Otago Regional Council

Flow naturalisation of Luggate Creek at SH6 Bridge

Otago Regional Council
Private Bag 1954, Dunedin 9054
70 Stafford Street, Dunedin 9016
Phone 03 474 0827
www.orc.govt.nz

ISBN
Report writer: Lu Xiaofeng
Data and statistical analyses performed by: Lu Xiaofeng
Reviewed by: Dave Stewart, Raineffects Ltd
Completed July 2023
Published: November 2023

Contents

Daily flow time series data 3
Daily water use time series 4
Total water use above the SH6 Bridge flow recorder on Luggate Creek 4
Flow naturalisation 5
Method 5
Naturalised flow statistics 6
Appendix 7
Table A1. The consents used to naturalise the flows at the SH6 Bridge on Luggate Creek 7

This document describes how naturalised flow statistics at the flow recorder at SH6 Bridge on Luggate Creek were derived.

Daily flow time series data

The daily flow time series data available for analysis are listed in **Table 1** and the locations of the flow sites are shown in **Figure 1**.

Table 1: The daily flow time series data available for analysis above Luggate Creek at SH6 Bridge.

Sites	Start	End	Length (year)
Luggate Creek at SH6 Bridge	17/12/2015	13/06/2023	7.5

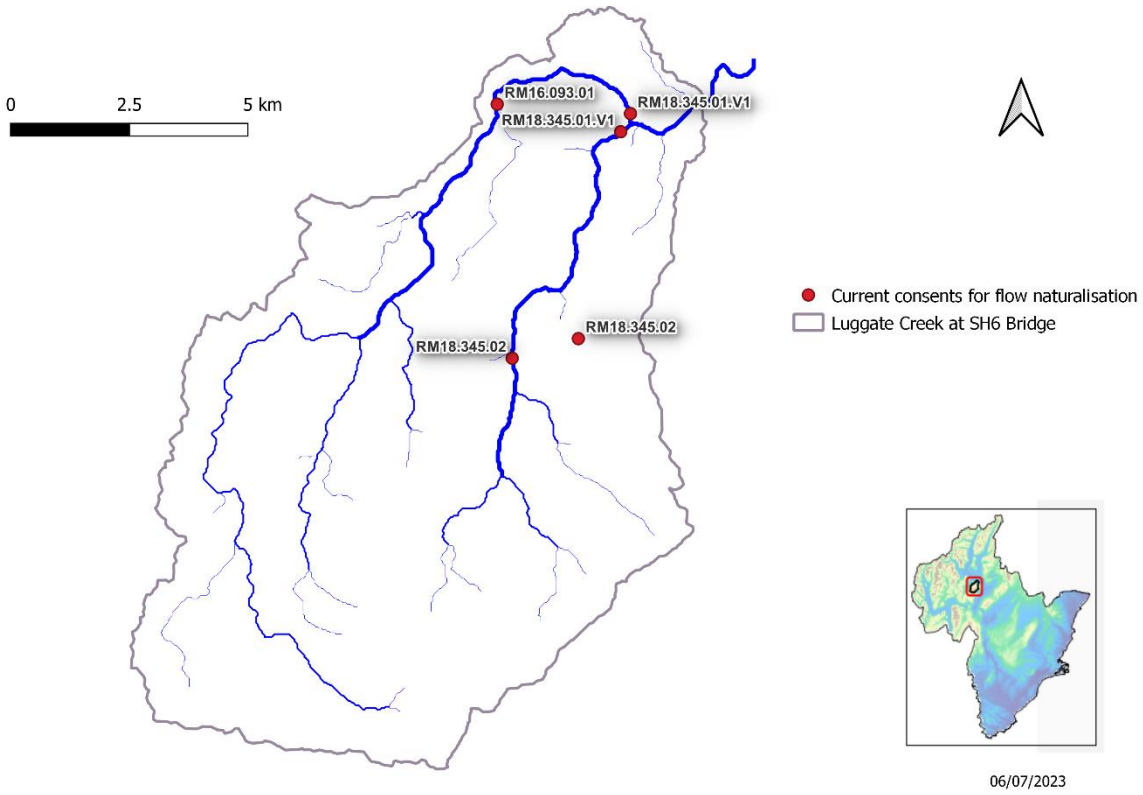

Figure 1: The locations of the current consents in the upstream area above the flow recorder at Luggate Creek at SH6 Bridge.

Daily water use time series

Time series data of water use (WU) is needed to naturalise the flow at Luggate Creek at SH6 Bridge flow recorder. All consents for water use must first be identified above the flow recorder.

Total water use above the SH6 Bridge flow recorder on Luggate Creek

As listed in **Table A1** in the **Appendix**, 29 consents are used to estimate the naturalised flows at SH6 Bridge flow recorder in Luggate Creek. Of these, only 3 are currently active. **Figure 2** shows the total combined WU above Luggate Creek at SH6 Bridge flow recorder.

