that annual take shows inter-annual variations, related in some degree to climate conditions (dry or wet years). The average annual take over the period 2012/13 to 2022/23 was 86% of the SDL. Since 2019, water take has been substantially less in response to high rainfall.

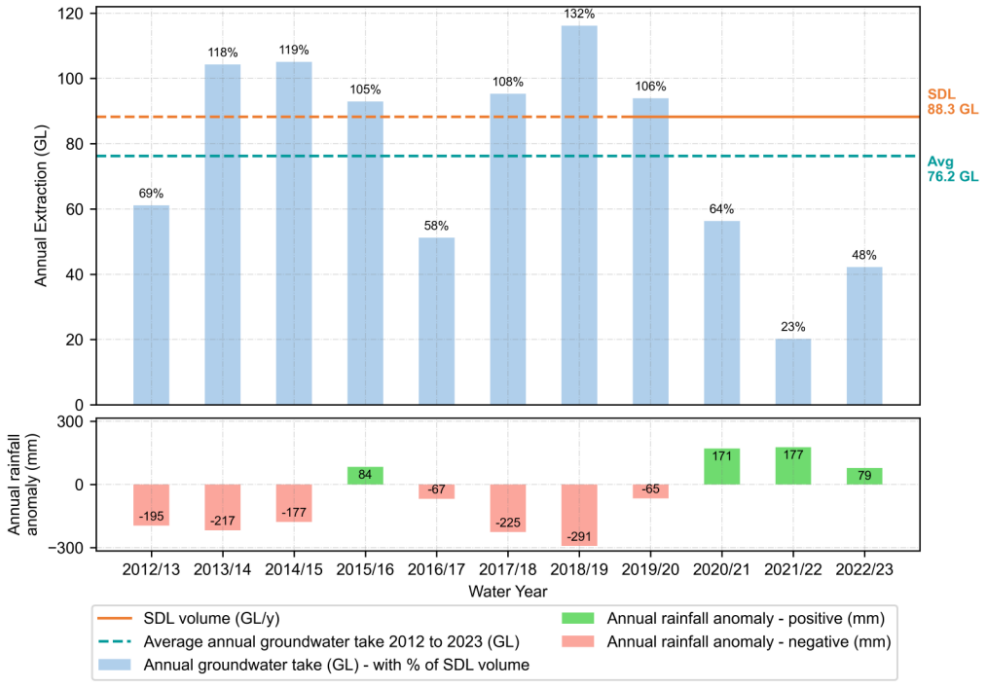

Figure 2: Utilisation for the period 2012/13 to 2022/23

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)	37%	32%	●●○	6%	64%	●●○
Surface water – groundwater connectivity	41%	40%	●●●	14%	67%	●●●
Productive base	49%	31%	●●●	9%	73%	●●●
Water quality	6%	0%	●○○	32%	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* (high confidence)
- *Surface water-groundwater connectivity* (high confidence)
- *GDEs* (moderate confidence)

The rates of decline in water levels for many of the monitoring bores are in the range of 0.1 to 0.5 metres per year, such that groundwater levels have declined by 5 to 20 metres (depending on the specific bore site) over the long-term. This trend has occurred across the majority of the eastern part of the Unit where most water take occurs, particularly between Narrabri and Wee Waa, as well as north and northwest of Wee Waa. The aquifer in this part of the Unit is relatively shallow (i.e. up to 40m deep) hence declines in this area of this magnitude can impact the *productive base*. The short-term trends show partial stabilisation in select locations, but overall declines have continued despite the ASGE program, the higher rainfall since 2020, and the associated decrease in groundwater take.

To date the identified water quality risks have not manifested in the monitoring data, noting that many of the monitoring bores do not measure salinity and hence the data for this characteristic is rated as having 'low confidence' (Table 1).

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.

Other lines of evidence

Confidence in the trends relating to impacts identified through monitoring bores has been qualified taking account of NSW advice that declining groundwater levels in the Unit do not impact *GDEs* and *connectivity* due to the depth of the resource. *GDEs* and *connectivity* are therefore not identified as at risk and will not be carried through to the consequence assessment.

