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AKAROA WHARF

ASSESSMENT OF ENVIRONMENTAL EFFECTS: LIGHTING

REVISION: F RESOURCE CONSENT

DATE: 4/08/2025

QUALITY ASSURANCE STATEMENT

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DISCLAIMER

EXECUTIVE SUMMARY

Pedersen Read have been engaged to undertake a lighting concept design and associated Assessment of Environmental Effects (AEE) for the artificial lighting associated with the proposed rebuild of Akaroa Wharf.

The Akaroa Wharf site is located within Akaroa Harbour on Banks Peninsula and is accessible off Beach Road that runs along the waterfront of the Akaroa township. The Wharf was built in 1887 and is nearing the end of its useable life.

The assessment is based upon the description of the project provided in the Enviser Project Description (Revision V2), dated April 2025, as well as the Isthmus Concept Design drawings (Revision A) and the Holmes General Arrangement Plan (Drawing Number: 145457.31_SSK-01). Refer to Appendix A: "Bibliography" for the list of documents and activities that have informed the review.

Akaroa Wharf is located within the coastal marine area. There are no specific lighting standards under the Regional Coastal Environment Plan for the Canterbury Region. Therefore, the proposed lighting has been assessed against the Christchurch District Plan requirements for Glare and Spill Lighting and Australian and New Zealand Standard AS/NZS 4282: 2023, "Control of the obtrusive effects of outdoor lighting", which collectively provide appropriate thresholds for consideration of lighting associated with the proposal.

The proposed lighting has also been assessed against the recommendations in the "National Light Pollution Guidelines for Wildlife" published by the Australian Government's Department of Climate Change, Energy, the Environment and Water.

The impact of artificial lighting on the night-time environment is defined in AS/NZS 4282:2023 as the following effects:

- Spill Light:
  "*Light emitted by a lighting installation that falls outside the boundaries of the property for which the lighting installation is designed*".
- Glare:
  A "*Condition of vision in which there is discomfort or a reduction in ability to see, or both, caused by an unsuitable distribution or range of luminance, or to extreme contrasts in the field of vision*".
- Sky Glow:
  The *"brightening of the night sky that results from the reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gas molecules, aerosols and particulate matter), in the direction of observation".*

Construction work on the wharf will take place between 7:30am and 6:00pm, Monday to Saturday. Work will not occur outside of these hours. During winter, when it gets dark earlier or stays dark later, artificial lighting may be used to allow work to continue safely within the approved hours. It is understood that the limiting factor associated with construction activities is related to noise as managed through Construction Noise Standard NZS6803:1999; as addressed under the Acoustic assessment accompanying the application.

Whilst artificial lighting could generate direct spill light in excess of the Christchurch District Plan maximum of 4 lux (Open Space Community Park Zone and Residential Banks Peninsular Zone) and 10 lux (Commercial Banks Peninsular Zone) during construction of the wharf, such lighting effects are expected to be of short duration, and localised in nature.

Mobile lighting plant has the most potential to create spill, glare and sky glow effects, given the need to provide safe illumination for construction activities. The effects are considered to be “less than minor” given their expected short duration in any given location and in conjunction with expected mitigation measures including aiming of luminaires to minimise the effects on dwellings, transport and ecology.

Permanent lighting will also be required for the rebuilt wharf. Careful and considered design of the wharf lighting is required to ensure that the expected glare, spill light, sky glow and ecological effects of the permanent lighting are “nil effect” to “less than minor”. Based on the recommendations associated with this assessment, and subject to appropriate conditions of consent it is considered that the effects associated with artificial lighting would be “nil effect” to “less than minor”, when measured against the existing wharf lighting environment.

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1. INTRODUCTION

Pedersen Read have been engaged to undertake a lighting concept design and an associated Assessment of Environmental Effects (AEE) for the artificial lighting associated with the proposed rebuild of Akaroa Wharf. The Akaroa Wharf site is located within Akaroa Harbour on Banks Peninsula and is accessible off Beach Road that runs along the waterfront of the Akaroa township. The Wharf was built in 1887 and is nearing the end of its useable life.

The assessment is based upon the description of the project provided in the Enviser Project Description (Revision V2), dated April 2025, as well as the Isthmus Concept Design drawings (Revision A) and the Holmes General Arrangement Plan (Drawing Number: 145457.31_SSK-01). Refer to Appendix A: "Bibliography" for the list of documents and activities that have informed the review.

A day and night visit to the wharf site and surrounding environs was undertaken on Monday November 11th, 2024. The night time observations occurred between 20:30 and 22:00 (on that day nautical dusk was at 21:41 and astronomical dusk at 22:27). Weather conditions were cloudy with a southwest wind of 43km/hr. The moon was a waxing gibbous phase, with 69% illumination, albeit predominantly obscured by high cloud, with moonrise at 14:31 and the moon at a moderate altitude (51°) during the night time site observations.

During the site inspection, the wharf and its associated lighting was observed day and night from various locations around the Akaroa township and harbour. Locations where the wharf was observed from during the site inspection were:

1. Wainui.
2. French Farm.
3. Children's Bay.
4. Beach Rd commercial area.
5. Akaroa Lighthouse
6. The wharf itself
7. The following residential addresses, with the consent of the homeowners:
    a. 1 Woodills Rd
    b. 25 Settlers Hill
    c. 59 Watson St

Refer to Figure 1 and Figure 2 below for a map view of these locations.

Figure 1 - Harbour view of locations where the wharf was observed from during the site observations

Figure 2 - Locations within Akaroa township where the wharf was observed during site observation

2. SITUATION

2.1 GENERAL

The replacement wharf will be rebuilt in the existing wharf's approximate location. The exact alignment of the replacement wharf is still being finalised. For the purposes of this assessment, a building envelope has been defined that allows for a potential shift of the wharf alignment 1.5 to 2.5 metres to the north. The new wharf will follow a similar form to the existing, with some changes such as a raised deck height and rearranged pontoon layout. A general arrangement plan of the proposed wharf is shown below as Figure 3 and included at full scale as Appendix C.

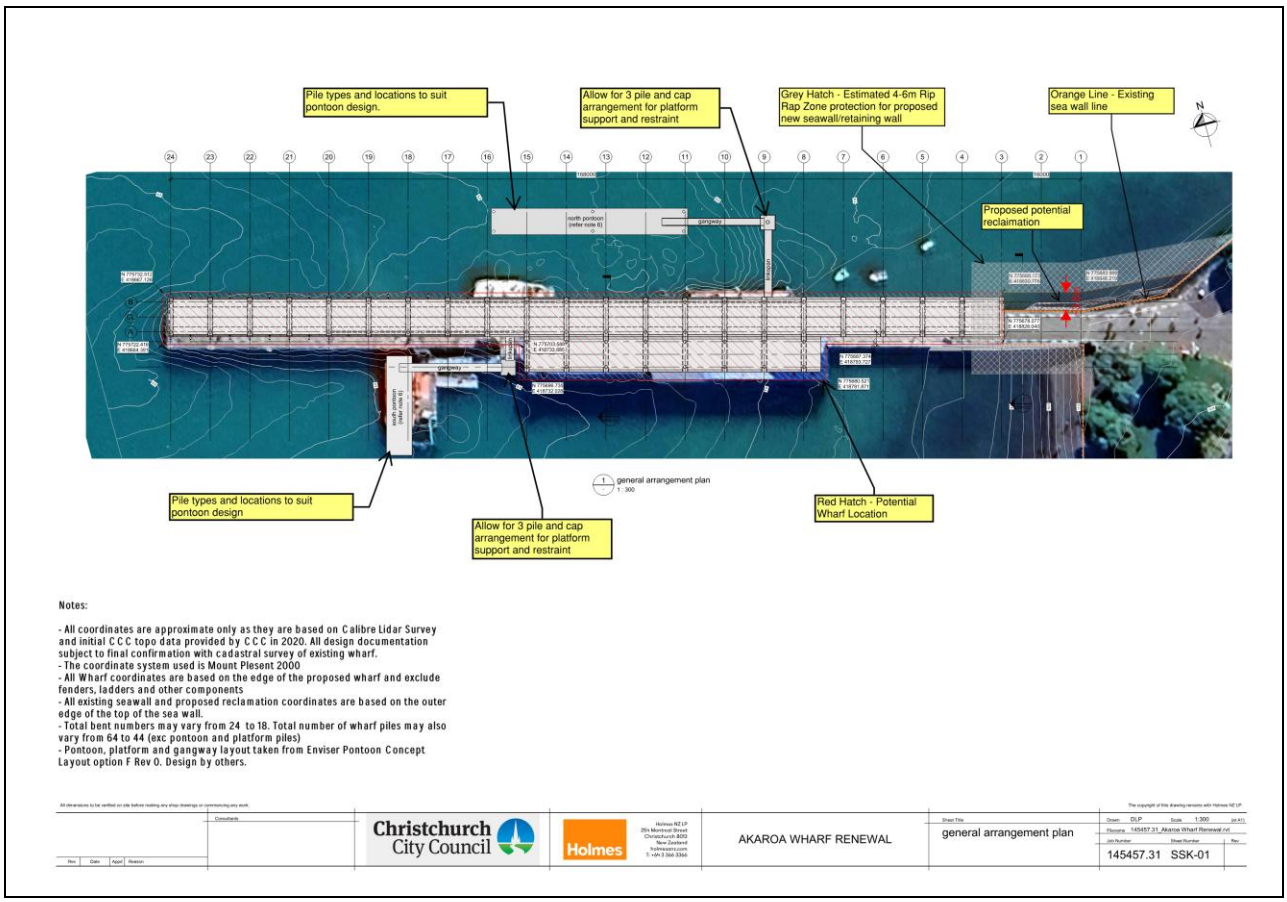


Figure 3 - GA plan of proposed rebuilt wharf.

2.1.1 Existing Buildings

The Black Cat and Blue Pearl buildings, which are currently located on the existing piles at the southern end of the wharf, will remain in place during the reconstruction works. The new wharf will be constructed adjacent to, but not beneath, these structures. They will remain on their existing piles and be reconnected to the new wharf via gangways

2.1.2 Laydown Areas

The Enviser Project Description (version V2) describes the proposed laydown areas associated with the proposed construction methodology. There are two proposed laydown areas, Laydown area 1 comprises an area of the recreation ground and a section of road adjacent to the boat ramp near Children's Bay, approximately 900m NE of the wharf site. Laydown area 2 is at the entrance to the wharf and a vehicle staging area at the Beach Rd boat ramp.

2.2 EXISTING LIGHTING ENVIRONMENT

2.2.1 Lighting arrangement

The existing wharf general lighting comprises 5 x pole mounted luminaires on the wharf structure and one pole mounted luminaire on the abutment. The existing poles are approximately 5m high. Refer to Figure 4 and Figure 5 for details of the existing wharf lighting arrangements.

In addition to the pole mounted lighting on the wharf, there are also 4 x wall mounted exterior bulkhead luminaires mounted on the Blue Pearl Gallery building, and some interior lighting in the Black Cat Cruises building, visible though the shopfront glazing. It is understood that any lighting associated with these buildings is not within the scope of this application.

