



Methodology for Horizons Source Water Risk Management Area Updates

December 2025

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December 2025
Report No. 2026/EXT/2015
ISBN 978-1-991448-18-7

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5 December 2025

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METHODOLOGY FOR HORIZONS SOURCE WATER RISK MANAGEMENT AREA UPDATES

1.0 Introduction

Pattle Delamore Partners Limited (PDP) has been engaged by Horizons Regional Council to update the current Source Protection Zones (SPZ) to be consistent with the Delineating Source Water Risk Management Areas (SWRMA) guidelines, released by the Ministry for the Environment (MfE) in 2023. The Horizons Regional Council's SPZ (now referred to as SWRMA) were previously delineated by PDP in order to comply with the Technical Guidelines for Drinking Water Source Protection Zones, which were authored by PDP in 2018 for MfE. In keeping with the previous guidelines, the new guidance denotes three default SWRMA defined in the 2023 guidelines as SWRMA1, SWRMA2, and SWRMA3. However, there are some differences in the new guidance compared to the older guidance, for example:

- The 2023 guidelines require shallow groundwater and surface water sources that are in hydraulic connection to be defined as a conjunctive source.
- The default zone 1 for groundwater supplies is now a minimum of a 5 m radius from the supply.
- The default zone 2 radius for groundwater supplies has increased from 2 km upgradient to 2.5 km upgradient.

PDP have previously undertaken a review of the SWRMA previously delineated for Horizons by PDP and identified several SWRMA that required updates to align with the 2023 MfE guidelines. This letter outlines the methodology used to delineate the SWRMA updates, and the updated shapefiles have been provided along with this letter.

1.1 SWRMA1

Table 1 identifies bores that do not have a 5 m radius surrounding the bore within the current SWRMA1 zone. The previous work defined the SWRMA1 as the existing property boundary for some groundwater supplies which may have not met the minimum radius of 5 m in all directions. The bores in the list have had an updated strict 5 m radius in all directions regardless of site constraints to comply with current MfE 2023 guidelines. Where the property boundary extends more than 5 m from the bore, the boundary has also been included in SWRMA1 as per the previous SWRMA1 extents.

Table 1: Supplies that have had SWRMA 1 updated to a 5 m radius surrounding the bore

Owner	Supply	Source ID	Bore Number
Horowhenua District Council	Foxton	Harbour Street bore	342077
Horowhenua District Council	Foxton Beach	Flagstaff bore	342105
Manawatu District Council	Feilding	Campbells Road bore	326117
Manawatu District Council	Feilding	Newbury Line bore	326113
Manawatu District Council	Rongotea	Rongotea bore	324125
Palmerston North City Council	Bunnythorpe	Raymond Street New bore	326103
Palmerston North City Council	Ashurst	Hacketts Road bore	337015
Palmerston North City Council	Palmerston North	Keith Street 1 bore	336223
Palmerston North City Council	Longburn	Longburn bore	335351
Palmerston North City Council	Palmerston North	Roberts Line 2 bore	336257
Palmerston North City Council	Palmerston North	Keith Street 2 bore	336317
Rangitikei District Council	Bulls	Bulls Supplementary bore	313069
Rangitikei District Council	Marton	Tutaenui bore	303029
Whanganui District Council	Whanganui (Aramoho, Blueskin and Heloise bores)	Blueskin bore	780035
Whanganui District Council	Whanganui (Kai Iwi bores)	Kai Iwi 3	699009
Whanganui District Council	Whanganui (Kai Iwi bores)	Kai Iwi 1	699022
Longburn Adventist College	Adventist College	Longburn Adventist Bore	335331
Whanganui District Council	Fordell	Reid's Hill Bore	792058
Massey University	Massey University	Old Dairy Factory Bore	336259
Manawatu District Council	Waituna West	Waituna West Bore	306009

Notes:

1. TDC Pahiatua, McKnight Bore found to meet 5 m in all directions based on site photos and has therefore not required updating.

In addition to the above, a number of supplies identified as conjunctive sources (i.e. supplies where water is ultimately sourced from both groundwater and surface water) required updates to SWRMA1 for consistency with the current guidelines. These updates relate to conjunctive sources from a bore not within a riverbed which have previously had SWRMA1 treated as a groundwater source.

The 2023 MfE guidelines now state that where a bore (or spring) for a conjunctive source is situated within, or less than 30 m from, a riverbed, the SWRMA1 extent should also be treated as a surface water supply, with a SWRMA1 extending 1,000 m upstream and 100 m downstream and 5 m into land from the edge of the riverbed and the gallery or bore, in combination with the 5 m radius around the bore or spring. The following table identifies the supplies that have had a surface water SWRMA1 incorporated to the existing SWRMA1 as part of being a conjunctive source. It is noted that the Totara Reserve bores are

situated more than 30 m from the river bed but given the topography and hydrological setting of this supply, it is reasonable to assume that this supply should be treated as a conjunctive source.

