Section 32 Evaluation Report for the Proposed Otago Land and Water Regional Plan

Chapter 12: Earthworks, bores, and drilling

This Section 32 Evaluation Report should be read together with the Proposed Otago Land and Water Regional Plan

Otago Regional Council

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Abbreviations

FMU	Freshwater Management Unit
NES	National Environmental Standard
NESF	National Environmental Standards for Freshwater 2020
NES-CF	National Environmental Standards for Commercial Forestry 2023
NOF	National Objectives Framework
NPS	National Policy Statement
ORPS	Otago Regional Policy Statement 2019
pORPS	Proposed Otago Regional Policy Statement 2021
pLWRP	Proposed Otago Land and Water Regional Plan 2024
QLDC	Queenstown Lakes District Council
RPS	Regional Policy Statement
RPW	Regional Plan: Water
RMA	Resource Management Act 1991

Earthworks, bores and drilling [EARTH] – Assessment of provisions

1. Introduction

1. This chapter outlines the development and analysis of the EARTH chapter provisions, which manage the activities of earthworks, bores and drilling.

1.1. Earthworks

2. Earthworks involve the alteration or disturbance of land. Earthworks include the moving, removing, placing, blading, cutting, contouring, filling, or excavation of earth (or any matter constituting the land including soil, clay, sand, and rock), but exclude gardening, cultivation, and disturbance of land for the installation of fence posts[1]. Earthworks are often needed to facilitate land development for urban (e.g., residential subdivision), and rural development purposes (e.g., constructed wetlands, installation of culverts and drains, development of laneways, water storage, and land clearance). When earthworks are undertaken, sub-soils are exposed, which can result in erosion and sediment-laden stormwater discharges.

1.2. Bores

3. A bore is any hole drilled or constructed in the ground that is used to investigate or monitor conditions below the ground surface; or abstract gaseous or liquid substances from the ground; or discharge gaseous or liquid substances into the ground; but it excludes test pits, trenches, soak holes and soakage pits[2]. Many domestic dwellings and commercial or industrial premises without reticulated water supply rely on bore water. Use of bore water include drinking water, sanitation, irrigation and other commercial uses. Bores are also required for dewatering, a process of pumping out groundwater to facilitate construction. Bores that are used for groundwater investigations or monitoring purposes are also known as piezometers.

4. Since 2018 there have been between 109 and 157 bores drilled each year in Otago as shown in table 1. Not all bores which are consented are drilled.

Table 1: Bore numbers in Otago

Year	Consented	Drilled
2023	325	157
2022	13063	125
2021	384	131
2020	386	111

[1] National Planning Standards definition

[2] National Planning Standards definition

[3] In 2022 two databases were combined, one of which included a backlog of consented wells. It is likely that those wells were consented over a long period of time.

Year	Consented	Drilled
2019	262	115
2018	113	109

1.3. Drilling

5. The drilling of land is also necessary for purposes other than bore construction. Examples include installing piles for building on liquefaction prone soils, drilling for mineral extraction or exploration and directional drilling. Directional drilling is used for laying new pipes, such as drinking water or sewage pipes. A steerable boring head is pushed through the ground while being rotated. Drill pipe is added behind the boring head so that there is always drill pipe in the bore hole. When the pilot bore is completed, the hole is enlarged to the required diameter by pulling a reamer back towards the drilling machine. When the hole has been opened to the required size the pipe is pulled into place.

2. Issues

6. The matters the EARTH chapter seeks to manage are effects on water quality, soil stability and health and habitats of threatened species. Sediment from earthworks can impact a wide range of values such as natural character and recreational uses of freshwater. Key resource management issues include:

   a. Discharge of suspended sediment and creation of sedimentation.

   b. Discharge of other contaminants, including hazardous substances.

   c. Effects on soil structural integrity.

   d. Exacerbation of natural hazards and land instability.

   e. Loss of riparian vegetation.

   f. Risk of contaminated drinking water due to poor bore security.

   g. Potential adverse effects of dewatering.

   h. Risk of cross mixing of water.

7. Additional policy issues with the status quo policy context that the EARTH chapter seeks to address are outlined in Section 3 of this chapter.

2.1. Earthworks

2.1.1. Discharge of sediment and sedimentation

8. When land is disturbed during earthworks, the rate of erosion increases because sub-soils are exposed to elements, which can result in sediment-laden run off entering receiving environments. Sediment and sediment transports are components of the natural functioning of rivers (e.g., sediment transport is a process that forms natural features, such as gravel bars). However, excess sedimentation and suspended sediment particularly of fine sand, silt, and clay particles, can cause adverse effects on the environment (Smith, McCord, & Rossaak, 2019). Parts of the Otago region are characterised by large areas of undulating and hilly topography. Earthworks undertaken on such topography in ways that

do not adequately manage erosion or sediment-laden runoff may result in adverse effects on water quality. Sediment discharges may cause the following adverse effects on water quality, freshwater ecosystems and mahika kai (National Institute of Water and Atmospheric Research, 2024):

a. Decreased water clarity, which reduces visibility for fish seeking food and places to live.

b. Damage to fish gills and filter feeding apparatus of aquatic invertebrates.

c. Changes to the bottom (benthic) structure of the waterway (e.g., gravels and boulders can be smothered by sand and silt).

d. Decreased numbers of invertebrate species due to smothering of habitat.

e. Decreased algal food supply at the base of the food chain.

f. Potential reductions in the quality of water for drinking or irrigation.

9. Excess sedimentation causes river channels to become unstable; flood capacity is decreased due to infilling, channel aggregation occurs, and bank erosion may increase (U.S. Geological Survey, 2023). Furthermore, sediment discharges can negatively affect reticulated systems when discharges enter public pipes, causing the pipes to become clogged thus reducing the network's capacity.

2.1.2. Discharge of other contaminants

10. Flocculants are used as an erosion and sediment control method, usually applied to sediment-laden water in settling ponds or similar. They make suspended sediment particles in liquids come together to form larger, heavier particles or 'flocs' that settle faster, and improve the clarity of the water. There is minimal information on the potential effects of flocculants on New Zealand's freshwater habitats and fauna. However, if not managed appropriately, flocculants can themselves enter water bodies and can cause damage to macroinvertebrates.