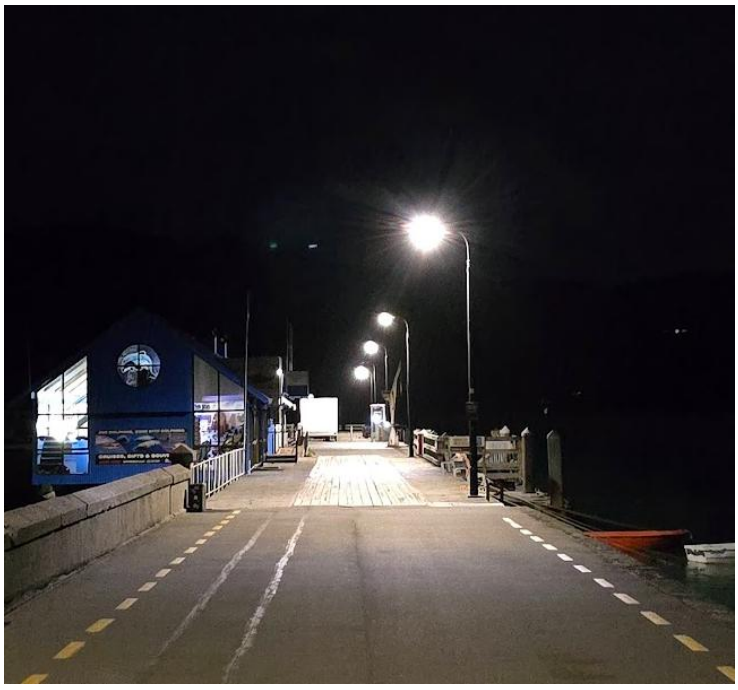


Figure 4 – Photograph of existing Wharf lighting arrangement

Figure 5 - Plan of existing wharf lighting arrangement

2.2.2 Lighting context

The Akaroa Wharf site is located within Akaroa Harbour on Banks Peninsula and is accessible off Beach Road that runs along the waterfront of the Akaroa township. The wharf is located adjacent to the commercial district of the township, with associated shop lighting and streetlighting. Directly adjacent the wharf, there are also 4 x wall mounted exterior bulkhead luminaires mounted on the Blue Pearl Gallery building, and some interior lighting in the Black Cat Cruises building, visible through the shopfront glazing. The existing wharf lighting is viewed within the context of the urban backdrop and is hence is largely indistinguishable in the context of the existing lighting in the surrounding environs.

Figure 6 - Existing Blue Pearl Building with existing wall mounted exterior luminaires

Figure 7 - Black Cat Cruises illumination visible through glazing

Part of the site observations included observing the wharf lighting and its associated environmental effects from French Farm and Wainui across the harbour. Figure 8 below shows the day and night view of the wharf as observed from French Farm. This location is indicative of viewpoints from across the harbour and demonstrates that the wharf lighting is inconspicuous within the broader lighting environment of Akaroa township.

Figure 8 - Night and day view of wharf from French Farm

2.2.3 Lighting sub-category

The Australian and New Zealand standard AS/NZS 1158.3.1:2020 describes the performance and design requirements for pedestrian area lighting schemes. The standard assigns various levels of required performance based on an assessment of the usage of an area, with associated subcategories defined in the standard.

The applicable AS/NZS 1158.3.1:2020 lighting subcategory for the wharf is subcategory PR4, this has been confirmed by email by Christchurch City Council (CCC). PR4 subcategory pertains to pedestrian areas with moderate usage during night-time, such as residential streets, parks, and walkways with some activity. It is part of the broader "P" lighting classifications, which focus on areas used primarily by pedestrians and cyclists rather than motor vehicles.

The light technical parameters associated with the PR4 subcategory are:

Average horizontal illuminance:	1.3 lux
Point horizontal illuminance (i.e. minimum):	0.22 lux
Illuminance uniformity, Cat P:	<8

Where the illuminance uniformity relates to the ratio of the maximum illuminance to the average illuminance.

2.2.4 Luminaires

The existing LED luminaires affixed to the wharf are Phillips RoadGrace type with a colour temperature of 4000K. The fittings are a flat glass type and are mounted at a horizontal tilt of 0deg. Refer to Figure 9 and Figure 10 for photographs of the existing wharf fitting type.

These were installed in approximately 2021-2022 as part of an LED upgrade/replacement program.

The original fittings they replaced were Betacom Goughlights with a colour temperature of 2000K, the historical fitting type was established by a review of the historical google maps photos and consultation with Betacom.

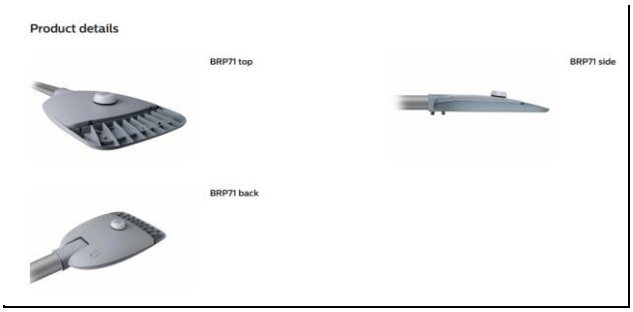


Figure 9 - Images of Philips RoadGrace fitting type, source: luminaire datasheet

Figure 10 - Image of existing wharf fitting, Philips RoadGrace

Neither the historical fittings, nor the existing LED fittings have any backlight shields or physical shrouding to control spill light.

2.2.5 Lighting controls

Christchurch City Council (CCC) have a wireless control system to manage and control streetlights. This system, known as the Central Management System (CMS) comprises a network that is formed between luminaire controllers (LCs) located on each streetlight. The network for the CCC LCs is an Itron wireless mesh network.

Each of the existing pole mounted luminaires on the wharf and abutment have an LC which is used to connect them into CCC's CMS. The CMS is then able to monitor and control the luminaires. The LCs on the luminaires also act as daylight sensors, automatically activating the lighting when it gets dark and switching them off when it gets light.

The wharf pole mounted luminaires are also subject to a prescribed dimming schedule, whereby the light level dims to a lower level late at night. This dimming schedule is summarised below in Table 1.

Dimming Profile	Monday-Friday 12am to 6am	Saturday-Sunday 1am to 6am
PR4 to PR5	70%	70%

Table 1 - Dimming Profile associated with the wharf lighting (source: CCC)

2.3 PROPOSED LIGHTING

2.3.1 Construction Phase

Construction work on the wharf will take place between 7:30am and 6:00pm, Monday to Saturday, as described in the Enviser Project Description, with the primary control being compliance with Construction Noise Standard NZS6803:1999. Work will not occur outside of these hours. During winter, when it gets dark earlier or stays dark later, artificial lighting may be used to allow work to continue safely within the approved hours.

The construction of the new wharf will require some dredging works to facilitate barge access during the construction phase. It is understood that the dredging will only occur during daylight hours, so construction lighting will not be required for the dredging works.

Where construction works are undertaken outside of daylight hours the following additional lighting is likely to be present:

- Standard vehicle head and taillights.
    - Required to be used in low light conditions and possibly during some construction activities and at some locations.
- Mobile lighting plant.
    - Typically, these would consist of diesel-powered LED lighting plant, with three to six LED floodlights mounted on extendable poles – normally in the order of 9m high (Reference Figure 11 for a typical mobile lighting plant). Luminaires would typically be aimed at a high angle to the ground to provide broad lighting coverage across the construction area. Luminaires traditionally use 4000K to 6000K+ lamps with high components in the blue area of the lighting spectrum.
    - Mobile plant location and orientation will vary over time in response to construction activities and locations. There may be situations where mobile lighting is required to protect construction work areas overnight.
- Construction Support Portacom Facilities.
    - Interior lighting would typically consist of surface mounted 4000K LED luminaires mounted at ceiling level. Portacoms do not typically have blinds on windows so that any interior lighting would be visible externally into the evening and at night. Such buildings would not normally have any exterior security lighting unless there was a high risk of theft.
- Construction area security lighting.
    - Construction wheeled vehicles would normally be returned to a yard compound when not in use.
    - Tracked equipment would generally be left on site as it would be operationally challenging to move them every day over any distance.

- In both above situations, security lighting would normally only be installed where theft or material damage were thought to be a risk. In such circumstances the lighting is likely to be designed to deter criminal activity – illuminating the area around, and the vertical faces of the equipment.

It would be expected that the wharf construction contractor would undertake a risk analysis on the lighting requirements for each task and duration at hand. Initially vehicle headlights or sidelights would be used until a better lighting solution became paramount at which point mobile lighting plant would be used.

A typical mobile lighting plant is show in Figure 11 and a typical civil works contract use of mobile lighting is shown in Figure 12.

Figure 11: Typical Mobile Lighting Plant

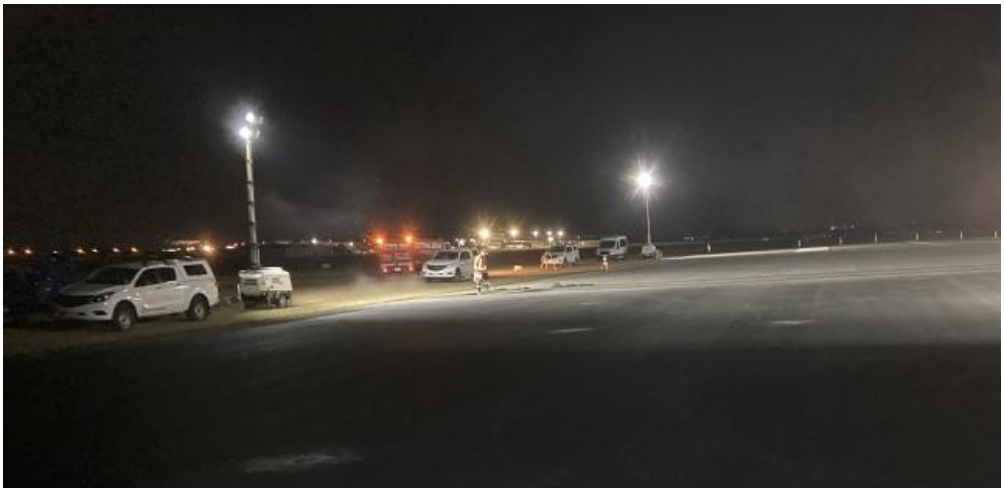


Figure 12: Typical Civil Works Mobile Lighting

2.3.2 Permanent Lighting

The design brief for the permanent lighting of the rebuilt wharf, as described by CCC is as follows:

- Low level lighting to wharf in general including pontoons e.g. night sky / emergency lighting levels.
- Task lighting to crane, diesel bowser and seating to end of wharf. Crane task lighting will be able to be turned on/off as required.
- Lighting in handrails leading to pontoons
- Feature lighting to feature handrail - e.g. limited up lighting to showcase design
- Feature lighting to taurapa e.g. limited up lighting to showcase design.
- Compliance with relevant health and safety standards.

Permanent wharf lighting will be informed by best practice design principles from the *National Light Pollution Guidelines for Wildlife*. Figure 13 (Guidelines Figure 4) illustrates these principles.

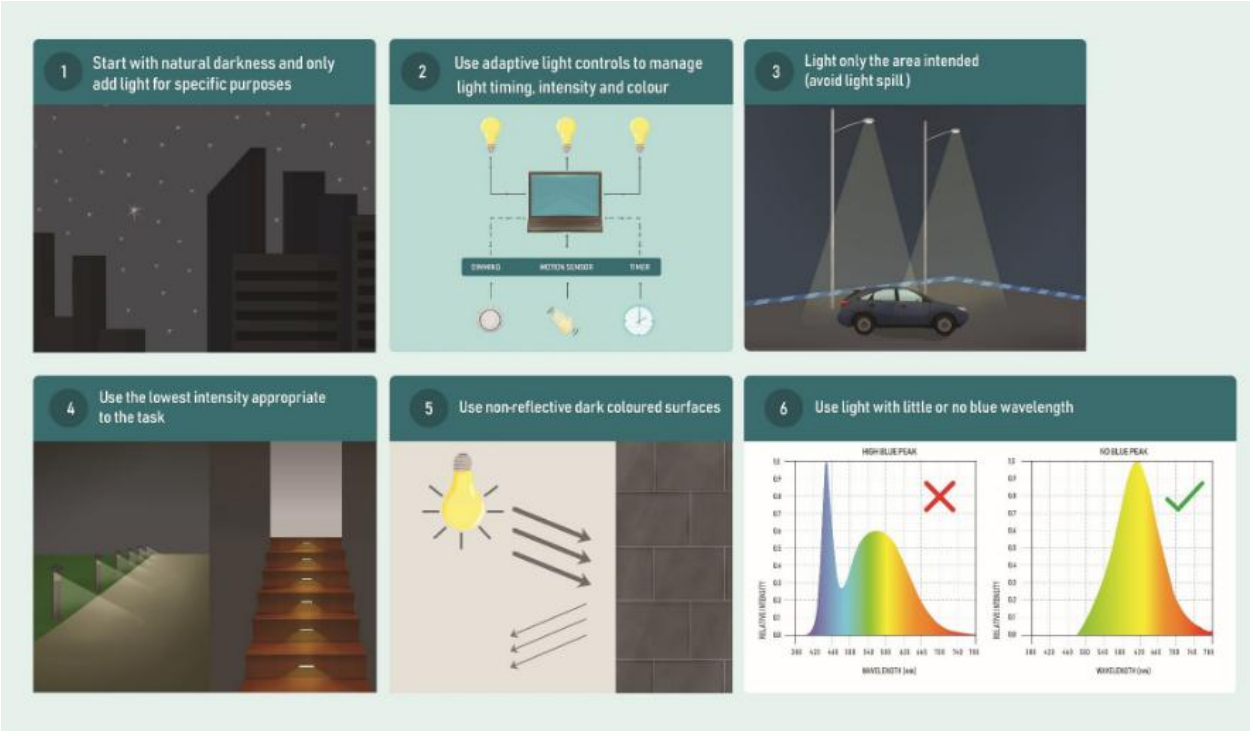


Figure 13 - Best Practice Lighting Design Principles as described in the National Light Pollution Guidelines for Wildlife

A concept lighting design plan is included as Figure 14, and included at full scale as Appendix D. Note that the design brief, as received from CCC, has described some "up lighting" for the feature handrail and taurapa sculpture. However, it is recommended that this lighting is achieved with downward facing lights, in accordance with the best practice design principles of AS/NZS 4282, summarised in Figure 17 and Figure 18. It is proposed that taurapa feature lights are mounted on existing adjacent street lighting poles.