It is noted that this finding aligns with the draft WRP risk assessment for the Unit which identified high risks to the *productive base* relating to aquifer structural integrity and local drawdowns affecting groundwater access. It also identified high risks to water quality due to induced salinity mobilisation.

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' presented below 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.

Modelled recharge information					
Status of recharge knowledge base (SY)	Proportion of SDL to recharge (modelled)	Proportion of aquifer storage to recharge estimate (modelled)			Proportion of average annual take to recharge (modelled)
		Modelled	Buffering	Sensitivity	
Modelled information best available	1.29 Risk indicated	1,270	High	Low	1.12

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	
				●		86

Table 3: Likelihood of take increasing to the SDL.

As can be seen in Table 2, **risk is indicated** because annual actual take exceeds recharge at a rate of 1.12 (i.e. annual take is 112% of the recharge rate). Similarly, the SDL **exceeds recharge** at a rate of 1.29 (i.e. the SDL is 129% of the re-charge rate). While 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 — in this case, there is a declining trend and monitoring shows that the level of the resource has significantly declined.

Groundwater take is close to SDL, and it is assessed that use of the full SDL is **likely**, having been reported twice since the completion of the ASGE program in June 2017.

Consequence assessment

The risk assessment has detected declining trends in water levels at more than 30% of monitoring bores and noted that average annual water take is greater than recharge rates, 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 and short-term monitoring data indicates potential risks to the assessment characteristics of the *productive base* due to declining groundwater level.

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	Potential nature of impact	Spatial scale of impact	Impact on key values	Final rating

Productive base	Potential impacts on provisioning services. Structural integrity of aquifer potentially compromised.	**High** SDL Unit level	**High** • Current groundwater levels have significantly declined, RCLs for groundwater levels are exceeded and the ratio of recharge to take indicates significant risk. • Insufficient volume to maintain provisioning services.	**HIGH**

Table 4: outcome of consequence assessment

Drivers of impact

In this Unit, the *productive base* has 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 an 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 **Low risk**	Recharge less than SDL **High risk**		Recharge greater than SDL **Low risk**	Recharge less than SDL **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', 'warmer and much drier', 'hotter 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.

The aquifer storage indicates that there is high buffering and therefore the resource will have lower sensitivity to an increase in use; but, as explored above, the observed decline in groundwater level is material. The associated impacts are already being realised, specifically for the *productive base*. Under full utilisation of the SDL or a drier climate (or both), the values listed in Table 2 (average annual water take as a proportion of recharge) would increase, and it is anticipated that the observed impacts on the *productive base* to date would be further exacerbated.

Initial Assessment

On the balance of all 3 Lines of Enquiry, the Authority's initial SDL assessment has found that SDLs **may not be supporting the Basin Plan's environmental outcomes** under current conditions with the *productive base* having been identified as at risk.

This risk may further increase under a drier or 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 this Unit. 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. 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 *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.

Further work is also in train to engage more deeply with the risks of climate on rates of decline and re-charge and uplift modelling capability for this Unit.

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

- Improved information base including improvement of the aquifer modelling for this Unit
- Targeted changes to rules or management settings

- An adjustment of the SDL for the Unit

The Authority intends to work with New South Wales to support initiatives already underway. This includes the development of a groundwater level decline operational protocol that is intended to manage long-term declines like those identified in the Lower Namoi Alluvium. The Authority will consult further with NSW about the drivers of the risks and the management that may be appropriate to address this.

Evidence

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

- NSW DPIE 2022, Upper and Lower Namoi groundwater sources, Review of groundwater levels in Upper and Lower Namoi groundwater sources 2021
- Australasian Groundwater and Environmental Consultants – GS29 Lower Namoi Alluvium one page summary
- Murray–Darling Basin Plan Groundwater Methods Report, Murray–Darling Basin Authority Canberra, 2020, Murray–Darling Basin Plan Groundwater Methods Report
- Groundwater report cards, Murray–Darling Basin Authority Canberra, 2020, Groundwater report cards

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.