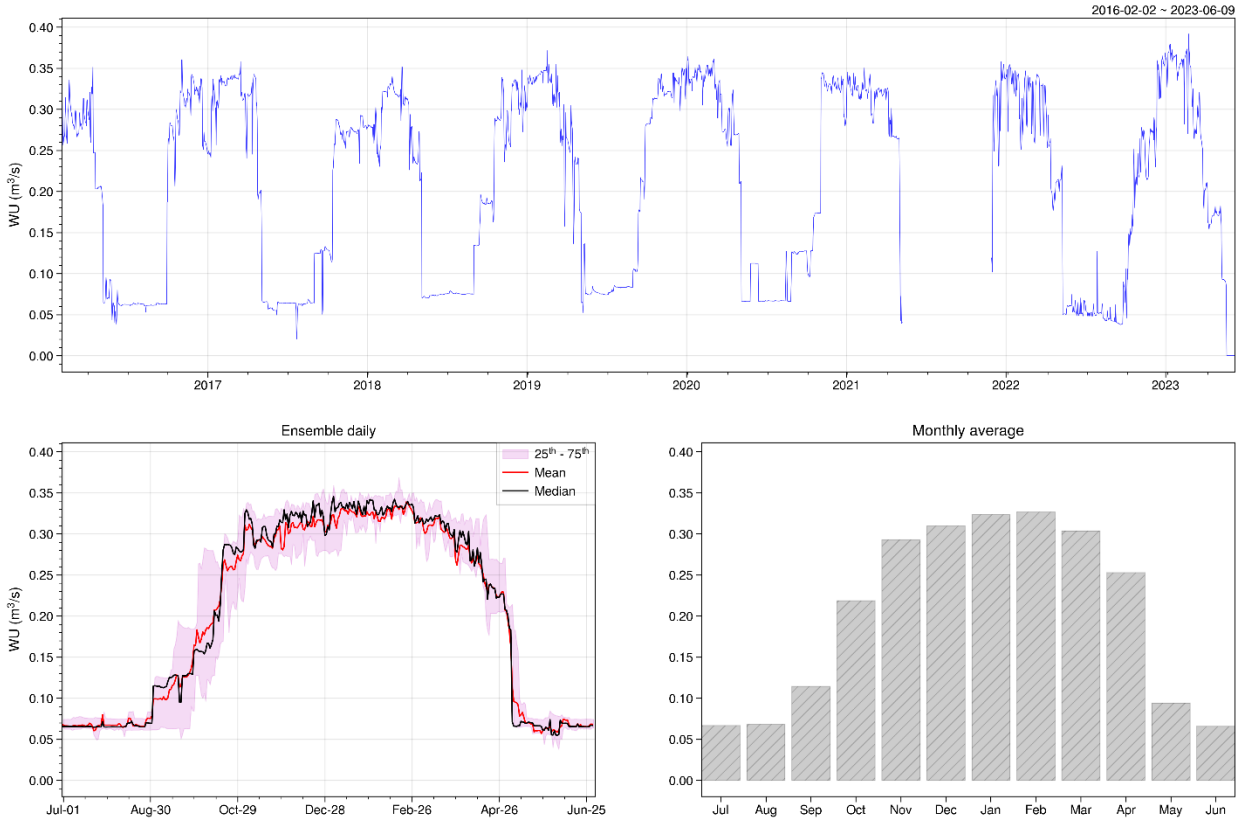

Figure 2: The total water use upstream of the recorder on Luggate Creek at SH6 Bridge.

As shown in **Figure 2**, the period from the water year 2016/17 onwards is used to naturalise the flows of Luggate Creek at SH6 Bridge. The average total WU during the possible irrigation seasons (Sep – Apr, inclusive) is 211 L/s since the water year 2016/17.

Flow naturalisation

This section describes how the naturalised flow statistics are estimated for the flow recorder on Luggate Creek at SH6 Bridge.

Method

The naturalised flow time series can be estimated by adding the upstream total WU to the observed flow records.

Producing long-term flow statistics is the key goal for this study including the naturalised seven-day mean annual flow (7dMALF) and long-term median and mean flows for the flow recorder on Luggate Creek at SH6 Bridge.

Naturalised flow statistics

Basic flow statistics (Table 2).

Table 2: Naturalised flow statistics for the recorder at Luggate Creek at SH6 Bridge (01/07/2016 ~ present).

Site	Mean (m^3/s)	Median (m^3/s)	FRE3[1] ($year^{-1}$)	7dMALF (m^3/s) (Jul - Jun)
Luggate Creek at SH6 Bridge (naturalised)	1.526	1.201	4.3	0.593
Luggate Creek at SH6 Bridge (observed)	1.344	1.078	4.8	0.312

[1] The frequency of events exceeding three times the median flow value. In this study, an independent event is defined by the minimal event interval of 7 days.

Appendix

Table A1. The consents used to naturalise the flows at the SH6 Bridge on Luggate Creek

Consent	Status	Water meter	Allocation type	Category	Consented rate
RM16.093.01	Current	WM0730	Primary	Surface Take	358
RM18.345.01.01	Current	WM0671	Primary	Surface Take	87
RM18.345.02	Current	WM0487	Primary	Surface Take	93
1480A	Expired			Surface Take	
1480B	Expired			Surface Take	
1480C	Expired			Surface Take	
1670	Expired			Surface Take	
2001.011.V1	Expired	WM0730		Surface Take	13.9
2008.519.V1	Expired	WM0487	Primary	Surface Take	169.8
2585A	Expired			Surface Take	
2585B	Expired			Surface Take	
2754	Expired			Surface Take	
3295B	Expired			Surface Take	
3295C	Expired			Surface Take	
3296	Expired			Surface Take	
94201	Expired	WM0730		Surface Take	20.83
950	Expired			Surface Take	
95541	Expired	WM0730		Surface Take	27.77
95560	Expired	WM0730		Surface Take	34.7
96588	Expired	WM0730		Surface Take	55.6
97629	Expired	WM0730		Surface Take	222.22
97803.V1	Expired	WM0487	Primary	Surface Take	111.1
WR412CR	Expired	WM0730	Primary	Surface Take	194.44
WR7284CR.V1	Expired	WM0671	Primary	Surface Take	55.55
WR7285CR.V1	Expired	WM0671	Primary	Surface Take	83.33
WR7286CR.V1	Expired	WM0671	Primary	Surface Take	55.55
WR7298CR.V1	Expired	WM0671	Primary	Surface Take	55.6
95603	Surrendered			Surface Take	
WR625CR	Surrendered			Surface Take	