

Before Hearing Commissioners
at Christchurch

under: the Resource Management Act 1991

in the matter of: applications CRC172455, CRC172522, CRC172456, and
CRC172523 to undertake channel deepening dredging
and maintenance dredging in Lyttelton Harbour

and

in the matter of: **Lyttelton Port Company Limited**
Applicant

Memorandum of counsel in response to the 7th Minute of the
Commissioners

Dated: 2 June 2017

REFERENCE: JM Appleyard (jo.appleyard@chapmantripp.com)
ML Nicol (michelle.nicol@chapmantripp.com)

Chapman Tripp
T: +64 3 353 4130
F: +64 3 365 4587

60 Cashel Street
PO Box 2510, Christchurch 8140
New Zealand

www.chapmantripp.com
Auckland, Wellington,
Christchurch

MEMORANDUM OF COUNSEL IN RESPONSE TO 7TH MINUTE OF THE COMMISSIONERS

May it please the Commissioners:

- 1 This memorandum is filed on behalf of Lyttelton Port Company Limited (*LPC*) in response to the 7th Minute of the Commissioners.
- 2 The Commissioners have asked a series of questions about Turbidity Triggers, each of which has been answered by LPC below.

How will a TSS value for a particular site be established, with reference to the appendices?

- 3 The hydrodynamic modelling is summarised in appendices 9, 10a and 10b of the application. The modelling calculates the predicted dredging related TSS (defined in the draft conditions as "Predicted Dredging Turbidity") at all 'nodes'¹ in the model grids. The models calculate a TSS value at each node, at each time step in the model as it is run. While the time step can vary² from seconds to minutes, the model can provide an interpolated output at any required time step and any position, i.e. the same 15 minute frequency as the monitoring buoy readings.
- 4 For each monitoring location, MetOcean will extract the predicted TSS data for the node closest to the monitoring location in question, or from the exact location using interpolation. This will create a time series of predicted TSS for that monitoring location, with a data point at every time step. This is analogous to the baseline monitoring data where the instrument creates a time series of turbidity (NTU) by measuring turbidity every 15 minutes.
- 5 The in-harbour model (used in appendix 9 to the application) is run in a predictive mode based on the salient tidal and seiche forces. This has been run for a year, and a 365 day long TSS time series for each monitoring location will be extracted from the modelling record.
- 6 The offshore model (used in appendices 10a and 10b to the application) is run in a hindcast mode for a period of 10 years of actual meteorological, current and wave conditions. From this hindcast modelling, time series TSS data is extracted for the entire 10 year period for each monitoring location.

¹ Nodes are the points where the grid lines intersect. Within the harbour near the monitoring locations the nodes are approximately 20m apart, and offshore they are approximately 300m apart

² Depending on the settling velocity of the particle size being modelled

Will the TSS concentration be calculated with reference to a one year modelling hindcast (as step 5 in appendix 2 seems to imply)?

- 7 As set out above, the in-harbour model generates a single predictive year of TSS results. This data, along with the baseline data, will be used to calculate the Intensity component.
- 8 The method is slightly different for the offshore hindcast model. The 10 year time series of modelled TSS is extracted. The year of baseline data is replicated and added to the entire 10 year time series. The Intensity component is calculated for each monitoring location on this 10 year long time series.
- 9 The reason for this difference is because the in-harbour model is predictive and the full tidal cycle occurs many times within a year. The offshore model is not predictive, and a much longer period is needed to ensure the full ranges of likely physical conditions are included.
- 10 An amendment has been made to Step 5 (parts 1 and 2) of Appendix 1 to the Maintenance conditions and Appendix 2 of the Channel Deepening conditions to clarify the above. These amended appendices are **attached**.

If the answer is "yes", is a one year hindcast already available, or is further modelling to be undertaken?

- 11 All offshore hindcast model runs were completed prior to the applications being lodged, and cover the period 1 January 2003 to 31 December 2012.
- 12 The predictive year of modelling used for the in-harbour model was also completed prior to the applications being lodged.

Is it the case that a temporal match between modelled TSS and monitored turbidity is required (as seems to be indicated in step 5 at (1) given the reference to the "same day month and hour")?

- 13 Yes, the model data and monitoring data need to be temporally matched. This is achieved by extracting the predicted dredging turbidity at the same time step as the monitoring buoys. If the data points do not align (e.g. as a result of instrument error) a slight time shift may be required. At most this would be half the length of the time step i.e. 7.5 minutes and would have no effect.

Once total turbidity in NTU has been established and the Intensity (NTU) for each tier at each site is calculated (pursuant to steps 5 & 6), do those intensity values remain constant into the future?

- 14 Yes, the Intensity values will be set following completion of the baseline period and will remain the same for the dredging stage. The Intensity component of the trigger values will be reported on under both Condition 9.4 and the EMMP (Condition 7.8.3 and 7.1).
- 15 Outside of a change in consent conditions, the Intensity component of the Turbidity Triggers could only be amended via establishment of a new baseline data set prior to a dredging stage. This was intended to be provided for in conditions 8.19 and 8.20, which allow for additional baseline monitoring to be undertaken (potentially at the consent authority's request).
- 16 However, LPC considers that a slight amendment to Condition 9.3 and 9.4 of the Channel Deepening conditions should be made to make this clearer. The amendments allow for the possibility of a new baseline dataset and consequential amendment of the Intensity component of the Turbidity Triggers, and are:
- 9.3 Upon completion of the baseline monitoring, the Intensity component of the turbidity triggers for each telemetered turbidity monitoring location shall be calculated using the baseline turbidity data referred to in condition 8.3 or in either conditions 8.19 or 8.20 plus the Predicted Dredging Turbidity at that location, using the methodology attached in **Appendix 2**.
- 9.4 The consent holder shall provide to the Consent Authority, at least two months prior to commencement of a Dredging Stage, a written report prepared by a suitably qualified and experienced expert which demonstrates that the turbidity triggers have been established in accordance conditions 9.2 and 9.3.
- 17 A full set of the Channel Deepening conditions with this change included is attached. The Maintenance conditions do not need to be updated.

Dated: 2 June 2017

Jo Appleyard
Counsel for Lyttelton Port Company Limited