The SWRMA intake protection zones (Zone 1) were manually defined, based aerial photography to define the river beds. Where the river beds are obscured by vegetation or tree cover, this required an element of expert judgement as to the width of the stream bed and in general a conservative approach was used.

Table 2: Supplies that have had a surface water SWRMA incorporated into the existing SWRMA1

Owner	Supply	Source ID	Bore Number (Blank for Springs and Surface Water)
Whanganui District Council	Whanganui (Kai Iwi bores)	Kai Iwi 3	699009
Fonterra	Fonterra Pahiatua	Fonterra Pahiatua Bore	348005
Kakahi Water Supply Society	Kakahi	Kakahi Springs	
Kaupeka Ki Runga Trust	Moawhango	Moawhango Spring	
Tararua District Council	Norsewood	Norsewood Bore	Unknown
Totara Reserve	Totara Reserve	Rangi Woods Bore	318023
Totara Reserve	Totara Reserve	Totara Reserve Bore	318021

1.2 SWRMA2

For a number of the groundwater supplies initially delineated for unconfined groundwater sources with limited/no information around aquifer properties, or springs, the default upgradient extent was defined as 2 km. The updated 2023 guidelines state that the default upgradient extent has now been updated to 2.5 km. Table 3 identifies bores and springs that have had their SWRMA2 zone to extend from 2 km to 2.5 km.

Table 3: Supplies that have had their SWRMA2 extended from 2 km to 2.5 km

Owner	Supply	Source ID	Bore Number
Whanganui District Council	Whanganui (Kai Iwi Bore)	Kai Iwi 3	699009
Rangitikei District Council	Bulls	Bulls Supplementary Bore	313069
Tararua District Council	Pahiatua	Pahiatua (McKnight bore)	348104
Kakahi Water Supply Society	Kakahi	Kakahi Springs	
Ruapehu Alpine Lifts	Whakapapa Ski Field	Waipuna Springs	
Kaupeka Ki Runga Trust	Moawhango	Moawhango Spring	
Tararua District Council	Norsewood	Norsewood Bore	Unknown
Manawatu District Council	Totara Reserve	Rangi Woods Bore	318023
Manawatu District Council	Totara Reserve	Totara Reserve Bore	318021

Table 3: Supplies that have had their SWRMA2 extended from 2 km to 2.5 km

Owner	Supply	Source ID	Bore Number
Fonterra	Fonterra Pahiatua	Fonterra Pahiatua Bore	348005
Tatum Park Holiday Conference Centre	Tatum Park	Tatum Park Bore 1	362101
Tatum Park Holiday Conference Centre	Tatum Park	Tatum Park Bore 2	362541

Another requirement is that shallow groundwater sources close to a river (i.e. riparian bores) as well as springs near surface waterways that recharge groundwater, need to have both a groundwater zone and surface water zone defined for SWRMA2 (i.e. a conjunctive zone). The following bores and springs have been assigned as conjunctive sources and have had updates made to the SWRMA2 extents to be consistent with the updated 2023 guidelines.

SWRMA2 surface water zones were defined using the methods previously undertaken for the Horizons region via a combination of methods.

- ✧ The velocity of the streams and rivers from which water is taken is generally not defined with certainty. Therefore, a default velocity of 1 m/s was used to define the 8 hour travel time, except for a number of the larger rivers where flow velocity data was available. A 1 m/s velocity equates to approximately a 28 km travel distance over 8 hours and in most cases, the intermediate zones extend to the edge of the surface water catchment.
- ✧ Where the river or streambed was visible through aerial imagery, the edge of the stream bed was manually delineated to match that data. However, in other cases, where the stream was obscured by trees or where the bed was too narrow to accurately define, the stream bed was assumed to represent a line and the 100 m buffer around the stream was set based on the line. This approach may mean that the extent of the zone 2 areas is slightly underestimated in some areas. However, this effect is not expected to be significant.
- ✧ The location of streams was generally based on the Land Information New Zealand (LINZ) streams data, as per the previous methodology used for the Horizons region due to the absence of region wide LiDAR data. However, LiDAR data was available and able to be utilised for the Moawhango and Whanganui (Kai Iwi) supplies.
- ✧ In most cases the New Zealand wide 8 m digital elevation model was unable to be utilised because the low resolution of the dataset did not allow correct stream definition in relatively flat areas in many of the catchments. For the two supplies above, the LiDAR stream network was defined based on a flow accumulation threshold of 200,000 m² (20 hectares) which generally matched with the LINZ stream data. In general, the LiDAR data provided stream lines that didn't extend as far upslope as the LINZ data. However, in the absence of high-resolution data, the LINZ data is considered to be appropriately conservative. In many situations, the additional extension of the LINZ data upslope (compared to the LiDAR model) primarily delineated dry channels rather than permanently flowing waterways.
- ✧ The intermediate zones were also clipped to the edge of the catchment boundaries and in some areas, the width of the intermediate zone is therefore less than 100 m.
- ✧ A small number of supplies extended into additional catchments as a result of the groundwater zone being extended from 2 to 2.5 km. As a result, some updates to the extent of SWRMA3 (overall catchment) were required.