11. Other contaminants that could enter waterbodies during earthworks activities include fuels/oils, cement, and lime. Fuels, lubricants, and hydraulic fluids from machinery can enter waterways when machinery is used in or adjacent to waterbodies, which may adversely affect freshwater species and stream health. The accidental discharge of lime slurry can alter the pH of a water body, making the water highly alkaline, which is extremely toxic to freshwater species. Furthermore, the discharge of lime can block interstitial spaces and embed substrates, smothering the habitat, and destroying spawning and fish habitat (Ministry for the Environment, 2021c).

2.1.3. Effects on soil integrity

12. When earthworks are carried out, soil can become compacted due to the use of heavy machinery and lose some of its structural integrity. Compacted soils lack good soil structure because the airspaces that are essential for the movement of water, gases and plant roots are compressed. It is difficult and costly to rehabilitate soil once this has occurred. Soil compaction can lead to:

a. Poor root growth which reduces crop yield through poor water and nutrient uptake.

b. A decline in soil structural stability.

c. A decrease in water entering the soil either as rain or irrigation and resulting impacts on groundwater recharge.

d. Poor root growth which reduces crop yield through poor water and nutrient uptake.

e. Difficulties with soil cultivation and seedbed preparation.

f. A decline in fertiliser efficiency because large blocks of compacted soil provide less surfaces to retain and release fertiliser for crop growth, and this can lead to loss of nutrients in run-off (Queensland Government, 2024).

2.1.4. Exacerbation of natural hazards and land instability

13. Earthworks can create or exacerbate natural hazard risk. For example, filling parts of a known overland flow path is likely to impede runoff and worsen flooding upstream, thus potentially increasing the area affected by inundation. Instances of land instability may be created where excavations under cut a hillside, or where excavations result in un-retained or bare hillsides (Hu, Drewry, Beare, Eger, & Muller, 2021).

2.1.5. Loss of riparian vegetation

14. When earthworks are carried out, riparian vegetation is sometimes cleared for site access or construction activities, which can cause adverse environmental effects due to the loss of vegetative cover. Riparian vegetation provides essential functions for waterbodies and for terrestrial and freshwater species. It protects banks from erosion and acts as a buffer for filtering sediments and contaminants from runoff before entering receiving waters. Riparian vegetation also shades waterbodies, which regulates water temperatures, thus minimising nuisance algae. Coupled with this, riparian vegetation provides both in-stream habitat for fish and macroinvertebrates, as well as terrestrial habitat for birds, insects, and lizards. Leaves, woody debris, and terrestrial insects falling into waterbodies provide food essential to fish and macroinvertebrates. Given all the benefits that riparian vegetation provides, it is important that the loss of this vegetation is minimised during earthwork activities (Ministry for the Environment, 2021c).

2.2. Bores and drilling

2.2.1. Potential effects of dewatering

15. Dewatering is the removal of groundwater from excavations, tunnelling, trenches, and sediment control devices and is generally undertaken by first pumping the groundwater, then treating the water and removing any silt, followed by the discharge of clean water (Ministry for the Environment, 2021c).

16. However, dewatering can generate fine textured material that is difficult to treat on site. Other potential effects of dewatering include sediment generation, discharge of contaminants, drawdown effect[4] and mortality of aquatic species and flooding. In addition,

[4] Drawdown effect is the lowering of the water table.

dewatering can also indirectly affect the hydrology of wetlands (Ministry for the Environment, 2021c).

2.2.2. Risk of contaminated drinking water due to poor bore security

17. Poor bore security increases the risk of harm to human health from contaminated drinking water, and risk of groundwater contamination. Examples of risks caused by poor bore security include below ground bore heads which are easily accessible to animals/livestock or inadequate backflow prevention. Investigations by ORC's compliance team have found multiple instances of poor bore security across Otago (Levy, 2023). Poor bore security is a likely cause of elevated *E. coli*, which is an indicator of the presence of other microbiological organisms.

2.2.3. Risk of cross mixing of water

18. If a bore is improperly sited or constructed there is a risk of drilling through two aquifers, which can result in the cross mixing of waters. Cross mixing of water is contrary to Kāi Tahu cultural and spiritual beliefs and values and degrades the mauri of the water (Ngāi Tahu ki Murihiku, 2008). Other potential effects of the cross-mixing of water include cross-contamination and adverse impacts on hydrology.

3. Status quo

3.1. Earthworks

19. This section describes the current regulatory framework for the management of effects from earthworks in Otago.

20. The pORPS requires the regional plan to manage land uses that may affect the ability of environmental outcomes for water quality to be achieved by requiring earthworks activities to implement effective sediment and erosion control practices and setbacks from water bodies to reduce the risk of sediment loss to water (LF–LS–M11 – Regional plans). Additionally, the regional plan must control earthworks where it may adversely affect historic heritage by requiring the use of accidental discovery protocols as conditions on resource consents.

21. The operative RPS 2019 fails to fulfil ORC's Section 30 RMA functions. It requires city and district councils to manage the discharge of dust, and silt and sediment associated with earthworks and implement accidental discovery protocols. It does not include any regional council direction for the management of earthworks.

22. The use of land for earthworks is managed by district councils, however the matters controlled through the district plan rules address district council functions rather than regional council functions. Until 2022, discharges from earthworks were not managed by ORC. In 2022 Plan Change 8 introduced the following rules for the use of land and associated discharge from earthworks:

    a. Policy 7.D.10: the loss or discharge of sediment from earthworks is avoided or, where avoidance is not achievable, best practice guidelines for minimising sediment loss are implemented to maintain water quality.

b. Rules 14.5.1.1 and 14.5.2.1 set out the specific requirements for residential earthworks. A resource consent is required if the activity does not meet the following permitted activity criteria:

   i. The area of exposed earth is no larger than 2,500m² per landholding in any consecutive 12-month period; and

   ii. Works are not within ten metres of a water body (such as a river, stream, wetland or lake), drain, water race or the coast; and

   iii. Exposed earth is stabilised when works are completed; and

   iv. Works are not on (potentially) contaminated land; and

   v. Soils and debris are not placed where sediment can enter waterways or the coastal marine area; and

   vi. Works will not result in flooding, erosion, land instability, subsidence, or property damage; and

   vii. Discharge of sediment to water will not result in any conspicuous change in the colour or visual clarity, objectionable odour, making water not suitable for farm animals, or cause significant adverse effects on aquatic life.