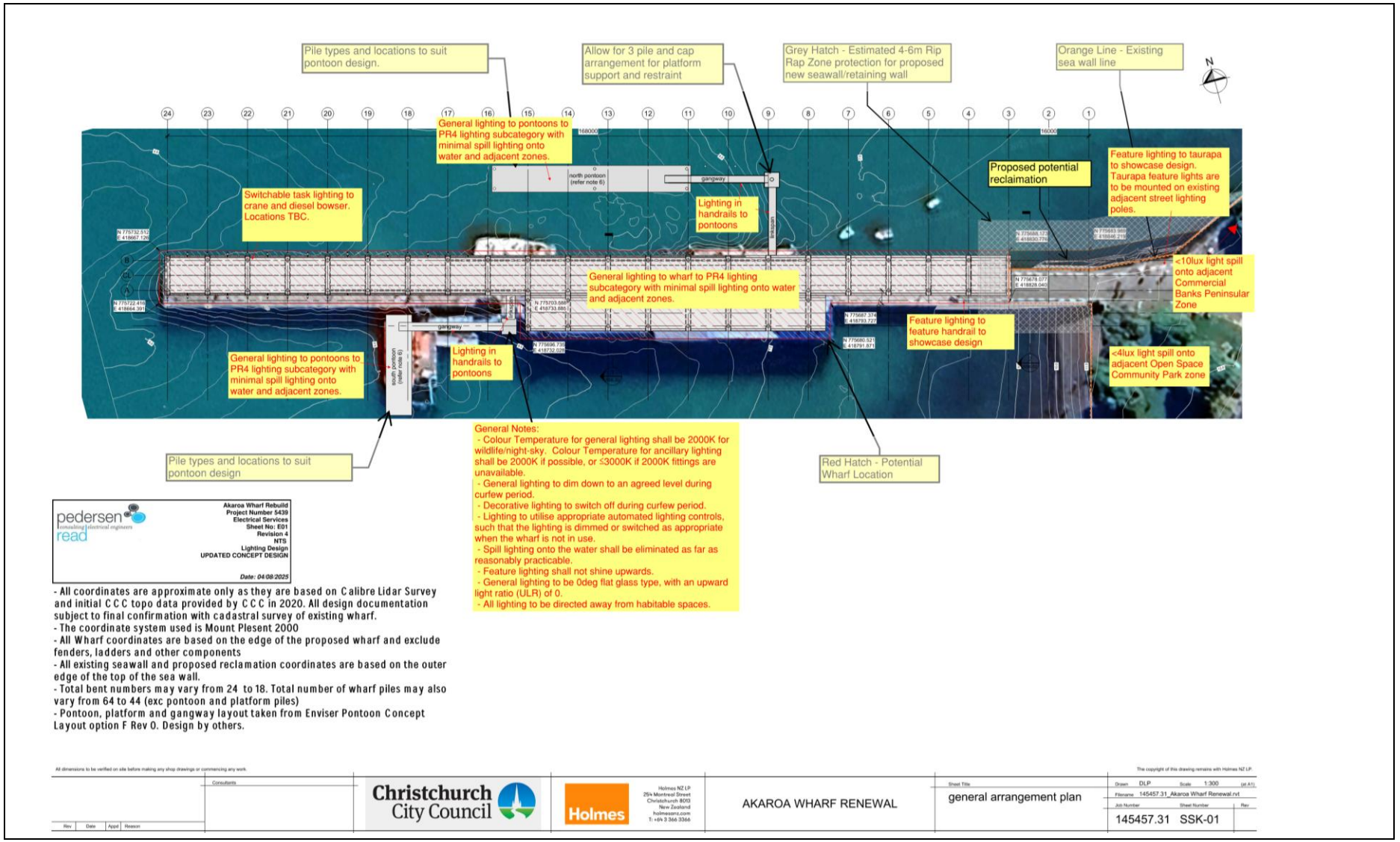


Figure 14 - Concept lighting design plan

3. LIGHTING EFFECTS

3.1 BASIS FOR ASSESSMENT

Akaroa Wharf is located within the coastal marine area. There are no specific lighting standards under the Regional Coastal Environment Plan for the Canterbury Region. However, the Christchurch District Plan addresses lighting effects in section 6.3.4 – Control of Glare and section 6.3.5 – Control of Light Spill and these are considered as an appropriate proxy to consider the artificial lighting effects from the proposal including both effects on the coastal marine environment and the adjoining Akaroa settlement and associated rural, commercial and residential areas.

Rule 6.3.4.1, Activity P1 of the Christchurch District Plan (Glare) states that "All fixed exterior lighting shall, as far as practicable, be aimed, adjusted and/or screened to direct lighting away from the windows of habitable spaces…so that the obtrusive effects of glare on occupants are minimised." It also requires that "Artificial outdoor lighting shall not result in a greater than 2.5 lux spill…into any major arterial road or minor arterial road." Refer to Figure 15 below for rule 6.3.4.1 of the Christchurch District Plan. Note that none of the nearby roads to the wharf or laydown areas are classified as either major or minor arterial roads or arterial routes, so the requirements of Activity P1/b will not affect this project.

Activity		Activity specific standards
P1	Any activity involving artificial outdoor lighting, other than activities specified in Rule 6.3.4.5 NC1 or NC2.	a. All fixed exterior lighting shall, as far as practicable, be aimed, adjusted and/or screened to direct lighting away from the windows of habitable spaces of sensitive activities, other than residential units located in industrial zones, so that the obtrusive effects of glare on occupants are minimised. b. Artificial outdoor lighting shall not result in a greater than 2.5 lux spill (horizontal or vertical) into any part of a major arterial road or minor arterial road or arterial route identified in Appendix 7.5.12 where this would cause driver distraction. Advice note: 1. See Appendix 6.11.13 for guidance on lighting design to reduce light spill and glare.

Figure 15 - Rule 6.3.4.1 of the Christchurch District Plan, stating glare restrictions for general outdoor lighting

Rule 6.3.5 of the Christchurch District Plan addresses light spill restrictions. The permitted lux spill allowance (horizontal and vertical) varies, depending on the classified zone of the area. Figure 16 below is an annotated extract from Planning Map 77A from the Christchurch District Plan detailing the planning zones in the vicinity of the wharf. Namely, "Commercial Banks Peninsula", "Open Space Community Parks" and "Residential Banks Peninsula"

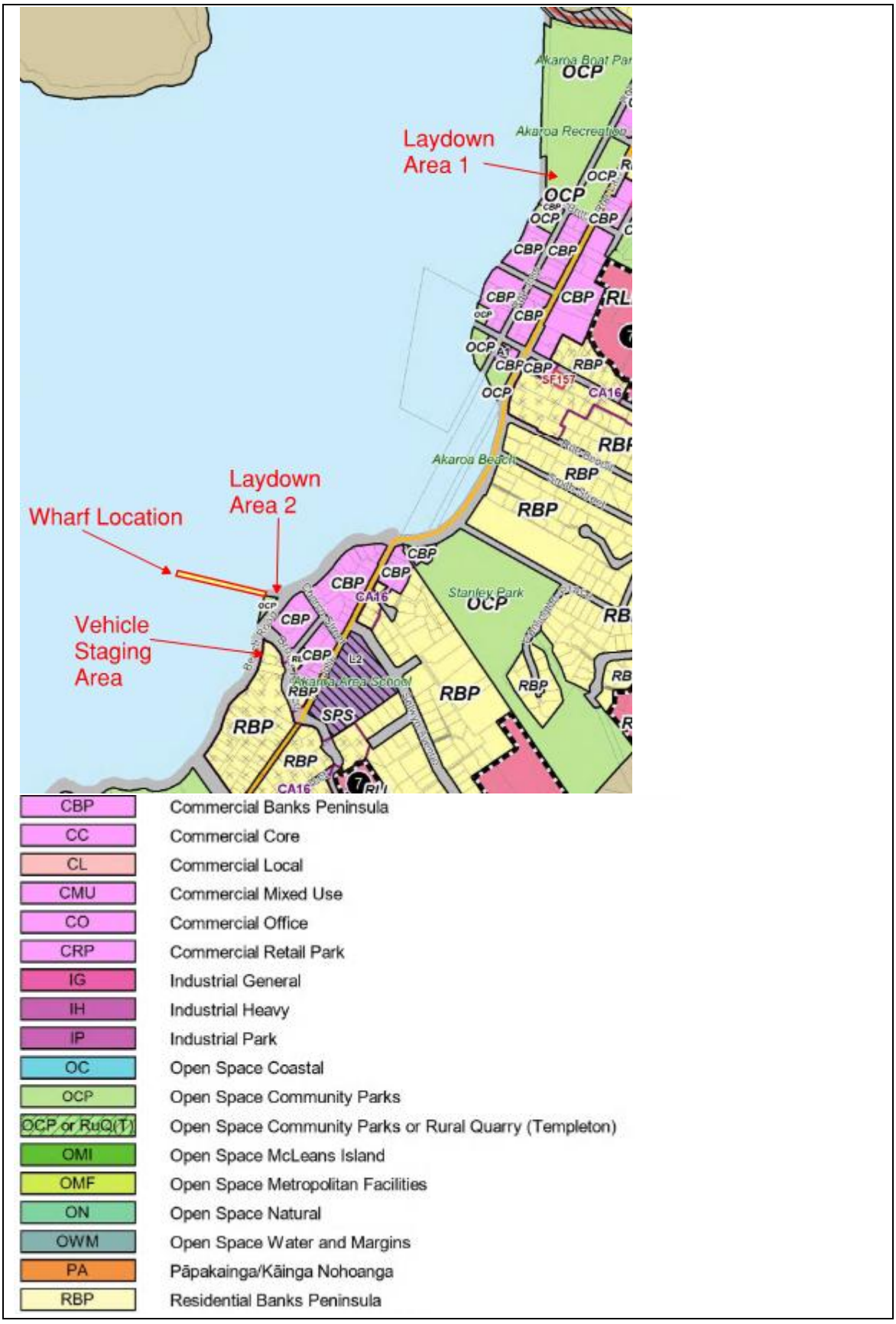


Figure 16 - Extract from Christchurch District Plan Planning Map 77A detailing the planning zones in the wharf vicinity

Table 6.3.6.1 of the Christchurch District Plan, details the light spill restrictions by zone. The open space community park (OCP) area adjacent the wharf has a permitted lux spill of 4 lux, the adjacent Commercial Banks Peninsular (CBP) area has a permitted lux spill of 10 lux and the nearby Residential Banks Peninsular Zone (RBP) has a permitted lux spill of 4 lux. This is summarised below in Table 2.

