
LPC – Coal Stockyard Expansion

Assessment of Environmental Effects:

Lighting

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LPC Coal Stockyard Expansion

Assessment of Environmental Effects

Introduction

This report has been prepared by Pedersen Read Ltd. for Lyttelton Port of Christchurch (LPC), in relation to the proposed Coal Stockyard expansion. It has been prepared in response to a further information request from the Christchurch City Council on the effects of lighting (RFI Question 9), and supplements the primary Assessment of Environmental Effects which accompanied the Resource Consent Application.

Pedersen Read Ltd are Consulting Electrical Engineers with lighting design expertise, and affiliation with the Association of Consulting Engineers (ACENZ), the Institute of Professional Engineers New Zealand (IPENZ), and the Illumination Engineering Society (IES).

Description

LPC propose reclaiming approximately 10 ha of Te Awaparahi Bay for port activities. It is also possible that part of the Te Awaparahi Bay hillside behind the existing coal stockyard would be excavated to provide an additional area of approximately 2 ha. This would enable the expansion of coal storage to cater for increased throughput.

Material for the proposed reclamation would be sourced primarily from LPC's existing Gollans Bay Quarry which has been used to supply rock for maintenance, coastal protection, and reclamation, since the early 1950's. As part of the project, LPC plans to upgrade existing quarry access and reinstate the haul road to provide direct access.

Refer to the primary Assessment of Environmental Effects for further details.

Lighting Terms and Effects

1) Lighting Terms

The following simple definitions apply to terms used in this report.

■ 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 /m²).

■ 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).

■ Luminaire

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

2) Environmental Effects

The impact of artificial lighting on the night environment can be characterised by the following effects.

- Glare: 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.
- Light Spill: Illumination which trespasses beyond the related application area, typically a property boundary.
- Sky Glow: The combined luminous effect of direct and indirect lighting on the appearance of the night sky.
- Visual Amenity: The aesthetic influence of artificial lighting on the night time landscape.

It should also be noted that these effects are subject to the variable influence of weather conditions. In particular atmospheric water vapour content (i.e. mist and cloud) accentuates sky glow appearance and has a diffusing affect on glare.

This report considers the existing environment, consequences of the proposed installation, and related mitigation.

District Plan Requirements

The proposed reclamation area is unzoned, therefore no rules in the District Plan are applicable, and resource consent is required to enable port activities to be established. However a relevant reference is the performance standard for the adjoining Lyttelton Port Zone, an extract of which is as follows:

2.3 Light

Activities conducted within the Lyttelton Port Zone shall comply with the following glare conditions:

No operation or activity shall be conducted so that direct illumination exceeds 10 Lux (Lumens per square meter) within the boundary of any site within the Residential Zone, Residential Conservation Zone, or Town Centre Zone. Light shall be measured on an instrument meeting the requirements of the New Zealand Standard C.P.22 (1962) and amendments.

There does not appear to be any other relevant rules associated with the Rural Zone.

Existing Night Environment

1) General Night Sky

The background night sky luminance above Te Awaparahi Bay and Gollans Bay, viewed from within the harbour or from the opposite side, is elevated by the loom of artificial lighting. The effect is dominated by the contribution from the eastern extremity of Christchurch city on the other side of the hills, and is most noticeable in conditions of extensive low cloud.

2) Quarry & Haul Road

The only existing source of artificial lighting in the area of Gollans Bay quarry and the associated hillside haul road is the sporadic presence of vehicle lighting on nearby Sumner Road, which reduces to a minimum late at night. Vehicle headlights have tightly controlled high intensity beams which follow the alignment of the winding roadway.

The quarry and haul road landscape is concealed from Lyttelton township¹, and normally observed only from within the harbour, or from the opposite side at a distance in excess of 2km. From that perspective the landscape appears in consistent dark contrast to the background night sky, with the occasional indication of vehicle lights tracing the roadway above.