23. All discharges from earthworks which are not residential are captured by general discharge provisions in section 12.C of the RPW (Wildlands, 2021a). Sediment discharges from earthworks are also managed by stormwater discharge rules, however, stormwater is defined as "the water running off from any impervious surface such as roads, carparks, roofs and sealed runways". This definition means stormwater is unlikely to be considered relevant for construction sites until impervious surfaces, such as roads or car parks, have been established.

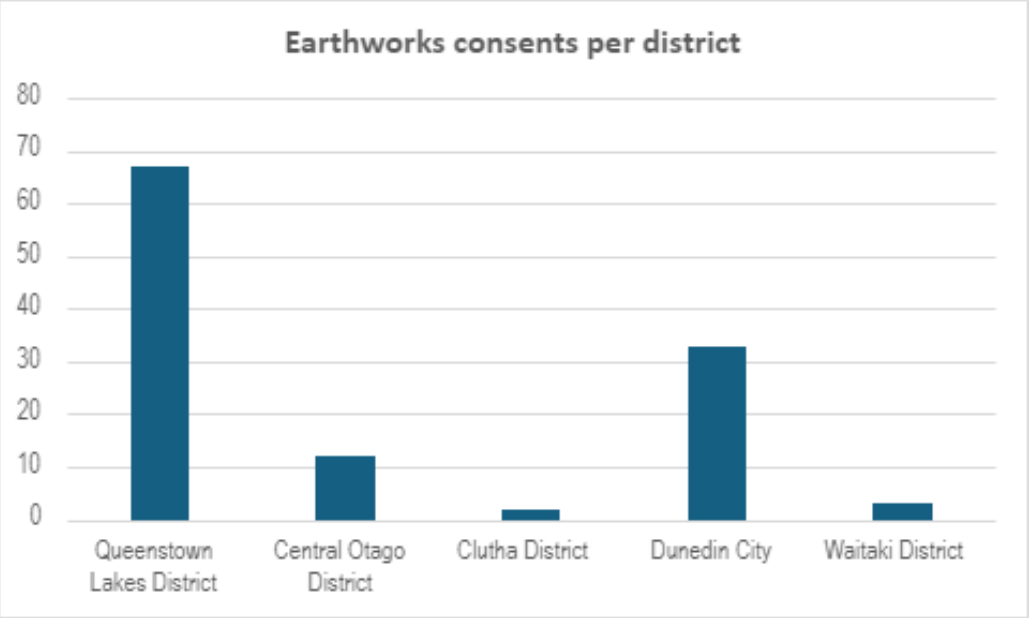

Figure 1: Earthworks consents per district. Source: ORC data team.

24. Since Plan Change 8 provisions were introduced in 2022, there have been 117 consents issued for residential earthworks in the region. Figure 1: Earthworks consents per district shows that most consented earthworks are in Queenstown and Dunedin.

25. Table 2 and 3 below shows the minimum, maximum, and median processing costs for resource consent applications that resulted in at least one discharge permit or one land-use permit for earthworks being issued.

26. The "number of examples" column shows how many applications resulted in that number of consents being issued. For example, in the 2022/23 financial year, there were 25 resource consent applications that resulted in two resource consents being issued (at least one of which was a discharge permit for earthworks). Some earthworks activities also require a water take permit, for dewatering the site. The information shows that the vast majority of applications result in 2 consents. It is likely that these consents are a land-use consent and a discharge consent. Overall, the costs of processing applications for earthworks ranged from $1,464.97 to $25,895.15.

Table 2: Processing costs for discharge permit – earthworks. Source: ORC data team.

Financial year	Number of consents issued	Minimum cost	Maximum cost	Median total cost	Number of examples
2022/23	2	2,158.28	11,898.14	4,093.64	25
	3	3,013.73	8,892.81	4,516.61	5
	4	3,964.70	8,581.87	6,273.29	2
	5	9,357.88	13,653.32	11,505.60	2
	6	10,494.18	10,494.18	10,494.18	3
2023/24	2	1,464.97	10,521.05	4,536.33	26
	3	2,008.27	12,117.33	6,843.47	4
	4	6,179.69	16,387.14	10,567.01	6
	8	9,086.70	9,086.70	9,086.70	1

Table 3: Processing costs for land use permit – earthworks. Source: ORC data team.

Financial year	Number of consents issued	Minimum cost	Maximum cost	Median total cost	Number of examples
2022/23	2	2,158.28	11,898.14	4,236.87	28
	3	3,711.32	8,892.81	7,396.60	5
	4	3,964.70	3,964.70	3,964.70	1
	5	9,357.88	13,653.32	11,505.60	2
	6	10,494.18	10,494.18	10,494.18	3
2023/24	2	1,464.97	10,521.05	4,730.59	25
	3	2,008.27	12,117.33	5,498.43	12

	4	6,179.69	16,387.14	14,307.33	6
	8	9,086.70	25,895.15	17,490.93	2

27. Some issues with the approach under the current provisions of the RPW are:

a. The RPW only manages residential earthworks. The effects of all earthwork activities are the same, regardless of whether they are for residential, commercial or rural/farming purposes, therefore management should not be limited to residential earthworks.

b. The current rule framework of Section 12.C (general discharge provisions) of the RPW raises issues for landholders and ORC compliance officers. Compliance with the permitted activity conditions may be difficult to predict or achieve under certain circumstances, as discharges are often the result of weather events. This means that the requirement for resource consent will only be triggered after the discharge has already occurred. Therefore, to ensure compliance at all times, developers may need to apply for resource consent prior to the discharge occurring if there is a chance that the permitted activity conditions may not be met.

c. The conditions of the RWP earthworks rules do not adequately manage the effects of earthworks that are carried out during the winter season. This is a management issue because during the winter months there is increased rain, snow and freezing in the Otago region, which can exacerbate sediment discharges and other contaminants entering receiving waters, or cause sediment treatment measures to fail.

d. The permitted activity area threshold is too high for earthworks on steep slopes. Earthworks up to 2,500m2 undertaken on a steep slope may have greater effects, in terms of sediment runoff, than earthworks over 2,500m2 on flat land. Therefore, there is a need for the permitted conditions to be more nuanced to manage these activities.

e. Greater guidance should be provided regarding erosion and sediment control measures. In the absence of policy direction, the Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (Auckland Council, 2016) are often used to inform consent conditions. Although useful, they are not always suitable for Otago conditions, and at times a bespoke approach is required.