Zone or scheduled activity	**Permitted lux spill (horizontal and vertical)**
Commercial zones, other than commercial central city business zone. i.e. Commercial Banks Peninsular zone (CBP)	10 lux
Open Space Community Parks Zone (OCP)	4 lux
Residential Zones, including Residential Banks Peninsular Zone (RBP)	4 lux

Table 2 - Light spill restrictions by zone, source, table 6.3.6.1 of the Christchurch District Plan.

Australian and New Zealand Standard AS/NZS 4282: 2023, "*Control of the obtrusive effects of outdoor lighting*", is the recognised standard in Australasia for managing the effects of outdoor lighting. AS/NZS 4282:2023 considers the effects of outdoor and interior lighting that emits directly into the outdoor environment and the lighting associated with lit vertical surfaces.

The Akaroa Wharf project has therefore been assessed against the Christchurch District Plan and the principles of AS/NZS 4282:2023.

The potential artificial lighting associated with the construction of the Akaroa Wharf is based upon information provided in the Enviser Project Description, the Isthmus and Holmes Concept Design drawings, on observations made during the site visit, and on lighting practices normally employed during construction of similar facilities.

3.2 ASSESSMENT CRITERIA

The impact of artificial lighting on the night-time environment can be characterised by the following effects (refer to Appendix B for a Glossary of Lighting Terms):

a. Spill Light

b. Glare

c. Sky Glow

AS/NZS 4282: 2023, Section 2.3.1 "*Effects on Residents*" outlines the specific effects that need to be considered with respect to residents:

> ***"2.3.1 Effects on residents***
>
> *Effects on residents generally involve a perceived reduction of amenity arising from light technical factors such as the following:*
>
> (a) *The **illumination from spill light being obtrusive**, particularly where the **light enters habitable rooms**. The illuminance on surfaces, particularly vertical surfaces, is an indicator of this effect.*

(b) *The **direct view of bright luminaires** from normal viewing directions causing annoyance, distraction or even discomfort or disability glare. The luminous intensity of a luminaire, in a nominated direction, is an indicator of this effect.*

(c) Changes in luminance in the peripheral vision due to effects such as variable content in signage or trees moving across bright lights.

*The **tolerable levels of** each of these **light technical parameters** will be **influenced by** the **ambient lighting existing** in the environment where the light technical parameters are being calculated."*

*(Note: "**Bolding**" of text added in this document).*

"Obtrusive" light is defined as follows:

"1.3.21 Obtrusive light

Spill light which, because of quantitative or directional attributes, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information such as transport signals."

AS/NZS 4282: 2023 uses various Light Technical Parameters (LTP) to assess potential lighting effects. Different limits for the parameters are applied based upon the ambient light conditions. These ambient conditions are set for various environmental zones.

AS/NZS 4282: 2023 introduces the concept of lighting curfew periods, during which lower light technical parameters are set. Unless otherwise specified by the controlling authority, the lighting curfew period is taken as between 11:00pm and 06:00am.

The environmental zones (AS/NZS 4282: 2023 Table 3.1 "*Environmental Zones*") potentially applicable to the Akaroa Wharf are as follows:

Environmental Zone A3: Described as "*Medium district brightness*" with examples: "*Suburban areas in towns and cities*" and "*Generally roadways with streetlighting through suburban, rural or semi-rural areas".*

In considering the location of the wharf and its environs, the location could be assessed as Zone A3.

3.2.1 Spill Light

Spill light is defined by AS/NZS 4282: 2023 as "*Light emitted by a lighting installation that falls outside the boundaries of the property for which the lighting installation is designed*".

AS/NZS 4282 identifies light technical parameter (LTP) Vertical Illuminance with respect to spill lighting.

Vertical Illuminance (EV) (measured in lux) is the total luminous flux (measured in Lumens) incident on a vertical surface, per unit area. The maximum non-curfew limits in the Standard are 2 lux (for Zone A3).

AS/NZS 4282: 2023 accepts that a higher level of light may be less obtrusive in the early hours of the evening when there is more activity, and most people are awake.

For later times (in the curfew period) lower limits are applied. CCC have informed Pedersen Read of a pre-existing dimming schedule for the wharf lights which dims the lighting to 70% during 12am to 6am Monday to Friday, and 1am to 6am Saturday and Sunday. It is expected that this dimming schedule shall also apply for the new wharf.

The Christchurch District Plan specifies a spill light maximum, measured horizontally or vertically of no greater than 10 lux for the adjacent Commercial Banks Peninsular area and no greater than 4 lux for the adjacent Open Space Community Park zone. These levels are comparable with the non-curfew A2 and A3 zone limits in the Standard.

For the Akaroa Wharf, the following spill light levels from the Christchurch District Plan are used as the assessment criteria for this assessment of environmental effects:

- Open space community park (OCP) area: 4 lux
- Commercial Banks Peninsular (CBP) area: 10 lux
- Residential Banks Peninsular (RBP) area: 4 lux

3.2.2 Glare

Glare is defined by AS/NZS 4282:2023 as a:

> *Condition of vision in which there is discomfort or a reduction in ability to see, or both, caused by an unsuitable distribution or range of luminance, or to extreme contrasts in the field of vision.*

The two terms that are normally used to describe the effects of glare on the ability to see are disability and discomfort. AS/NZS 4282: 2023 defines these as:

> *Disability Glare: Glare that impairs the visibility of objects without necessarily causing discomfort.*
>
> *Discomfort Glare: Glare that causes discomfort without necessarily impairing the visibility of objects.*

Whilst the Christchurch District Plan's Section 6.3.4 is titled "…Control of glare", it does not provide a basis for measurement or assessment of glare from artificial lighting – it only provides a basis for the control of spill light.

Glare's impact on visual amenity depends very much on the situation in which it occurs.

Wherever there is the potential for a direct view of luminaires there is the potential for glare.

Where the viewing location is remote from the lighting source, the primary effect would be Disability Glare, i.e. glare that impairs the visibility of objects without necessarily causing discomfort.

AS/NZS 4282 identifies the following light technical parameters related to glare:

a. **LTP Luminous Intensity (I):** Luminous intensity (measured in candela (cd)) of a light source is the emitted luminous flux per unit solid angle – stated simply it is the light sources brightness in a given direction. The luminous intensities for the potential environmental zones identified for the wharf are as follows:

   Zone A3: 12,500 cd (non-curfew) and 2,500 cd (curfew)

b. **LTP Threshold Increment (TI):** *The measure of disability glare expressed as the percentage increase in luminance contrast threshold required between an object and its background for it to be seen equally well with a source of glare present. Note: Increasing values of threshold increment correspond to increasing disability glare.* (Definition from AS/NZS 4282: 2023)

Vehicle headlight, task, and safety lighting, whilst often excluded from Plan Rules, including the Christchurch District Plan (rule 6.3.3), can result in adverse effects – particularly in rural environments. AS/NZS 4282: 2023 notes that it does not apply to vehicle headlights or working lights mounted on moving vehicles and plant. With respect to glare, the extent of any effects will depend upon lighting intensity, visibility from outside of the site, and rapid intensity change (i.e., flashing).

3.2.3 Sky Glow

Sky Glow is defined by AS/NZS 4282:2023 as the:

> *Brightening of the night sky that results from the reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gas molecules, aerosols and particulate matter), in the direction of observation.*

Whilst AS/NZS 4282:2023 considers both natural and man-made sky glow, this review only considers the effects of man-made sky glow which is defined as:

> *Man-made Sky Glow: part of the sky glow that is attributable to man-made sources of radiation (e.g., outdoor lighting).*

Light reflected off the ground and buildings can be difficult to control without careful consideration of where the light is being aimed, because it is dependent upon the reflective characteristics of the illuminated material. However, direct light spill can be effectively controlled by appropriate luminaire selection and use.

The extent of sky glow that occurs is affected not just by the amount of light that is directed into the sky, but also the climatic conditions. More sky glow is apparent when there are particles in the air for the light to reflect off. This occurs in cloudy, foggy, and drizzly conditions, and if there are dust particles in the air.

The Christchurch District Plan states in objective 6.3.2.1 that managing the night sky and minimising unnecessary light spill into the night sky is an objective of the policy, however “sky glow” is not specifically mentioned in the Christchurch District Plan.

AS/NZS 4282 identifies the following light technical parameter related to sky glow:

a. **LTP Upward Light Ratio (Luminaire) (ULR_L):** “*ratio of the luminous flux of a luminaire that is emitted, at and above the horizontal, divided by the total luminaire flux when the luminaire is mounted in its designed position.*”

b. **LTP Upward Light Ratio (System) (ULR_S): “***ratio of the luminous flux of all luminaires in the system that is emitted directly into the night sky, divided by the total flux of all the luminaires, when the luminaire(s) is (are) mounted it its design position(s), and excluding reflected light from surfaces or obstructions.”*

(Definitions from AS/NZS 4282: 2023).

To minimise sky glow, all luminaires would ideally be of the type that emit zero light above the horizontal plane. Guidance is provided within AS/NZS 4282:2023, specifically Appendix A Section A.6.3 “*Selection of luminaires and light distribution*”, which notes:

"The selection of luminaires can have a significant effect on the ability to control the light that is emitted outside the boundary of the properties. It is important that the selected luminaire has a light distribution that is appropriate not only for the overall lighting task, but also to minimize obtrusive light. As a general principal [sic] *lighting installations that control obtrusive light well will be generally more efficient at lighting the task.*

*Figure A1 (*Figure 17*) gives simplified indication of the different types of luminaires and the impact that it has on obtrusive light. It shows preferred and non-preferred luminaire light distributions.*

*Figure A2 (*Figure 18*) indicates how the distribution of the luminaire can affect the ability to control obtrusive light. Avoid the use of luminaires that do not have the ability to control, shape, or shield the spread of the light, particularly at the edges of the beam. A lighting installation may benefit from a variety of different distribution types that have different abilities to restrict over-spill at the front of the beam, back-spill, and side-spill."*

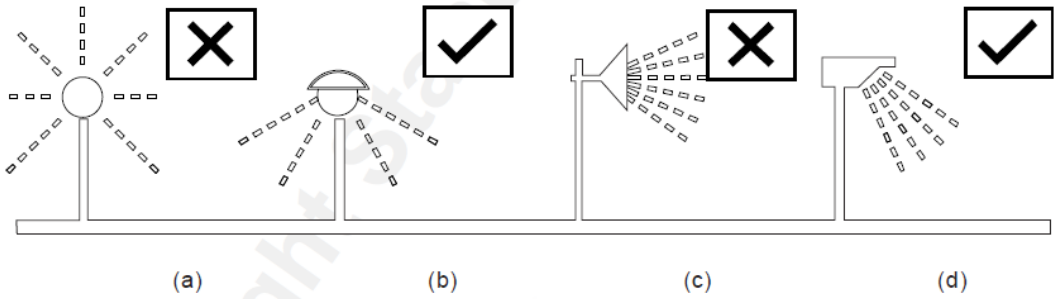


FIGURE A1 SIMPLIFIED LIGHTING TYPES AND THEIR ABILITY TO CONTROL OBTRUSIVE LIGHT

Figure 17: AS/NZS 4282: 2023 Appendix A Figure A1

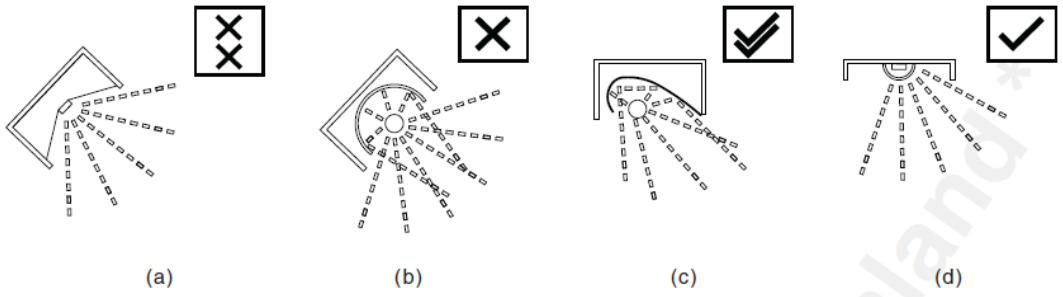


FIGURE A2 EFFECT OF THE LIGHT DISTRIBUTION OF THE LUMINAIRE ON THE ABILITY TO CONTROL OBTRUSIVE LIGHT

Figure 18: AS/NZS 4282: 2023 Appendix A Figure A2

Vehicle headlights, task lights, and safety lights have the potential to cause skyglow, the extent of which depends on their intensity, aiming configuration, and location. For example, vehicle headlights on high-beam will create more skyglow than those on dipped-beam and a vehicle driving up to the crest of a hill will produce more than one driving down a hill.