3) Coal Stockyard Waterfront

The Coal Stockyard, from the hillside to the waterfront, is illuminated by groups of high pressure sodium vapour floodlights which have a yellow/gold coloured output. The floodlights are pole-top mounted in a radial arrangement, at a typical height of 30m. They are of a fully enclosed high performance reflector type with a design downward tilt orientation of at least 20° below horizontal. The amount of floodlighting in use, and the frequency, is variable and related to Stockyard operations.

There is also a relatively small amount of low power local lighting (i.e. typically bulkhead type) associated with buildings and major plant items, and vehicle lighting.

Vehicle lighting in this area is associated with a small amount of mobile plant used for Stockpile operations, and light vehicle access. The headlights for both have reflector controlled directional beams and the prevalence is sporadic according to Stockyard operations (e.g. train unloading, ship loading, and Stockpile management). The main light vehicle travel route is on a roadway immediately behind the seawall, whereas the mobile plant within the Stockpile area moves variably throughout and frequently in a repeated pattern.

The Coal Stockyard adjoins the Cashin Quay wharf area. It is also concealed from Lyttelton township¹, and the prevalent view to the area is from within the harbour, or from the opposite side at a distance in excess of 2km. From that perspective the affect of lighting on the visual amenity is the relevant environmental consideration, and it can be summarised as follows;

- Low intensity glow beneath the floodlights, with a yellow/gold colour appearance. The density varies according to atmospheric particle content, although conditions such as fog also reduce observation visibility.
- Dim indirect illumination of the hillside immediately behind the Stockyard, and a reduction in the darkness of the hillside above, particularly in the presence of low cloud.
- Interspersed points of increased brightness associated with the peripheral direct output from some floodlights (i.e. those where the tilt angle and southern aspect result in partial exposure. Contribution from secondary light sources (i.e. vehicles, plant etc) is insignificant in this context.

¹ Landscape + Visual Assessment (Fig 6) - Boffa Miskell

Overall the environmental effects of the existing Coal Stockyard lighting are comparable but secondary to those of the Cashin Quay wharf immediately to the west, and typical of an expansive industrial site. The scale of the lighting is relatively small on the overall panorama, but with the contrast of mostly dark surroundings it is a prominent visual feature at night.

Proposed Exterior Lighting

The nature and extent of the various forms of exterior lighting associated with the proposed development is described as follows:

1) Quarry & Haul Road

No active quarrying operations are proposed after dark. However it is anticipated that there will be occasions when stockpiled material is loaded onto trucks for transportation down to the reclamation area after dark. To support that activity it is anticipated that portable floodlighting would be provided in the form of two trailer mounted assemblies incorporating a diesel powered generator, an extendable pole of nominal height 7.5m, and adjustable reflector type floodlighting luminaires (i.e. typically 4 on each unit).

The position of the portable floodlighting units would vary to suit quarrying operations and vehicle access. Luminaires would generally be aimed downwards and towards the task areas. Partial direct view of the output from some luminaires is likely, particularly from the opposite side of the harbour. The extent of that direct view would depend upon the relativity between luminaires, work site, and view position, and also the accuracy of the aim adjustment.

No roadway lighting is proposed for the haul road, but it should be noted that truck headlights would be evident in the same manner and with similar orientation to those of vehicles on Sumner Rd. The increased incidence of this form of lighting would however be very minor.

2) Coal Stockyard Waterfront

For the expanded Coal Stockyard the proposed lighting installation consists of a professionally designed reconfiguration and extension to the existing pole mounted floodlighting network. This would involve additional poles and fixtures of the same general type as those existing, in proportion to the additional area. Similar floodlight mounting and aiming arrangements would also be employed. The amount of floodlighting in use, and the frequency, would remain dependant upon Stockyard operations.