3.2. Bores and drilling

28. This section describes the current regulatory framework for the management of effects from bores and drilling in Otago.

29. The pORPS includes a policy that requires water in Otago's aquifers is suitable for human consumption, unless that water is naturally unsuitable for consumption (LF–FW–AER7). The operative RPS 2019 does not include any regional council direction for the management of drilling and bores.

30. The RPW contains a number of objectives relevant to the management of bores. These include objectives that seek to sustain the recognised uses of Otago's groundwater and maintain the quality of Otago's groundwater.[5]

31. The RPW also contains a policy that require appropriate siting, construction, and operation of new groundwater bores, to prevent contaminants from entering an aquifer and the contamination of groundwater in any aquifer from the groundwater in another aquifer; and to promote such management for existing bores.[6] Further policies require new drill holes to be appropriately sealed to prevent contaminants entering any aquifer and seek to support the use of appropriate codes of practice and management guidelines for land use activities that may result in contaminants entering groundwater.[7]

32. The construction of bores is a controlled activity[8]. ORC restricts its control to the following matters: location, depth, management and maintenance, method of drilling, duration of consent, monitoring requirements.

33. The drilling of land, other than for the purpose of creating a bore, and other than on the bed of any lake or river, is a permitted activity providing the drilling does not occur over an aquifer identified in the C-series maps (Figure 2), and the hole is filled or sealed on completion of the work so that contaminants are prevented from entering the hole at any level.[9]

34. The drilling of land (other than for the purpose of creating a bore) over an aquifer is a controlled activity[10] and ORC restricts its control to the following matters: the potential for contamination of groundwater, location, depth, management, method, duration of consent, monitoring requirements.

35. Except as provided by the above provisions, the drilling of land, other than for the purpose of creating a bore and other than on the bed of any lake or river, is a restricted discretionary activity.[11]

[5] RPW 9.3.1 and 9.3.3

[6] RPW Policy 9.4.14

[7] RPW Policy 9.4.17 and 9.4.21

[8] Rule 14.1.1.1

[9] Rule 14.2.1.1

[10] Rule 14.2.2.1

[11] Rule 14.2.3.1

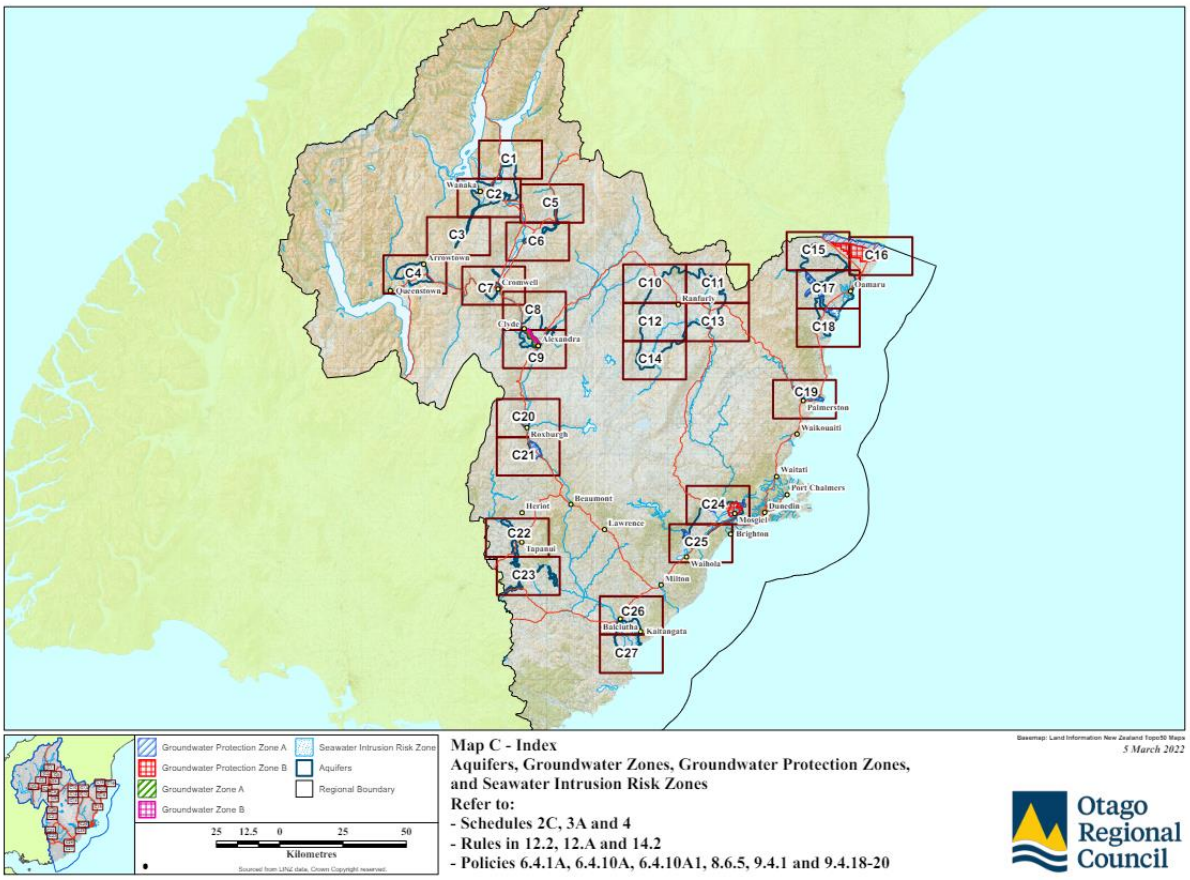

Figure 2: C-series maps of the RPW showing aquifers in Otago

36. Some issues with the status quo management of bores are:

a. The RPW provisions make no reference to the national drilling standards (Standards New Zealand , 2001).

b. Existing bores are not required to be secure. Currently, no rule exists in the RPW for managing the operation, maintenance or repair of an existing bore. Compliance staff have identified this as a gap in the RPW which means that ORC currently cannot enforce the upgrade, repair or decommissioning of an insecure bore.

c. Drilling for the purpose other than a bore over an aquifer requires consent, even when the drilling does not interfere with the water table. Feedback from ORC's compliance team suggests that many consents for drilling are unnecessary if the drilling is above the water table and does not penetrate an aquifer.

d. The RPW provisions do not give guidance on directional drilling.

