

Appendix 8.02 – Structural Engineering; Cobham Drive Park

Wellington City Council

**Report for Independent Review of the WCC Indoor Sports
Centre Project**

Engineering Assessment - Executive Summary

Cobham Park Proposal

April 2009

1.0 Executive Summary

1.1 This report provides an engineering assessment of the proposed Indoor Sports Centre to be constructed at Cobham Park. The assessment is a conceptual review and does not extend to an in-depth technical review of the project.

1.2 The site is a prominent undeveloped flat site on the western side of the intersection of Cobham Drive and Tory Street, Kilbirnie on the isthmus connecting the Miramar peninsular with Kilbirnie. Located near the coastal fringe at the southern end of Evans Bay, the site is exposed to strong salt laden winds from both the northerly and southerly direction. Under strong northerly wind conditions, it is also exposed to salt spray from Evans Bay. The site exposure demands that the durability of the facility is appropriate to the harsh site environment. The exterior cladding materials selected for the indoor stadium are considered appropriate for the site environment.

1.3 The site is reclaimed land, reclamation having taken place in the late 1950's, early 1960's as part of the development of Wellington Rongatai Airport. Fill materials to a depth of between 3.4 and 4.5 metres overlying marine deposits on the site. The maximum site water table is assessed at 1 metre below existing ground level.

1.4 The fill materials contain ash deposits generated by the Evans Bay coal fired power station located in the area of the current Fire Training Station adjoining the site. An extensive investigation and testing program has been undertaken to determine the extent of any contamination in the ash deposits and fill. The majority of the ash and fill materials were found to have no contamination concentrations above the Ministry of Environments guidelines appropriate to residential land use. Some heavy metal and or PAH concentrations above the residential guidelines were identified in 18 test pits. Based on these results, material that is not to be disturbed during excavation for foundations and the undercroft is to remain in place with an appropriate capping. Contaminated material, exposed during excavations, is to be placed under the concrete slab of the Indoor Sports Centre, the carpark or disposed of to the Wellington City Council landfill. Appropriate allowance is included in the contract for the management of the contaminated material.

1.5 The marine deposits underlying the site have been established to be prone to liquefaction and lateral spreading under earthquake induced vibrations. Predicted settlements and lateral spreading at serviceability and ultimate limit state earthquake are as follows.

EVENT	SETTLEMENT FROM LIQUEFACTION	LATERAL SPREADING
Serviceability earthquake (25 year return period)	<15mm	< 5mm
Ultimate limit state (1000 year return period)	80 – 200mm	75 – 2000mm

1.6 The building is to be founded on shallow pad foundations without interconnecting tie beams through the centre of the complex. The structural system with the articulated 4 pin frames adopted for the indoor stadium is an elegant solution,

which forms a feature of the interior space and is well suited to the irregular plan of the facility. While the 4-pinned frames have the ability to accept differential settlements at support points, the three dimensional bracing in the longitudinal direction is less able to accept differential settlements between adjoining frames.

1.7 Differential settlements combined with the effects of lateral spreading caused by liquefaction under a serviceability earthquake may cause settlements beyond the desirable tolerances of the sports floor. Settlements under a more significant earthquake introduce uncertainty as to the overall performance of the structure and have the potential to seriously affect the functionality of the facility. This feature of the complex appears at odds with the 70-year design life and high quality design features incorporated in the facility. While the indoor stadium has been demonstrated to comply with Building Code requirements, it is recommended that ground enhancement works be considered to reduce the risk of property damage under earthquake.

1.8 The complex structural form and irregular plan layout of the indoor stadium result in the facility costing more than other indoor community sporting facilities.

1.9 The Cobham Indoor Sports Stadium incorporates many large span and heavy structural elements that are ideally suited to prefabrication off-site and transportation to the site. Erection of the structural components will require large cranes. The site is sufficiently large beyond the footprint of the building to provide the contractor with adequate working space for cranes, scaffolding, storage and other construction activities.

1.10 The floor level of the indoor stadium is to be raised approximately 1400mm above existing ground level. Excavated fill materials from the area of the undercroft carpark are to be used as fill materials over the existing ground below the eastern sports hall. The suitability of the fill to be placed and compacted is a construction risk as removal and replacement of the fill with imported material would add considerable cost.

1.11 The sub-base around the perimeter of the building, the carpark and below the undercroft is fill materials with low strength. Sub-grade replacement to achieve a suitable working surface for heavy transportation equipment and cranes for the structural components is a further construction risk.

1.12 Considerable attention is given to providing durable materials to the exterior of the complex. Nevertheless, the exposure of the site to salt laden air and sea spray will require regular removal of salt deposits on the exterior cladding elements and in particular, those elements in the unwashed zone. Internal structural elements, not designed for exterior durability, may be exposed to salt spray and salt laden air sufficient to build up an undesirable salt coating on these elements during construction, necessitating removal of these salt deposits prior to final enclosure.