Other secondary light sources (e.g. vehicles and other plant) would remain of a similar order to that existing,

Assessment of Environmental Effects

The affect of the proposed exterior lighting on the surrounding existing environment is assessed as follows:

1) Glare

The form and orientation of the proposed additional lighting at the quarry and the Stockyard, and the separation distance from prevalent viewing locations, is such that no significant glare effect is anticipated from that perspective.

There is a possibility that any misaligned portable floodlights within the quarry could result in discomfort glare, when viewed from the lookout area adjacent to the Evans Pass summit, thereby detracting from the general view in that direction. However this is unlikely given the functional requirement to orientate the floodlighting towards the truck loading operations, and the unlikely use of the lookout area at night. The potential effect is further constrained by the limited and temporary operation that lighting.

2) Light Spill

The proposed design of additional lighting, in combination with the geographic features and property boundaries, is such that light spill will also be insignificant, both in absolute terms and relative to the District Plan lighting rule for Lyttelton Port Zone.

3) Sky Glow

a. Quarry lighting

The output of the proposed portable reflector type floodlights is constrained to directional beams, generally aimed to support truck loading operations. In conjunction with the steep hillside backdrop, this will eliminate any significant direct emission to the night sky above the hill tops. Any indirect effect from illuminated quarry areas will also be negligible because of the relatively small area and low emission level involved. Furthermore the background night sky to the north is influenced by light emission from Christchurch city which reduces contrast potential.

The set-up and repositioning of the portable floodlighting has potential for environmental effects. However given the need for the lighting to support truck loading operations, any significant misalignment is unlikely. Also the potential affect of misalignment on sky glow is minimal because of the relatively small amount of lighting involved.

The negligible extent of this effect is further mitigated by the limited use and temporary nature of the floodlighting.

b. Coal Stockyard

The proportional addition to the existing Coal Stockyard lighting remains within a similar field of view from the other side of the harbour. Given the minimal upward lighting output, and the separation provided by the hillside, the affect of the additional lighting on sky glow above the hilltops is assessed as imperceptibly small.

4) Visual Amenity

a. Quarry lighting

With the quarry floodlighting aimed at the truck loading positions the affect on night time visual amenity, from the prevalent viewing perspective and distance, would be the creation of a small illuminated patch, of similar brightness to Cashin Quay, in contrast to the dark surrounding hillside.

The effect would be readily noticeable, but of low intensity and very small scale in relation to the landscape panorama from a normal viewing perspective. It would also be mitigated by the limited use and temporary nature of the floodlighting.

Truck headlights on the haul road would also be noticeable, but insignificant to visual amenity because of alignment with the comparable existing effect associated with adjacent Sumner Rd and the very minor increase in overall incidence

b. Coal Stockyard

The lateral extent of the floodlit Coal Stockyard area, viewed from the opposite side of the harbour, would remain similar to that existing. The additional lighting within that range will only marginally increase the low level luminance from that perspective, and remain less than that of the Cashin Quay area immediately to the west.

The overall affect on visual amenity, from the opposite side of the harbour, would therefore be no more than a subtle, almost imperceptible increase in contrast to the surroundings.

Conclusion

The prevailing view to both the Quarry and the Coal stockyard is from within the harbour, or from the opposite side at a distance in excess of 2km. Both areas are concealed from Lyttelton township¹

The glare, light spill, and sky glow effects of the proposed lighting within the Quarry will be negligible in terms of both absolute value and reference to relevant standards or rules, including the Lyttelton Port Zone rules of the District Plan. The influence on visual amenity will be clearly apparent, but of a low order and very small scale in relation to the landscape panorama from the prevalent view perspective. That effect would also be mitigated by the limited use and temporary nature of the lighting

The existing lighting effects from the Coal Stockyard would change little as a result of the proposed additional floodlighting, which consists of a professionally designed reconfiguration and extension to the present concept, within a similar field of view from the prevalent perspective.

In summary, the proposed floodlighting in both areas is assessed as having no more than a very minor effect on the surrounding night time environment.

¹ Landscape + Visual Assessment (Fig 6) - Boffa Miskell