3.2.4 National Light Pollution Guidelines for Wildlife, May 2023

AS/NZS 4282:2023 references the National Light Pollution Guidelines for Wildlife. The aim of the guidelines is that artificial light is managed so that wildlife, both terrestrial and marine, is:

1. Not disrupted within, or displaced from, important habitat
2. Able to undertake critical behaviours such as foraging, reproduction and dispersal.

The guidelines recognise that animals perceive light differently from humans, with most animals being sensitive to ultraviolet (UV)/violet/blue light. Figure 19 is taken directly from the guidelines (Guidelines Figure 2) and shows comparative light perception among different species groups.

It is noted that the guidelines state that "*The guidelines do not infringe on human safety obligations. Where there are competing objectives for lighting, there may be a need for creative solutions that meet both human safety requirements for artificial light and threatened and migratory species conservation*".

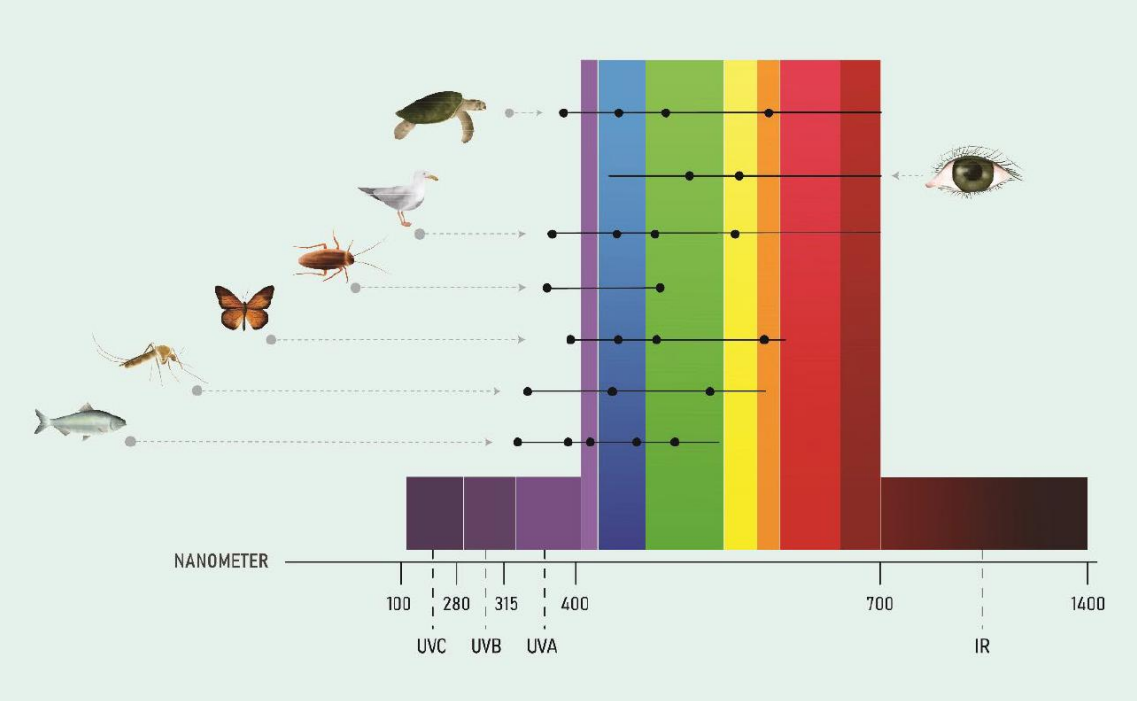


Figure 19: Comparative light perception among different species groups

(Ability to perceive different wavelengths of light in humans and wildlife shown by horizontal lines. Black dots represent report peak sensitivities.)

Appendix K of the guide contains a section on artificial light and aquatic communities. It states that: *The penetration of light into fresh and saltwater is determined by the colour and intensity of light as well as the turbidity of water. In clear water, short wavelength blue-green light penetrates furthest, while red light scatters and diminishes rapidly with depth.*

Appendix K of the guidelines also refers to the effect of light pollution on water on the vertical migration in aquatic systems. Light pollution on the ocean surface can lead to a disruption in the feeding cycles of aquatic communities. Figure 20 is taken directly from the guidelines (Guidelines Figure 39) and shows the effect of artificial light pollution on vertical migration in aquatic systems.

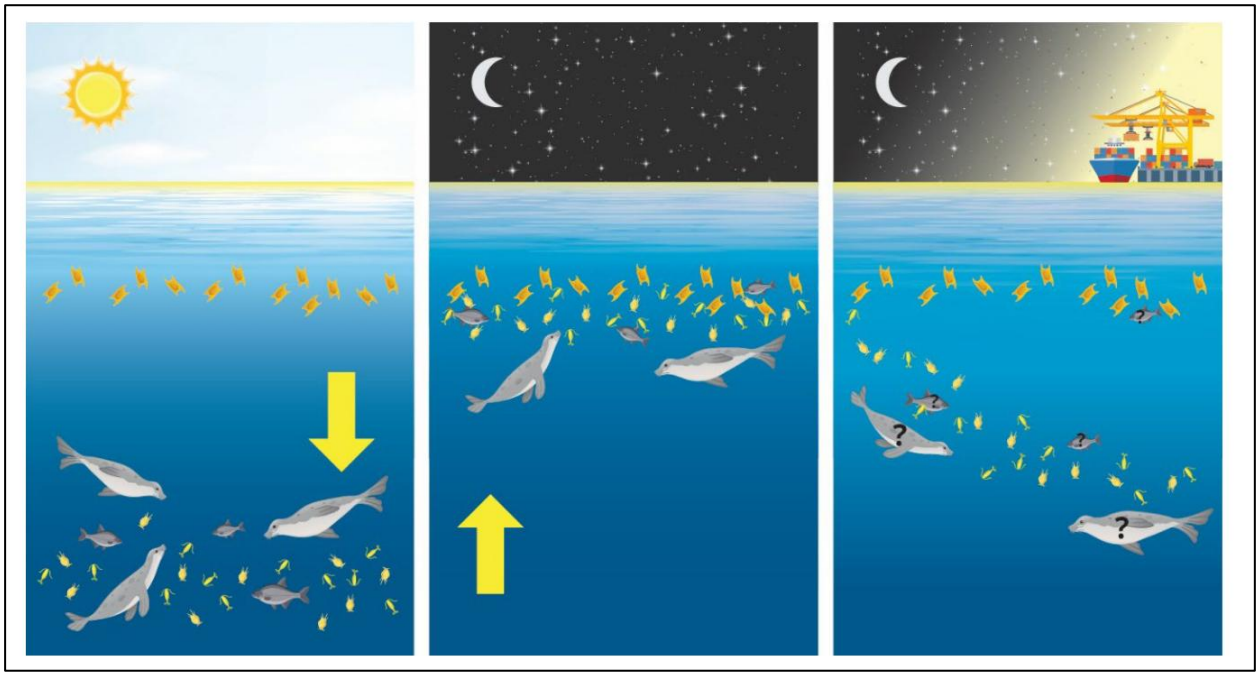


Figure 20 - Effects of artificial light on vertical migration in aquatic systems

The guidelines recommend:

1. Always using best practice lighting design to reduce light pollution and minimise the effect on wildlife.
2. Undertaking an environmental impact assessment of effects of artificial light on listed species for which artificial light has been demonstrated to affect behaviour, survivorship or reproduction.

According to the guidelines, best practice lighting design incorporates the following design principles. Figure 13 (Guidelines Figure 4) illustrates these principles:

1. Start with natural darkness and only add light for specific purposes.
2. Use adaptive light controls to manage light timing, intensity and colour.
3. Light only the object or area intended – keep lights close to the ground, directed, and shielded to avoid light spill.
4. Use the lowest intensity lighting appropriate for the task.
5. Use non-reflective, dark-coloured surfaces.

6. Use lights with reduced or filtered blue, violet and ultraviolet wavelengths.

The guidelines are supported by a series of technical appendices that provide additional information on topics including: "*Best practice lighting design"*, "*What is light and how does wildlife perceive it?*", Management of artificial light for wildlife including seabirds, bats, terrestrial mammals, and ecological communities.

An environmental impact assessment (EIA) process is recommended if there are species that are known to be affected by artificial light within 20kn of a project.

There are 5 steps involved in assessing the potential effects of artificial light on wildlife, and the adaptive management of artificial light requires a continuing improvement process (Reference Figure 21)

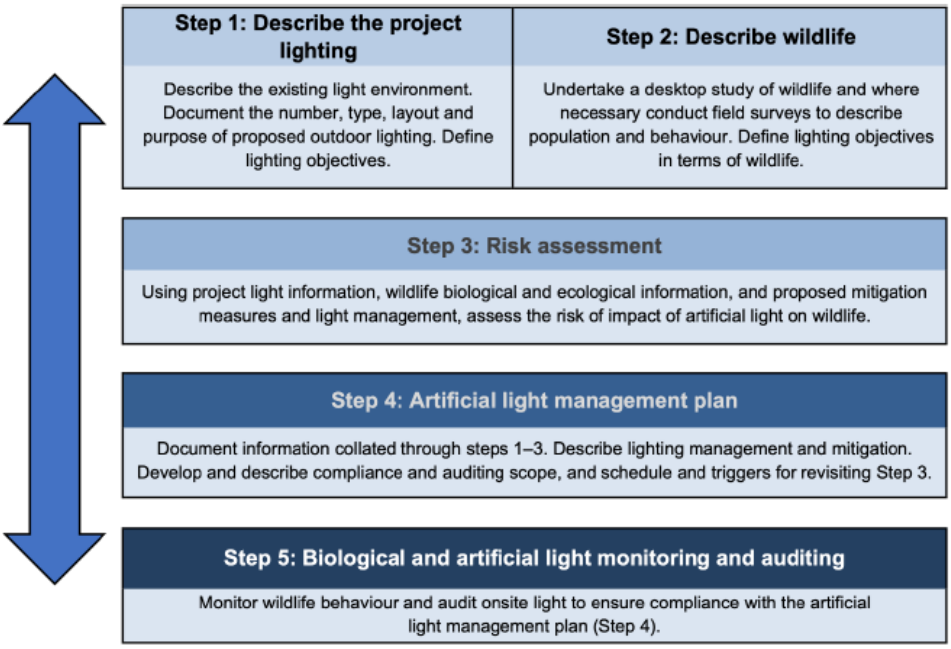


Figure 21: Flow chart describing the environmental impact assessment process

3.2.5 Environmental Impact Assessments

3.2.5.1 Marine Mammals

The ecologist associated with Marine Mammals is Dr Deanna Clement, Cawthron Institute.

A summary of the consultation with Dr Clement is as follows:

1. While there are indeed listed species within a 20km radius of the site and certain marine mammals can be drawn to bright lights, there is currently no evidence that existing wharf lighting is causing any disturbances or attracting marine mammals.
2. To that end, as long as the new lighting isn't any brighter than the existing and the lighting isn't shining directly onto the water, then the wharf lighting will be appropriate for the marine mammals.

