

EARTHQUAKE REPAIRS AT CHRISTCHURCH WWTP – CLARIFYING THE SITUATION

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ABSTRACT

Christchurch Wastewater Treatment Plant has four large secondary clarifiers that separate solids from the mixed liquor in the final stage of treatment, allowing waste activated sludge (WAS) to be recycled within the biological process. The major earthquake on 22nd of February 2011 (MM X) and resulting liquefaction at the site rendered all four clarifiers unserviceable, with varying degrees of structural and mechanical damage. Failure of the clarifiers put the plant operations into a position of serious risk.

This paper outlines the investigations of the earthquake damage, the strategy for “quick fix” repairs to restore plant function, decisions on permanent repair priorities and methods, and the management of operational risks over the two year duration of the repair works. It also discusses resilience issues for large infrastructure assets. Without the clarifiers in operation the treatment plant was exposed to operational risks related to discharge of high loads solids to the downstream oxidation ponds. This created urgency to put in place a temporary repair on at least 2 clarifiers. The paper describes how a temporary “quick fix” was identified and successfully implemented within 3 months to deal with operational risks and restored basic plant functionality. More difficult and complex issues were faced with the permanent repairs. The paper describes the method for selecting repair options for each clarifier taking into account repair option costs ranging, from \$2M to \$45M, the relative performance of each option, and the varying level of damage discovered. Furthermore, as new information came to hand during the repair works the repairs had to be modified “on the go” to address additional failure modes.

Designing resilience into infrastructural assets is a key issue for local authorities. The paper discusses some approaches to designing for resilience using the clarifier repairs as a working example.

The paper also describes how operational risks were managed over the two year period while the works were undertaken as well as some technical highlights including the success and failure of various diagnostic tools, and the use of very large bore (1.8M diameter) CIPP liners for pipe repairs.

KEYWORDS

Earthquake repairs, resilience, operations