

# KiwiRail Holdings – Palmerston North Regional Freight Hub - S92 Requests and Responses – Geotech

*This report has been prepared for the benefit of KiwiRail. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.*

Rev. no	Date	Description	Prepared by	Checked by	Reviewed by	Approved by
1	12 February 2021	Draft response	A Mott	K Clapcott		

## Question

*176) Is there any potential for cumulative adverse effects from lateral spreading and/or differential settlement in conjunction with flooding (some areas of the Regional Freight Hub will be located within Flood Prone Areas), in the event of a seismic event?*

## Response

The scenarios outlined in the question are unlikely. Lateral spreading occurs during or shortly after seismic events. Strong seismic events causing damage are generally between Modified Mercalli (MM) MM6 to MM8 and occur infrequently within the region. One of the pre-requisites for lateral spreading is for liquefaction to be generated. Liquefaction is predicted to commence at MM7 intensity shaking. The probability of liquefaction occurring at the same time as a flood event is remote. When undertaking geotechnical design for earthworks and structures, conventional practice assumes 'normal' groundwater levels due to the very low probability of a large seismic event occurring at the same time as a flood event.

Differential settlement can occur in areas subjected to new loads following construction (eg. structures or earthwork fills) with or without a seismic event. Flooding could trigger differential settlement if the ground is sufficiently permeable, soils are loose, and floodwaters were able to penetrate previously unsaturated or unloaded ground. Differential settlement in a combined flood and seismic event are unlikely for the same reason as outlined above (ie. the low probability of both happening at the same time).

Ground investigation during the design process will determine if soils are prone to liquefaction, lateral spreading and differential settlement and if so, whether any remedial options are necessary to manage these risks.

Andy Mott  
Principal Engineering Geologist