3. However, if the wharf lighting were to attract more fish than the existing wharf lighting does, this could potentially have a cascading effect, indirectly drawing marine mammals to the area as predators.

3.2.5.2 Marine Ecology

The ecologist associated with Marine Ecology is Ross Sneddon, Cawthron Institute.

A summary of the consultation with Ross Sneddon is as follows:

1. Cawthron have identified no habitats of critical importance, no critical migratory pathways and no organisms of at-risk or threatened status within the adjacent seabed and intertidal areas of Akaroa Inlet.
2. For the communities that have been identified, there exists little to no specific information on sensitivities to artificial light.
3. Noting that the Wildlife guideline uses a spatial criterion of “within 20km”, since the focus of the marine assessment is benthic communities of sessile or mobility restricted organisms, this distance is probably not appropriate.
4. While fish are certainly affected by artificial lighting, significant adverse effects are possibly limited to migratory or breeding behaviour. Local fish for which this is most relevant would be diadromous species such as whitebait and possibly eels.
5. Cawthron has not identified any communities of critical importance, or at risk or threatened status, nor any migratory pathways.

3.2.5.3 Avifauna

The ecologist associated with Avifauna (i.e. birds) is Dr Leigh Bull, BlueGreen Ecology.

A summary of the consultation with Dr Bull is as follows:

1. Some species are attracted to lights which then results in “fallouts”, This is when birds are attracted to lights and then fall to the ground below them, making them vulnerable to predation and vehicles.
2. Light spill onto the water can result in changes to food supply or availability (e.g. fish)
3. For coastal birds, lighting of areas where they may inhabit at night can have the effect of making them more visible to predators.

Dr Bull’s recommendations for the lighting installation to reduce the effects on avian communities are as follows:

1. Use warm yellow-green colour temperature (2,000K)
2. Avoid excess / unnecessary lighting.
3. All lighting to be downward facing and hooded, to ensure there is no upward light spill / light pollution.
4. Use motion-sensor LED lighting and set to be dimmed from 10pm-5am.
5. Reduce the height at which the wharf lighting is mounted as low as possible.

Dr Bull's Akaroa Wharf Replacement Coastal Avifauna Assessment, Revision C, 23 July 2025 concluded that given the proposed permanent lighting will be informed by best practice design principles from the National Light Pollution Guidelines for Wildlife it is expected to have a positive effect on coastal avifauna.

3.3 ASSESSMENT OF EFFECTS

3.3.1 Effect Definitions

This assessment of environmental effects uses the following effects definitions, as informed by the Quality Planning New Zealand website in their AEE guidance. It is also understood that the assessment is to consider the change in environmental effects from the environment as it currently exists, that is with the established wharf and associated lighting. Also of relevance is that where a statutory plan standard (or alternatively relevant national guidance) provides for, or permits a certain level of effect (threshold) then it is only the effects beyond that threshold that are relevant in terms of the assessment and considerations as to mitigation.

Effect	Description
Nil effects:	No effects at all, or effects equal to, or less than the effects of the existing installation.
Less than minor effects:	Effects that are discernible day-to-day effects, but too small to affect other persons.
Minor effects:	Effects that are noticeable but will not cause any significant impacts.
More than minor effects:	Effects that are noticeable that may cause an adverse impact but could be potentially mitigated or remedied.
Significant effects that could be remedied or mitigated:	An effect that is noticeable and will have a serious impact on the environment but could be potentially mitigated or remedied.
Unacceptable effects:	Extensive adverse effects that cannot be avoided, remedied or mitigated.

Table 3 - Effect Definitions used in this AEE

3.3.2 Existing Lighting

3.3.2.1 Spill Light Effects

The existing wharf lighting does not create spill light into the neighbouring zones more than the limits described in the Christchurch District Plan, namely:

1. Open space community park (OCP) area: 4 lux
2. Commercial Banks Peninsular (CBP) area: 10 lux
3. Residential Banks Peninsular (RBP) area: 4 lux

The potential spill lighting effects onto neighbouring zones associated with the existing lighting would be assessed as being “less than minor” (using the effects definitions described in Table 3.). They are also at a level that is anticipated and provided for by the District Plan, and are part of the existing environment.

The existing wharf lighting produces light spill onto the water's surface of approximately 5 lux, as demonstrated below in Figure 22.

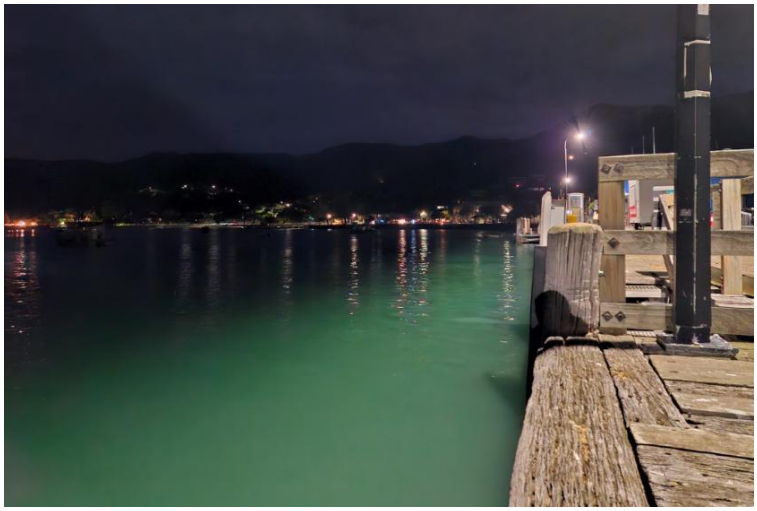


Figure 22 - Photo of existing wharf lighting demonstrating light spill onto the water

The spill lighting effects onto the water associated with the existing lighting are assessed as being "minor" to "more than minor" (using the effects definitions described in Table 3.), noting that these effects spill lighting effects are part of the existing lighting environment.

3.3.2.2 Glare Effects

The existing wharf lighting is 0deg flat glass type, and topographically, it is installed below the level of the local geography. This means that glare from the light sources is not generally visible from the surrounding environs. The only potential glare which was viewed in the site inspection was a small amount of reflected glare on the surface of the water. This reflected glare is not material in the context of the environs of the surrounding lighting associated with Akaroa township.

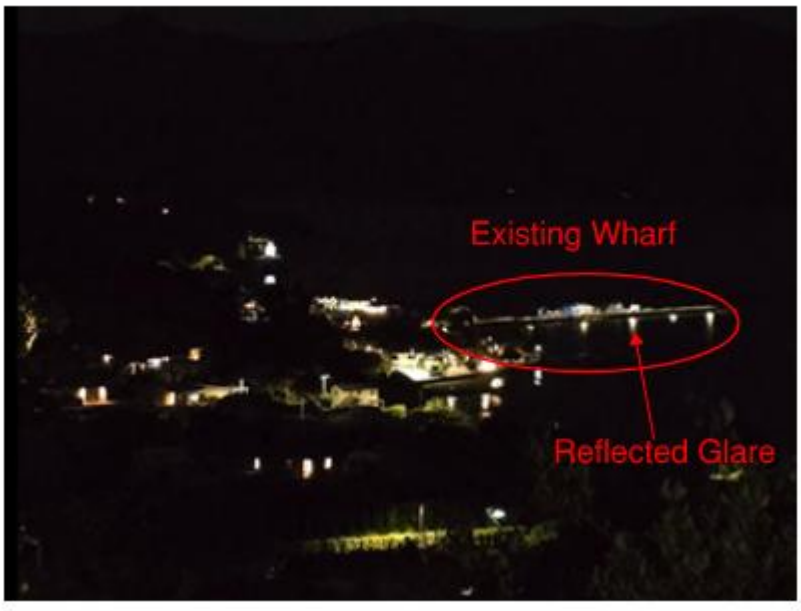


Figure 23 - Night time view of wharf from Woodills Rd residential property showing reflected glare on water.

The glare lighting effects associated with the existing pole mounted lighting would be assessed as being “less than minor” (using the effects definitions described in Table 3.), noting that these glare effects are part of the existing lighting environment.

3.3.2.3 Sky Glow Effects

The existing wharf lighting uses Phillips RoadGrace luminaires. These fittings have an upward light ratio (ULR) of 0, as confirmed by the lighting supplier, and are mounted at an angle of 0deg. There was no direct sky glow observed during the nighttime site inspections of the wharf. There is potential for there to be sky glow generated from the wharf lighting reflected off the water and the surface of the wharf. The extent and impact of this reflected light will depend upon the reflectivity and of the surface being illuminated but should be less as the light intensity decreases with the square of the distance from the source.

The potential sky glow effects (both direct and reflected) associated with the existing lighting would be assessed as being “less than minor” (using the effects definitions described in Table 3.), Noting that these sky glow effects are part of the existing lighting environment.

3.3.2.4 Ecological Effects

The colour temperature of the existing wharf lighting is 4000K, which is defined in the National Light Pollution Guidelines for Wildlife as being in the highly visible range for wildlife. Furthermore, the existing approx. 5lux light spill onto the water has the potential to attract fish, which could potentially have a cascading effect, indirectly drawing marine mammals and birds to the area as predators. Having said that, there have not been any observed effects on the existing marine mammals, marine ecology of avifauna, caused by the existing lighting. As noted, these effects are also part of the existing environment and provide the comparison for considering the replacement wharf project and associated artificial lighting.

The effects of existing lighting on marine mammals, marine ecology and avifauna would be considered to be “less than minor” to “minor”, (using the effects definitions described in Table 3.). Noting that these ecological effects are part of the existing lighting environment.

3.3.3 Construction Lighting

3.3.3.1 Spill Light Effects

Where artificial lighting is required during the wharf construction, direct spill light has the potential to exceed the Christchurch District Plan requirement for the permitted maximum thresholds of the adjacent zones, namely

- Open space community park (OCP) area: 4 lux
- Commercial Banks Peninsular (CBP) area: 10 lux
- Residential Banks Peninsular (RBP) area: 4 lux

(Reference: Christchurch District Plan, Table 6.3.6.1: Light Spill Standards by Zone).

Mobile lighting plant traditionally uses luminaires that flood the area to be illuminated with light, with minimal or no control over spill light. Mobile lighting would be expected to move to support, and provide safe working conditions for the construction works such that it would be only in one location and luminaire orientation for short durations.

The potential spill lighting effects associated with temporary construction lighting could be assessed as being “more than minor” (using the effects definitions described in Table 3.). Although the expected short duration should reduce this effect from “more than minor” to “minor”.

3.3.3.2 Glare Effects

Mobile lighting plant has the potential to result in glare effects as the luminaires are traditionally installed with their light producing faces aimed at a high level to the ground (Reference Figure 11) - to flood an area with light. Any lighting which is not installed with horizontal flat glass, such that lamp sources are visible from outside the site, may cause glare effects.

With respect to the wharf construction, any lighting has the potential to create glare effects where the lighting is viewed in the context of a darkened foreground or background. The extent of effects will depend upon the perspective of the viewer, the viewing location, and the type of controls placed upon the use of mobile lighting plant. Given that mobile lighting plant is only to be used in selected situations it is assessed that the effects could range from “minor” to “more than minor” (using the effects definitions described in Table 3.).

Vehicle headlight, taillight, task, and safety lighting, whilst often excluded from Plan Rules, can result in adverse effects. With respect to glare, the extent of any effects will depend upon lighting intensity, visibility from outside of the site, and rapid intensity change (i.e., flashing)

Vehicle lighting may also be visible from more remote locations. Movement associated with head, tail, and task lighting would be visible along with rotating or flashing security beacons. The extent of effects will depend upon the perspective of the viewer, and the viewing location. Given the wharf’s location adjacent Akaroa township and its associated vehicle movements, glare effects for construction vehicle lighting are assessed as “less than minor” (using the effects definitions described in Table 3.).

3.3.3.3 Sky Glow Effects

Generally, whenever luminaires are installed with their light producing faces aimed above the horizontal, there is the potential to produce direct sky glow effects.