4. Objectives

37. Section 32(1)(b) requires an examination of whether the provisions in a proposal are the most appropriate way to achieve the objectives. The objectives and environmental outcomes that are particularly relevant for this topic are:

a. All of the environmental outcomes included as objectives in chapters FMU1 to FMU5 (including chapters CAT1 to CAT5); and

b. EARTH-O1 – Earthworks and bores.

38. While all the FMU objectives are relevant to the EARTH provisions, the following FMU objectives are of particular relevance to the earthworks provisions:

    i. FMU1 to 5-O1 Ecosystem health

    ii. FMU1 to 5-O7 Natural form and character

39. Ecosystem health is often impacted by sediment from earthworks, and natural form and character can be directly impacted by the scale and scope of the earthworks.

40. The following FMU objectives are of particular relevance to the bores and drilling provisions:

    i. FMU1 to 5-O8 Drinking water supply (source water)

41. FMU1 to 5 - O8 drinking water supply is relevant, due to the risk of contaminated groundwater from insecure bores.

5. Overview of sub-topics

42. The options below are presented on a sub-topic basis. The sub-topics are:

    a. Earthworks; and

    b. Bores and drilling.

6. Subtopic: Earthworks

6.1. Reasonably practicable options

43. To achieve the relevant objectives for earthworks, three options have been identified through the policy development process, which included community engagement, review of relevant provisions in other regional plans, and discussion in a series of council workshops:

    a. **Option 1**: Status quo (manage residential earthworks)

    b. **Option 2**: Manage all types of development

    c. **Option 3**: Refined framework for all types of development (preferred option)

6.1.1. Option 1: Status quo (manage residential earthworks)

44. This option would retain the permitted activity rule framework of the RPW with the rules only managing earthworks for residential purposes.

6.1.2. Option 2: Manage all types of development

45. This option would extend the RPW provisions to manage earthworks for non-residential purposes. Under this option earthworks would retain the permitted activity rule framework of the RPW. Earthworks that do not meet the permitted activity criteria would require a discretionary consent.

6.1.3. Option 3: Refined framework for all types of development (preferred option)

46. ORC's compliance team has assessed the effectiveness and workability of the RPW provisions introduced in Plan Change 8. Their assessment has resulted in drafting of Option 3 which increases scope of management while allowing for some pragmatic exclusions.

47. Option 3 widens the scope of management beyond residential earthworks. It also contains a more refined permitted activity rule framework than that which exists in the RPW.

48. This option manages all types of earthworks other than earthworks for forestry, which are managed under the NES-CF. The RPW management framework is refined by introducing permitted activity thresholds based on area, slope, and distance from water bodies.

49. Under this option, the earthworks may only be a permitted activity if one of the following three 'entry' conditions are be met:

    a. Small setbacks from water bodies (10 metres) for small areas of earthworks (up to and including 2,500 m^2) and low slope (less than 10 degrees).

       OR

    b. Larger setbacks from water bodies (50 metres) for small areas of earthworks (up to and including 1,000 m^2) and steeper slopes (over 10 degrees).

       OR

    c. Larger setbacks from water bodies (50 metres) for large areas of earthworks (over 2,500 m^2 and less than 10,000 m^2) with a lower slope (less than 10 degrees).

50. There are key details to note within these entry conditions. First, earthworks for the purposes of farm tracks, riparian planting and erosion and sediment control devises are excluded from the area, slope, and set-back thresholds. Farm tracks have a management pathway via a Freshwater Farm Plan. Earthworks for the purpose of riparian planting will be within the setback distances from water bodies, and so need to be excluded from this condition. Earthworks for the purposes of erosion control should be permitted, regardless of distance to water and scale, as it benefits the receiving environment.

51. Earthworks are not required to be setback from artificial watercourses[12]. This exclusion is to allow the clearing, maintenance and infilling of irrigation canals. However, to avoid contamination of stormwater networks, sediment is not allowed to enter stormwater networks except where prior written approval is obtained from the network operator.

52. Following on from these entry conditions, there are a range of other conditions that need to be met in Option 3. These include:

    a. Measures should be implemented in accordance with Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (Auckland Council, 2016) for earthworks over 250 m^2.

[12] A watercourse that is deliberately created by human action (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, farm drainage canal, drain, or duck pond) provided that it is not part of a water body or a modified watercourse

b. Earthworks should not occur within a habitat of threatened species, a drinking water protection zone, a mātaitai or taiāpure, an area subject to a natural hazard or a critical source area.

c. Earthworks in or within 50 metres of a natural inland wetland are permitted if they comply with section 38 of the NESF. This condition allows earthworks to occur within wetlands if they are for the purpose of restoration, maintenance, or biosecurity.

d. A requirement to observe an accidental discovery protocol, which gives effect to the pORPS[13].

e. Earthworks do not occur on contaminated or potentially contaminated land, unless they meet the requirements of section 8 of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

53. In Option 3, earthworks that do not meet the permitted activity conditions are treated as a discretionary activity and will need a discretionary resource consent to occur lawfully. Policy directs the consent applicant to:

a. ensure the activity is managed in accordance with best practice erosion and sediment control measures tailored to the site characteristics and use Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region (Auckland Council, 2016) where appropriate; and

b. prepare an erosion and sediment control management plan in accordance with APP17 – Erosion and sediment control plans; and

c. avoid or minimise soil erosion, land instability, flooding, property damage, and loss of sediment to water.

54. Table 4 shows a comparison of the proposed earthworks area thresholds against the district plan rules. The table shows that the pLWRP area thresholds are less stringent than four of the five territorial authority plans in Otago.

Table 4: Comparison of proposed area thresholds against the district plan rules

Authority	Area/size of earthworks undertaken as a permitted activity	Is the district plan more or less stringent than the pLWRP?
Dunedin City Council	Less than 2m change in ground level Should not exceed 200m^2 30m^3 per 100m^2 of land on less than 12-degree slope.	More
Central Otago District Council	2000m^2 (area) or 3000m^3 (volume)	Less
Clutha District Council	(a) An excavation depth or fill height up to 3m, or (b) the removal or the depositing of material up to 250 m^3, or (c) an area of earthworks up to 1000m^2.	More

[13] HCV–HH–M4.