Table 4 identifies bores and springs that have had their SWRMA2 zone to extend to represent a conjunctive source. This table also provides commentary on the changes made and any modifications to SWRMA3 as a result.

Table 4: Conjunctive sources that have had updates made to the SWRMA2 extents as per MfE guidelines

Owner	Supply	Source ID	Bore Number (Blank for Springs and Surface Water)	Change to SWRMA2
Rangitikei District Council	Bulls	Bulls Supplementary bore	313069	Surface water zone added (and subsequent minor amendment to SWRMA3). Has been combined with Bulls riparian bores.
Rangitikei District Council	Bulls	Bulls Riparian bores		Groundwater zone added (and subsequent minor amendment to SWRMA3). Has been combined with Bulls supplementary bore.
Whanganui District Council	Whanganui (Kai Iwi bores)	Kai Iwi 3	699009	Surface water zone added.
Tararua District Council	Akito	Akitio Spring		No change to SWRMA2 required upon assessment of catchment size in comparison to groundwater zone.
Fonterra	Fonterra Pahiatua	Fonterra Pahiatua Bore	348005	Surface water zone added.
Kakahi Water Supply Society	Kakahi	Kakahi Springs		Surface water zone added.
Kaupeka Ki Runga Trust	Moawhango	Moawhango Spring		Surface water zone added.
Tararua District Council	Norsewood	Norsewood Bore	Unknown	Surface water zone added.
Tatum Park Holiday Conference Centre	Tatum Park	Tatum Park Bore 1	362101	Surface water zone added.
Tatum Park Holiday Conference Centre	Tatum Park	Tatum Park Bore 2	362541	Surface water zone added.

Table 4: Conjunctive sources that have had updates made to the SWRMA2 extents as per MfE guidelines

Owner	Supply	Source ID	Bore Number (Blank for Springs and Surface Water)	Change to SWRMA2
Totara Reserve	Totara Reserve	Rangi Woods Bore	318023	Surface water zone added.
Totara Reserve	Totara Reserve	Totara Reserve Bore	318021	Surface water zone added.
Ruapehu Alpine Lifts	Whakapapa Ski Field	Waipuna Spring		Surface water zone added.
Kaiwhaiki Marae Committee	Kaiwhaiki Marae	Spring		Surface water zone added.
Matahiwi Marae	Matahiwi Marae	Spring		Surface water zone added.
Patiarero Marae	Patiarero Marae	Spring		No change to SWRMA2 required upon assessment of catchment size in comparison to groundwater zone and elevation difference between spring and waterways.
Ranana Marae Committee	Ranana Marae	Spring		No change to SWRMA2 required upon assessment of catchment size in comparison to groundwater zone and elevation difference between spring and waterways.
Manawatu District Council	Halcombe	Rangitikei River	314009 and unnamed bore	Groundwater zone added (and subsequent minor amendment to SWRMA3).

Notes:

Ministry of Defence Ohakea (Rangitikei River) source not delineated as Horizons advised this supply is no longer in use.

As stated in the table above, the Bulls riparian bores and Bulls supplementary bore have now been treated as one supply with the same SWRMA2, given that both of these supplies are now required to be treated as a conjunctive source, and owing to their proximity to each other. Previously the riparian bores were treated as surface water and the supplementary bore was treated as groundwater. As a result, the downgradient extent of SWRMA3 also required updating to match the downgradient extent of SWRMA2.

Likewise, the Halcombe supply has had a groundwater zone added which extends further downgradient of the previous SWRMA3, and therefore SWRMA3 has also been updated to match the downgradient extent of SWRMA2.

The overall catchment for Kakahi Spring has been extended, based on the increase in upgradient extent made to the groundwater zone. This has subsequently required SWRMA3 to be updated to a larger catchment. Upon review of LiDAR data for this supply, it has been decided that the spring is unlikely to source water from the Whakapapa River due to the difference in elevation between the river and the spring.

Three of the spring sources (Akito, Patiarero Marae and Ranana Marae) were assessed based on the local topography, and it is considered unlikely that these springs would be hydraulically connected to surface waterways beyond those captured by the current SWRMA2, due to the spring elevation being notably higher than the local waterways. As such, no updates were made to SWRMA2 for these supplies.

2.0 Conclusion

This letter provides a summary of the supplies that have been updated to meet the 2023 MfE guidelines. As a result, all currently delineated SWRMA for Horizons are considered to be consistent with the latest guidelines. A shapefile containing the updated SWRMA extents have been provided with this letter.

3.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Horizons Regional Council and others (not directly contracted by PDP for the work). PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

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Yours faithfully

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