Mobile construction lighting as shown in Figure 11 and Figure 12, will produce direct sky glow which could be visible from several hundred metres away. The effects will depend upon the extent of uplighting, viewing location and the backdrop to the area being viewed.

Whilst these effects could be assessed as “more than minor”, the expected short duration should reduce this effect from “more than minor” to “minor”, (using the effects definitions described in Table 3.).

Vehicle head, task, and security lighting could contribute to the skyglow. Given the limited duration of construction activities being undertaken outside of daylight hours, and the wharf's location adjacent Akaroa township and its associated vehicle movements, the effects would be expected to be "less than minor" (using the effects definitions described in Table 3.).

3.3.3.4 Ecological Effects

3.3.3.4.1 Marine Mammals and Marine Ecology

It is expected that mobile lighting plant would create short wavelength spill light onto the water surface of the harbour. This has the potential to attract fish, which could potentially have a cascading effect, indirectly drawing marine mammals to the area as predators. Furthermore, the likely cool colour temperature of the lighting is defined in the National Light Pollution Guidelines for Wildlife as being in the highly visible range for fish. The construction lighting is also more likely to penetrate further into the depth of the water, owing to the likely cool colour temperature.

The effects of construction lighting on marine mammals and marine ecology could be assessed as "More than minor", (using the effects definitions described in Table 3.), However, given the limited duration of construction activities being undertaken outside of daylight hours, and the limited duration of the construction works, this reduces the effect from "more than minor" to "minor."

3.3.3.4.2 Avifauna

The colour temperature of potential mobile construction lighting is likely to be in the range of 4,000K – 6,000+K, with high components in the blue area of the lighting spectrum. This is defined in the National Light Pollution Guidelines for Wildlife as the highly visible range for birds. The potential mobile construction lighting is also likely to be aimed at a high angle to the ground to provide broad lighting coverage across the construction area, making it potentially highly visible to birds. Some species may be attracted to the temporary construction lighting, which could result in "Fallout", this is when birds are attracted to lights and then fall to the ground below them, making them vulnerable to predation and vehicles.

Temporary construction lighting is also likely to produce light spill onto the water which could result in disruption to Avifauna food supply availability (e.g. fish).

The effects of construction lighting on avifauna could be assessed as "More than minor", (using the effects definitions described in Table 3.). However, given the limited duration of construction activities being undertaken outside of daylight hours, and the limited duration of the construction works, this should reduce the effect from "more than minor" to "minor."

3.3.4 Proposed Lighting

Refer to section 2.3.2 - Permanent Lighting for a description of CCC design intentions and a concept lighting design for the permanent lighting for the wharf.

3.3.4.1 Spill Light Effects

It is proposed that the wharf lighting, including the exterior lighting associated with the rebuilt buildings, is designed such that it does not create spill light into the neighbouring zones more than the limits described in the Christchurch District Plan, namely:

1. Open space community park (OCP) area: 4 lux

2. Commercial Banks Peninsular (CBP) area: 10 lux
3. Residential Banks Peninsular (RBP) area: 4 lux

The potential spill lighting effects associated with the proposed permanent wharf lighting, compared to the existing wharf lighting environment, are assessed as being “nill effect” for the general lighting and “less than minor” for the decorative lighting, the feature lighting and the handrail lighting (using the effects definitions described in Table 3.).

3.3.4.2 Glare Effects

It is proposed that the wharf lighting is designed such that as much as possible, the luminaires are 0deg flat glass type. Some of the proposed lighting is not suitable to be 0deg flat glass type, e.g. the handrail lights and the feature lighting to the feature handrail and the taurapa, in these instances, it is proposed that the lighting be directed in a downward direction to minimise potential glare issues, in accordance with the design principles of AS/NZS 4282, summarised in Figure 17 and Figure 18.

It is proposed that the lighting for the new buildings is designed such that glare from the shopfront glazing is minimised as far as reasonably practicable.

The potential glare lighting effects associated with the proposed permanent wharf lighting, compared to the existing lighting environment, are assessed as being “nil effect” for the general area lighting and “less than minor” for the decorative lighting, the feature lighting and the handrail lighting (using the effects definitions described in Table 3.).

3.3.4.3 Sky Glow Effects

It is proposed that the wharf lighting is designed such that as much as possible, the luminaires have an upward light ratio (ULR) of 0 and are mounted at an angle of 0deg. Where it is not possible to mount the luminaires at 0deg, it is proposed that the lighting is directed in a downward direction to minimise potential sky glow issues, in accordance with the design principles of AS/NZS 4282, summarised in Figure 17 and Figure 18.

The potential sky glow lighting effects associated with the proposed permanent wharf lighting, compared to the existing lighting environment, are assessed as being “nil effect” for the general area lighting and “less than minor” for the decorative lighting, the feature lighting and the handrail lighting (using the effects definitions described in Table 3.).

3.3.4.4 Ecological Effects

It is proposed that wharf lighting is designed with the following considerations for the marine mammals, the marine ecology and avifauna:

1. Illuminance levels are no greater than the existing.
2. The colour temperature of the luminaires is 2000K for the general lighting. Colour Temperature for ancillary lighting shall be 2000K if possible, or ≤3000K if 2000K fittings are unavailable.
3. Spill light onto the water is eliminated as far as reasonably practicable.
4. Luminaires to utilise back light shields and shrouds.

5. Lighting is, as much as possible, 0deg flat glass type, mounted at an installation angle of 0deg.
6. Where 0deg installation is not possible, it is proposed that the lighting is directed in a downward direction, in accordance with the design principles of AS/NZS 4282, summarised in Figure 17 and Figure 19.
7. General wharf lighting to be mounted as low to the ground as reasonably practicable.

The potential ecological effects associated with the proposed permanent wharf lighting, compared to the existing lighting environment, are assessed as being “nil effect” (using the effects definitions described in Table 3.).

3.3.5 Potential Mitigation Measures – Construction Lighting

During construction of the wharf, the use of vehicle headlight and security lighting is expected to be a fundamental part of the safety management systems. As such the lighting effects are unlikely to be able to be practicably mitigated. Certainly, security lighting (i.e. rotating or flashing beacons) can be expected to be present on most vehicles during construction. Vehicle head lights would be used whenever vehicles are being operated in low light conditions.

Mobile lighting plant is expected to be used by exception rather than during normal daytime construction works. It is likely to be used in particular situations which might require construction after dark. Mobile lighting plant locations would be expected to vary over time to support the construction with the duration in any one location or orientation likely to be relatively short.

The limited duration and variable location of the mobile lighting plant, combined with the suggested mitigations outlined below, mean that the type of mobile lighting plant regularly used in civil works construction (high colour temperature luminaires (4000K or greater), general floodlights, etc – i.e. as shown in Figure 11) would be acceptable. If, however, mobile lighting plant was to become semi-permanent in a given location and orientation for a duration of greater than one week, then additional mitigation measures should be considered to minimise effects on residents and ecology.

Mobile lighting effects could be mitigated by some, or all, of the following:

- Careful plant location and luminaire aiming to minimise spill light and glare effects i.e. aim lights away from dwellings and water.
- Where practicable, reduce the intensity/output of lighting fittings.
- Tilt lights downwards as much as possible.
- Locate and aim lighting adjacent to roadways and intersections to ensure safety of road users is not compromised whilst minimising the effects to dwellings.
- Install blinds to windows and glass doors where site support facilities (i.e. Portacoms) are to be used after dark.
- Undertake a risk analysis for any lighting proposed to ensure health and safety is not compromised and effects to neighbours are minimised.

These mitigations should be included in the construction management plan (CMP).

The implementation of these described mitigations can reduce the glare and spill light effects associated with the construction lighting to “less than minor”.

3.3.6 Potential Mitigation Measures – Permanent Lighting

The permanent lighting for the wharf will be designed with the following mitigation measures to minimise the potential associated environmental effects:

1. The colour temperature for the pole mounted lighting shall be ≤2000K. The colour temperature for all other lighting shall be ≤3000K, with a preference for ≤2000K if available.
2. Spill light onto the water shall be eliminated as far as reasonably practicable.
3. Luminaires to utilise back light shields and shrouds.
4. Pole lighting shall be 0deg flat glass type with an upward light ratio (ULR) of 0, mounted at an installation angle of 0deg.
5. All other lighting shall be either 0deg flat glass type, or if 0deg installation is not possible/appropriate, it shall be directed in a downward direction, in accordance with the design principles of AS/NZS 4282, summarised in Figure 17 and Figure 19.
6. General wharf lighting to be mounted as low to the ground as reasonably practicable.
7. Lighting to utilise appropriate automated lighting controls, such that the lighting is dimmed or switched as appropriate when the wharf is not in use. Consultation with CCC shall be undertaken to determine an appropriate “out of hours” schedule.
8. General lighting to dim down to a lower illuminance level during a defined curfew period, and Decorative / Feature Lighting (e.g. lighting to decorative handrail and taurapa) to switch off during a defined curfew period. Consultation shall be undertaken with CCC to determine an appropriate curfew period. The current dimming schedule, as advised by CCC is lighting dimmed to 70% 12am-6am Mon-Fri and 1am-6am Sat-Sun, however the recommendation from Dr Leigh Bull, the Avifauna ecologist is 10pm-5am.
9. Feature lighting to feature handrail and taurapa sculpture to be carefully designed such that light only falls on the items being lit and associated glare and spill issues are minimised as far as reasonably practicable. These items are to be lit from above as far as reasonably practicable. It is proposed that the feature lighting for the taurapa sculpture is mounted on the adjacent existing street lighting poles. The decorative handrail may need to have the lighting incorporated into the design of the handrail.

4. SUMMARY OF EFFECTS

A summary of the effects described in the above assessment is included below

Effect	Existing Lighting, no mitigations	Construction Lighting, no mitigations	Construction lighting with proposed mitigations, changes in bold	Proposed Lighting with mitigations in place.
Spill Light	Neighbouring zones: "less than minor" Onto water: "minor" to "more than minor"	Construction Lighting: "minor"	Construction Lighting: "**less than minor**"	General (pole mounted) lighting" "nil effect" decorative lighting, feature lighting and handrail lighting "less than minor"
Glare	Pole lights: "less than minor"	Construction Lighting: "minor" to "more than minor" Construction Vehicle lighting: "less than minor"	Construction Lighting: "**less than minor**" Construction Vehicle lighting: "less than minor"	General (pole mounted) lighting" "nil effect" decorative lighting, feature lighting and handrail lighting "less than minor"
Sky Glow	Pole lights: "less than minor"	Construction Lighting: "minor" Construction Vehicle lighting: "less than minor"	Construction Lighting: "minor" Construction Vehicle lighting: "less than minor"	General (pole mounted) lighting" "nil effect" decorative lighting, feature lighting and handrail lighting "less than minor"
Ecological	"less than minor" to "minor"	Construction Lighting: "minor"	Construction Lighting: "minor"	"nil effect"

Table 4 - Summary of lighting effects associated with the existing, construction and proposed Akaroa wharf lighting

5. CONCLUSION

Artificial lighting will be required to support the Akaroa wharf construction whenever works are undertaken outside of daylight hours. Most of the construction works are expected to occur during daylight hours with limited works after dark.

Whilst artificial lighting could generate direct spill light in excess of the Christchurch District Plan maximums of 4 lux and 10 lux for the adjacent zones during construction of the wharf, such lighting effects are expected to be of short duration, and localised in nature.

Mobile lighting plant has the most potential to create spill, glare and sky glow effects, given the need to provide safe illumination for construction activities. The effects are expected to be “minor” (using the effects definitions described in Table 3.). Given their expected short duration in any given location and in conjunction with expected mitigation measures including aiming of luminaires to minimise the effects on dwellings, transport and wildlife, the overall impact of the construction lighting with mitigation measures in place is expected to be “minor” to “less than minor” (using the effects definitions described in Table 3).