Queenstown Lakes District Council	10m^3 in heritage areas, up to 1000m^3 in a rural zone. Unlimited for roads.	More
Waitaki District Council (draft plan)	300m^2 in the rural lifestyle area in any 12-month period and 500m^2 in the rural general in any 12-month period.	More

6.2. Clause 3 consultation summary

55. Clause 3 feedback was received by several parties. The main issues are summarised below:

a. Concerns about the environmental impact of allowing earthworks to occur as a permitted activity on a slope over 10 degrees, regardless of proximity to water bodies.

b. Concern that the appendix APP16-Erosion and Sediment Control Plans lacks scientific rigour and provides for a lower quality management plan in comparison to the QLDC District Plan rules in the Earthworks chapter and QLDC EMP Guidelines.

c. Earthworks should be managed to avoid effects on water body form and function such as silting up of lake or riverbeds or change in channel shape.

d. Earthworks in relation to ecological and biodiversity values should be permitted.

e. If earthworks are downhill from a waterbody, the activity should be permitted.

f. Effects on coastal marine area should be managed.

g. Suggestion that a freshwater farm plan manage earthworks for farm tracks and silage pits.

h. Permitted activity pathway is required for the following activities that can involve earthworks:

i. Activities associated with erosion and sediment control device.

ii. Establishment/maintenance associated with cultivation and riparian planting.

iii. Burying of material infected by unwanted organisms as declared by Ministry for Primary Industries Chief Technical Officer or an emergency declared by the Minister under the Biosecurity Act 199.

iv. Irrigation and land drainage.

i. Request that earthworks required for maintaining infrastructure associated with renewable electricity generation, including access tracks and roads are permitted.

56. The clause 3 feedback resulted in the following changes in the development of the preferred option (Option 3):

a. Earthworks for the purposes of farm tracks, erosion control and riparian planting are excluded from the area/slope/setback requirements.

b. The setback requirement from artificial watercourses (irrigation races and drains) was removed to allow for the maintenance and infilling of these watercourses.

c. The permitted activity area size threshold on slopes over 10 degrees was reduced from 2500m^2 to 1000m^2.

6.3. Clause 4A consultation summary

57. No feedback was received from iwi on these specific provisions as part of clause 4A consultation.

6.4. Efficiency and effectiveness assessment

58. Table 5 below identifies and assesses the environmental, cultural, social, and economic costs and benefits anticipated from implementing the options proposed above. The main parties affected by these changes include:

a. Property and land developers.

b. Agencies such as ORC that undertake earthworks for flood protection, such as the building of stop banks.

c. Infrastructure providers such as power companies and KiwiRail.

d. Territorial authorities that undertake earthworks for infrastructure including housing, local roads, commercial buildings.

e. NZTA/Waka Kotahi undertake earthworks for road construction/widening or maintenance and repair of national roads.

Table 5: Benefits and costs for EARTH - Earthworks

	BENEFITS	COSTS
Option 1	This option protects water quality and a wide range of other values (recreational, cultural, natural character) from the adverse effects of residential developments through targeted erosion and sediment control measures. There are economic benefits to those undertaking earthworks for non-residential purposes who have no restrictions imposed on them by the pLWRP (although they will still need to comply with district plan rules). An additional benefit of retaining the existing provisions is not relitigating the approach, which was recently agreed in 2020 (Plan Change 8). This reduces uncertainty in the period between notification and the plan becoming fully operative. Option 1 is beneficial to developers of commercial and industrial properties, as there are no added consent costs for these activities.	Setting different standards for earthworks according to the purpose of these activities, whereby some earthworks are managed through the plan and others are not creates an unequitable approach and environmental risk. This option is likely to lead to unnecessary adverse effect on water quality if erosion and sediment control measures are not voluntarily undertaken for non-residential earthworks. Some low-risk residential earthworks will need a consent under this option, which may impose unnecessary costs in certain situations. Not permitting earthworks that are being undertaken for environmental management purpose, such as riparian planting and erosion control within water body set back areas, may constrain progress towards outcomes. This option may result in more expensive remediation interventions (e.g., more water treatment, in-stream clearance) to clean up waterways affected by sediment discharges caused by earthworks Some high-risk activities on steep slopes would be permitted under Option 1 which

		is an environmental risk. The cultural costs of failing to manage earthworks activities are: • Sediment discharges causing deep sediment layer in the bed of a river results in loss of safe access to Mahika kai, and discourage harvest
Option 2	This option is likely to have improved outcomes for water quality and a wide range of other values (recreational, cultural, natural character) because of a wider range of earthworks being managed better with appropriate erosion and sediment controls through a permitted activity or consent. Recognising the effects from all earthworks are the same and regulating them in the same way is a more equitable approach than Option 1. Option 2 also has greater Council oversight of activities across urban and rural areas of the region through the consenting non-residential earthworks.	Widening the scope of the rules may require consents for some activities which are beneficial to the environment, such as riparian planting and erosion and sediment control. Costs to develop non-residential land will increase due to consenting costs. Costs for earthworks consents between June 2022 and December 2023 ranged from around $2,000 to just over $16,300.
Option 3 (preferred option)	The benefits of option 2 apply, as well as: A fine-tuned approach to the rule framework ensures ORC is only managing activities which pose a risk to the environment. Allowing riparian planting and erosion control within water body set back areas will allow good environmental outcomes to continue being achieved. Greater clarity and guidance for plan users with the inclusion of APP17 which lists what should be included in an erosion and sediment control plan. Greater Council oversight through consenting non-residential earthworks. More clear and specific permitted activity conditions will ensure that the rules can more easily and effectively enforced.	The consenting costs of Option 2 apply.