Permanent lighting will be required for the rebuilt wharf. Careful and considered design of the wharf lighting is required to ensure that the expected glare, spill light, sky glow and ecological effects of the permanent lighting are “less than minor” to “nil effect”, compared to the existing wharf lighting environment (using the effects definitions described in Table 3.).

APPENDICES

Appendix A Bibliography

The following information / activities have informed this review:

1. Enviser, Project Description, Version V2, April 2025.
2. Isthmus Concept Design Drawings A0-000 – A6-001, Revision A, 22/10/2024.
3. Enviser RFP document for Pedersen Read
4. A day and night visit to the wharf site and surrounding environs, undertaken on Monday the 11th November 2024.
5. The Christchurch District Plan Rules with respect to Glare and Light Spill. And Christchurch District Plan Planning Map 77A.
6. Australian / New Zealand Standard AS/NZS 4282: 2023, *"Control of the obtrusive effects of outdoor lighting*".
7. Australian Government, Department of Climate Change, Energy, the Environment and Water, "*National Light Pollution Guidelines for Wildlife*", May 2023, Version 2.0
8. Consultation with the project ecologists, namely:
    a. Marine Mammals: Dr Deanna Clement, Cawthron
    b. Marine avifauna: Dr Leigh Bull, BlueGreen Ecology
    c. Marine ecology: Ross Sneddon, Cawthron
9. Consultation with the project heritage consultant, namely William Fulton, Team Architects
10. Dimming Profile information and AS/NZS 1158 category information from CCC (email)
11. AEE guidance information Quality Planning website www.qualityplanning.org.nz.
12. Consultation with Allan Stephenson from Signify regarding the technical parameters of the existing wharf lighting.
13. Consultation with Betacom regarding legacy fitting types.
14. Regional Coastal Environment Plan for the Canterbury Region, August 2020
15. Blue Green Consultants, Akaroa Wharf Replacement Coastal Avifauna Assessment, Rev C, 23 July 2025
16. Email consultation with Enviser regarding the proposed timing of dredging works (i.e. no dredging to occur after dark).
17. Holmes Consulting Akaroa Wharf Renewal General Arrangement Plan 145457.31 SSK-01

Appendix B Glossary of Lighting Terms

The following simple definitions are based upon those within Australian/New Zealand Standard AS/NZS 4282:2023 "*Control of the obtrusive effects of outdoor lighting"* and apply to terms used in this report:

GLARE

Condition of vision in which there is discomfort or a reduction in the ability to see, or both, caused by an unsuitable distribution or range of luminance, or extreme contrasts in the field of vision.

Visual impairment or discomfort resulting from the intensity of a light source and the brightness contrast with the associated surroundings. It is affected by the light source size and intensity, background brightness, and the location relative to the viewing position.

The two terms that are normally used to describe the effects of glare on the ability to see are *disability* and *discomfort*.

Disability Glare: Glare that impairs the visibility of objects without necessarily causing discomfort.
A typical example of *disability* glare is the glare from approaching headlights on the open highway at night, which prevent anything else being seen on the road. The eye is unable to adapt to the bright headlight and to the significantly lower brightness on the road at the same time. Hence the glare is having a disabling effect. This disabling effect is related to the intensity of the source in the direction of the eye with respect to the brightness of the surroundings. As a comparison, the same car approaching with its headlights on during the day will cause almost no disability because of the brightness of the surroundings.

Discomfort Glare: Glare that causes discomfort without necessarily impairing the visibility of objects.
An example of *discomfort* glare is a bright sky on a sunny day can cause discomfort, particularly to those used to wearing sunglasses who are without them, however the ability to see is not impaired.

The key difference between the two is that *disability* glare has a physiological effect and can be objectively measured, whereas *discomfort* glare has a psychological effect and is much more subjective. What may not cause discomfort to one person may cause significant discomfort to another person.

Note: Both *disability* and *discomfort* glare may be present concurrently.

ILLUMINANCE

The measure of illumination level, which is the amount of light or luminous flux (i.e. Lumens) incident on a surface, per unit area, measured in Lux (1 Lux = 1 Lumen /m^2).

LUMINAIRE

The international term for a lighting fitting, which is the assembly that contains a light source and distributes the light output.

LUMINANCE

The measure of brightness, which is a function of concentration or density of luminous intensity (i.e. Candelas) in a given direction per unit area, measured in Candela/m² (Cd/m²).

LUX

The International System (SI) unit of illuminance and luminous emittance, measuring luminous flux per unit area. It is equal to one lumen per square metre.

SKYGLOW

The brightening of the night sky that results from the reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gas molecules, aerosols and particulate matter), in the direction of observation.

It comprises two separate components as follows:

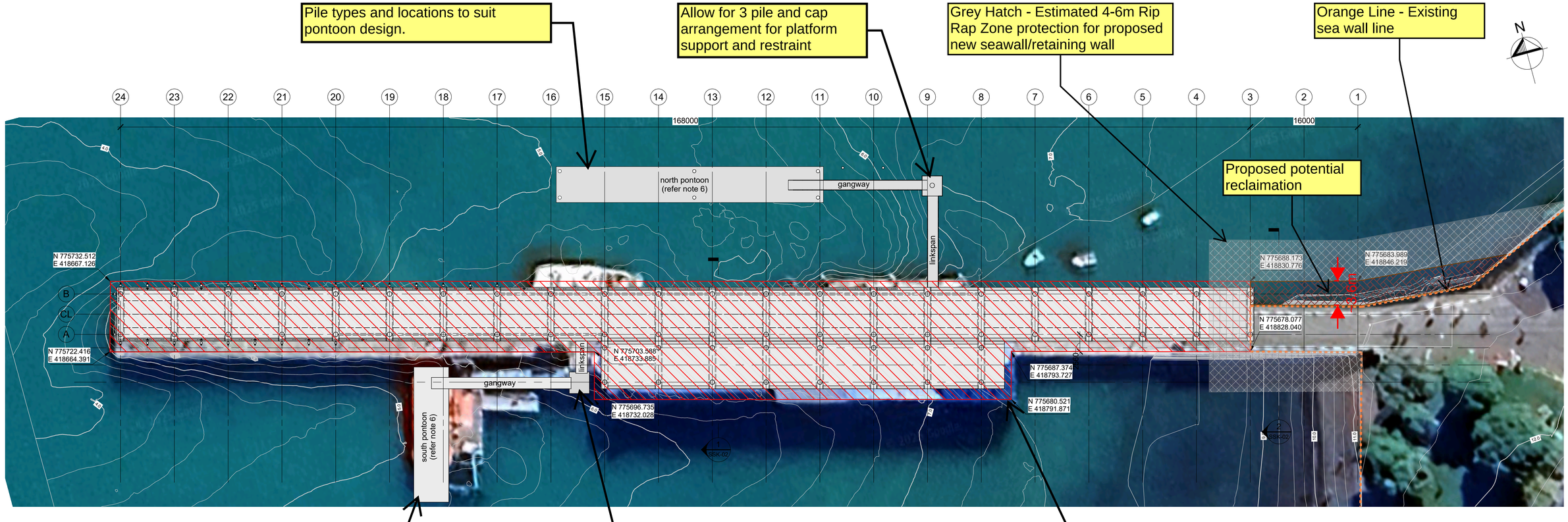
Natural Sky Glow: That part of the sky glow that is attributable to radiation from celestial sources and luminescent processes in Earth's upper atmosphere.

Man-Made Sky Glow: That part of the sky glow that is attributable to man-made sources of radiation (e.g. outdoor lighting).

SPILL LIGHT

Light emitted by a lighting installation that falls outside the boundaries of the property for which the lighting installation is designed.

Appendix C Plan of proposed wharf



Notes:

- All coordinates are approximate only as they are based on Calibre Lidar Survey and initial CCC topo data provided by CCC in 2020. All design documentation subject to final confirmation with cadastral survey of existing wharf.
- The coordinate system used is Mount Plesent 2000
- All Wharf coordinates are based on the edge of the proposed wharf and exclude fenders, ladders and other components
- All existing seawall and proposed reclamation coordinates are based on the outer edge of the top of the sea wall.
- Total bent numbers may vary from 24 to 18. Total number of wharf piles may also vary from 64 to 44 (exc pontoon and platform piles)
- Pontoon, platform and gangway layout taken from Enviser Pontoon Concept Layout option F Rev 0. Design by others.

All dimensions to be verified on site before making any shop drawings or commencing any work.

Rev	Date	Appd	Reason

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AKAROA WHARF RENEWAL

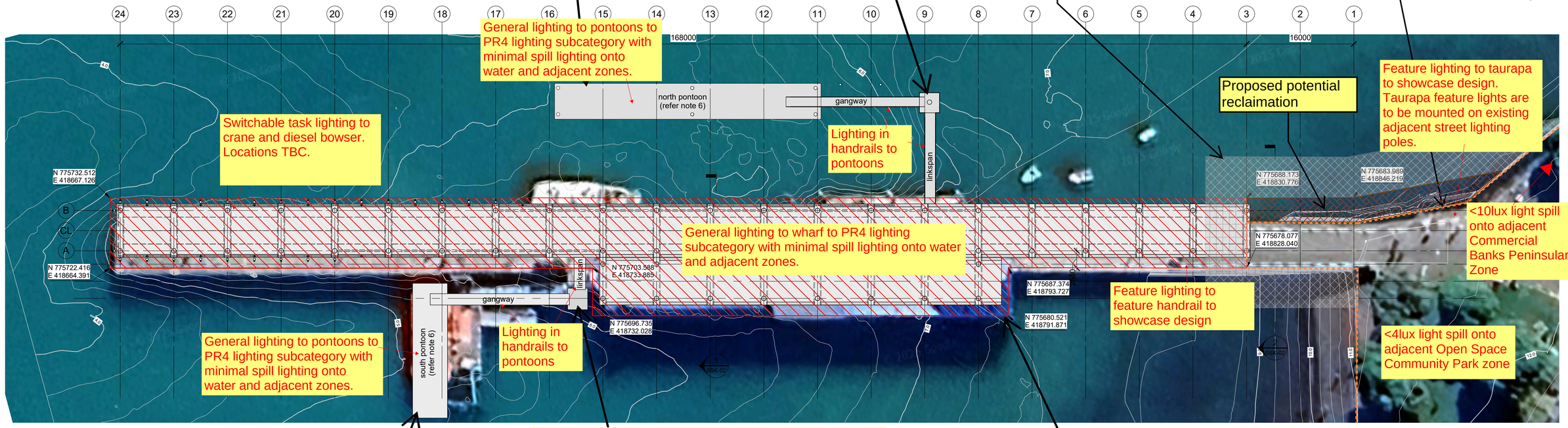
Sheet Title: general arrangement plan

Drawn: DLP | Scale: 1:300 (at A1)

Filename: 145457.31_Akaroa Wharf Renewal.rvt

Job Number: 145457.31 | Sheet Number: SSK-01 | Rev:

Appendix D Concept Lighting Plan



General Notes:
- Colour Temperature for general lighting shall be 2000K for wildlife/night-sky. Colour Temperature for ancillary lighting shall be 2000K if possible, or ≤3000K if 2000K fittings are unavailable.
- General lighting to dim down to an agreed level during curfew period.
- Decorative lighting to switch off during curfew period.
- Lighting to utilise appropriate automated lighting controls, such that the lighting is dimmed or switched as appropriate when the wharf is not in use.
- Spill lighting onto the water shall be eliminated as far as reasonably practicable.
- Feature lighting shall not shine upwards.
- General lighting to be 0deg flat glass type, with an upward light ratio (ULR) of 0.
- All lighting to be directed away from habitable spaces.

pedersen read consulting electrical engineers

Akaroa Wharf Rebuild
Project Number 5439
Electrical Services
Sheet No: E01
Revision 4
NTS
Lighting Design
UPDATED CONCEPT DESIGN

Date: 04/08/2025

- All coordinates are approximate only as they are based on Calibre Lidar Survey and initial CCC topo data provided by CCC in 2020. All design documentation subject to final confirmation with cadastral survey of existing wharf.
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AKAROA WHARF RENEWAL

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