59. Table 6 below assesses the effectiveness and efficiency of the proposed provisions in achieving the objectives.

Table 6: Efficiency and effectiveness assessment for EARTH-Earthworks

Effectiveness	
Option 1	This option is unlikely to be very effective in achieving the objectives, as non-residential earthworks will not require erosion and sediment control measures other than the district council's requirements, which are inconsistent and focus on different matters, such as the generation of dust and amenity values rather than water quality.
Option 2	This option manages all earthworks so is far more likely to be effective in achieving the objective. Better sediment and erosion management will have immediate positive effects on water quality,

	with social, economic, cultural, and environmental benefits. Practices will improve over time, due to targeted requirements and more awareness and understanding of them by resource users.
Option 3 (preferred option)	The points listed in Option 2 apply here, as well as: Managing earthworks that pose an environmental risk while enabling other earthworks that are specifically intended to support environmental enhancement (such as earthworks for the purpose of riparian planting or erosion and sediment control) is considered to the be the most effective approach.
Efficiency	
Option 1	Retaining the current provisions would have some efficiencies in terms of fewer resources spent on new public education of the provisions and updating internal ORC processes. This option is inefficient in achieving the objectives compared to other options because it will require other and potentially more expensive interventions (such as more water treatment to clean up waterways affected by sediment discharges caused by earthworks) or it will require higher restrictions or more stringent controls on other activities to achieve environmental outcomes. This shifts the costs to other users or activities.
Option 2	Some low-risk earthworks will require consent under this option, reducing efficiency. The option is less efficient compared to Option 3 because it poses unnecessary restrictions on earthworks that can have an environmental benefit or whose environmental effects can effectively be managed through other mechanisms. Inefficient to require consent for activities which can be managed through alternative pathways – such as the NES CF, farm plans.
Option 3 (preferred option)	This option is more efficient than the other two options because it will enable some earthworks that can be managed successfully through other mechanisms (i.e., Freshwater Farm Plan or NES-CF Additionally, efficiency is increased because low risk earthworks can progress without the need for resource consent and APP17 provides applicants and consent planners with erosion and sediment control plan guidance.

60. Section 32(2)(c) of the RMA requires ORC to take into account the risk of acting or not acting if there is uncertain or insufficient information.

61. There is sufficient information about the environmental, social and cultural impacts of discharges from earthworks in Otago. The limitations of the provisions introduced under Plan Change 8 are also well understood. These circumstances warrant the implementation of a more refined rule framework than the status quo. Overall, the information supporting Option 3 is suitably certain and sufficient that there is a minimal risk of acting.

6.5. Conclusion

62. The effectiveness and efficiency assessments have shown that, overall, Option 3 is a more effective and efficient way to achieve the relevant objectives of the pLWRP than Option 1 or 2. Therefore, based on these assessments, Option 3 is considered the most appropriate way to achieve the objectives of the pLWRP.

7. Subtopic: Bores and Drilling

7.1. Reasonably practicable options

63. To achieve the relevant objectives for bores and drilling, three options have been identified through the policy development process, which included community engagement, review

of relevant provisions in other regional plans, and discussion in a series of council workshops:

a. **Option 1:** Status quo

b. **Option 2:** LWRP (preferred option)

c. **Option 3:** Bore installers programme

7.1.1. Option 1: Status quo (manage installation of new bores)

64. This option would retain a controlled activity status for the construction of bores, and drilling over aquifers.

7.1.2. Option 2: LWRP (preferred option)

65. Option 2 retains controlled activity status for the installation of new bores, with additional entry conditions, including:

a. adherence to the New Zealand Standard Environmental Standard for Drilling of Soil and Rock (Standards New Zealand , 2001),

b. 100 metres setback from a wetland,

c. not within the bed of a lake or river, contaminated or potentially contaminated land or the habitat of threatened species,

d. special casing for areas with known artesian groundwater[14].

66. If the activity does not meet the controlled entry conditions, a discretionary consent is required for the drilling of a bore.

67. Option 2 also introduces a permitted activity rule framework for the management of existing bores. The permitted activity rule contains conditions that require all existing bores to be secure and well maintained to prevent contamination, leakage of groundwater, or mixing of water from different aquifers. As well, conditions require bores to have a functioning backflow prevention device, and maintenance to be done in accordance with the NZS 4411:2001 Environmental Standard for Drilling of Soil and Rock (Standards New Zealand , 2001). If the existing bore does not meet the requirements of the permitted activity, the bore owner can either repair the bore to achieve compliance, decommission the bore or apply for the activity to be managed via a discretionary consent.

68. This option permits drilling for a purpose other than creating a bore. Drilling on land above an aquifer is permitted if the drilling does not penetrate the aquifer and other conditions are met. Other conditions include avoiding drilling within water body setbacks or a drinking water protection zone; or on contaminated land or potentially contaminated land unless they meet the requirements of section 8 of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

69. A 5-metre setback from a waterbody (excluding wetlands) was included to align with cultivation setbacks in the FMU chapters. Feedback from the ORC compliance team was

[14] Artesian groundwater is corrosive and can damage bore casing (Levy, 2023).

that drilling, unlike earthworks, is a precise activity. Therefore 3 metres setback from water bodies is considered sufficient to manage the risk of sediment entering freshwater.

70. Additionally, an accidental discovery protocol must be followed if the drilling disturbs an archaeological site; and the drilling should comply with NZS 4411:2001 Environmental Standard for Drilling of Soil and Rock (Standards New Zealand , 2001). If the permitted conditions are not met, then a discretionary consent is required.

7.1.3. Option 3: Bore installers programme

71. Under Option 3, the rule framework specified in Option 2 would remain, with an additional permitted activity allowing the drilling of a bore by an accredited driller.

72. To gain accreditation, companies must provide information to the regional council and meet performance requirements. The regional council will perform regular audits of accredited drillers to ensure they are meeting performance requirements. The council provides an online portal that outlines a step-by-step process for drillers to assess the site for suitability and requires drillers to upload a bore log. Pre-drilling checks need to be satisfied to meet the permitted activity conditions. Some areas need to be protected from unauthorised drilling. A consent is required if a drill site is located in one of the following areas:

a. rūnanka sensitive area

b. contaminated land

c. an area controlled by a flood protection bylaw

d. an archaeological site

73. Once drilling commences, the NZS 4411:2001 Environmental Standard for Drilling of Soil and Rock (Standards New Zealand , 2001) must be followed. Information on bores drilled are uploaded to the regional council's web portal, and a percentage of bores drilled are audited annually.

7.2. Clause 3 consultation summary

74. The rule framework for managing bores and drilling was consulted on during pre-notification consultation under Clause 3, Part I, First Schedule of the RMA. Most of the feedback supported the provisions as drafted, with some feedback from an environmental group suggesting that the setback distance from wetlands should be amended from 10 metres to 100 metres. This is because the hydrological functioning of natural inland wetlands can be adversely affected by the taking of water from bores and drains up to 100 metres away.

7.3. Clause 4A consultation summary

75. There was no feedback from iwi specific to these provisions as part of clause 4A consultation.

7.4. Efficiency and effectiveness assessment

76. Table 7 below identifies and assesses the environmental, cultural, social, and economic benefits and costs anticipated from implementing the provisions proposed in the options above.

77. The parties affected by the provisions include (but are not limited to):

a. Bore owners.

b. People who plan to install a bore. It may be for domestic or stock animal drinking water supply, town water supply, irrigation, monitoring or other purposes.

c. Under option 3, bore drillers who need to be accredited. Many bore drillers in Otago are accredited with ECAN's Bore Accreditors Programme.

d. Drilling companies and their customers.

Table 7: Benefits and costs for EARTH - Bores

	BENEFITS	COSTS
Option 1	A controlled activity status for managing the drilling of bores protects water quality and reduces risks of groundwater contamination. A guidance document (Heather, 2023), produced by ORC's science, compliance, and consent staff is resulting in good compliance with the current framework.	In some situations, low risk drilling over aquifers currently requires consent and therefore imposes costs to both applicants and to ORC. Applicants bear the consent costs while for ORC the cost is in the time spent auditing these low-risk activities. ORC cannot require bore heads to be secure at all times, which may affect future generations' ability to access uncontaminated drinking water resources. This is a significant human health risk which can affect all groundwater stores but is especially significant in drinking water protection zones.
Option 2 (preferred option)	The benefits of option 1 apply, as well as: Better protection of groundwater resources from a management framework for existing bores will benefit future generations' ability to access uncontaminated drinking water resources. Remediation of groundwater can be extremely challenging. Also, there may not be alternative options available for some individuals or communities. Low risk drilling over aquifers is permitted and therefore fewer resources are needed from a consenting perspective for the resource user.	Some resource users with failing bores may face additional costs to secure, consent or decommission their bores. However, these costs are likely to be less than those that may arise for them or others if this situation is mis-managed.
Option 3	Fewer consent processing resources are needed for Option 3 because the data is uploaded online by the drillers. Comprehensive data on bores and drilling activities are received by ORC via a portal. There are no consenting costs for applicants.	In January 2023 a meeting was held between ORC and Environment Canterbury staff to further assess this option. ORC staff concluded that the costs outweighed the benefits. While Environment Canterbury's programme audits 10% of bores drilled annually, this level was due to limited resources. It was noted that

	BENEFITS	COSTS
		100% auditing would lessen the environmental risks. The costs to audit 100% of bores drilled would likely be the same or more than the costs of a controlled consenting framework. Option 3 needs extra resources from the Council for implementation, particularly to train drillers and set up an online portal. Unless there is some cost-recovery from resource users then it is incurred by ratepayers. ORC is unable to charge for monitoring of permitted activities[15] or require ongoing bore reporting. Ongoing cultural advice resourcing to manage runaka sensitive areas. More ORC resources needed to set up and audit the programme than those for Option 2. These resources may have come at the expense of other council services or been borne by ratepayers. Option 3 has an increased environmental risk of groundwater contamination due to less council oversight, and undue reliance on driller information which can be challenging to resolve and potentially imposes costs on future generations.

78. Table 8 below assesses the effectiveness and efficiency of the proposed provisions in achieving the objectives.

Table 8: Efficiency and effectiveness assessment for EARTH - Bores

	Effectiveness
Option 1	Poor bore security increases the risk of harm to human health from contaminated drinking water, and risk of groundwater contamination. The status quo provisions manage this risk for new bores, however the risk from existing bores is poorly managed as ORC does not have a management framework to require the upgrading or decommissioning of insecure bores.
Option 2 (preferred option)	Management of existing bores will reduce the risk of groundwater/drinking water contamination. Option 2 is more effective at contributing to FMU-O8: Source water from water bodies (after treatment) is safe and reliable for the drinking water supply needs of the community.
Option 3	The Bore Installers Programme is less likely to be as effective as Option 2, due to less oversight of bores drilling from ORC.
	Efficiency
Option 1	Requiring consents for low risk drilling over aquifers reduces the efficiency of this option.

[15] The RMA does not generally provide for cost recovery for monitoring permitted activities.

	There is little benefit to requiring consents for this activity, as it is a cost to applicants as well as a cost of ORC staff time, which could be better spent elsewhere. Efficiency is also decreased by the poor management of existing bores. It is inefficient to allow problems to arise (i.e., groundwater stores are contaminated) and then try to deal with the problem.
Option 2 (preferred option)	The most efficient way to achieve the objective because only drilling which poses a risk to groundwater health requires a consent. If drilling does not penetrate an aquifer, the drilling can be undertaken through a permitted activity framework with conditions. Efficiency is also gained through the proactive management of existing bores.
Option 3	This is considered to be the least efficient option. The efficiencies gained from allowing the drilling of bores as a permitted activity may be lost due to auditing of drilling activities, and/or compliance or remediation works in cases where the drilling is not done to the applicable standard. Feedback from Environment Canterbury indicated that to be fully effective, 100% of bores would need to be audited, which undermines any efficiencies gained from the programme.

79. Section 32(2)(c) of the RMA requires ORC to take into account the risk of acting or not acting if there is uncertain or insufficient information.

80. Otago has a documented history of inappropriate bore development and subsequent abandonment of bores (Levy, 2023). Sufficient information exists to warrant tighter controls on the use and construction of bores and make the proposed changes to allow low risk drilling over aquifers.

81. Overall, the information supporting Option 2 is suitably certain and sufficient that there is a minimal risk of acting.

7.5. Conclusion

82. The effectiveness and efficiency assessment demonstrates that, overall, the proposed amendments under option 2 are more efficient than the status quo and are effective at achieving the objectives of the pLWRP. Given the efficiency and effectiveness of option 2, the council considers that this option is the most appropriate way to achieve the objectives of the pLWRP.