Green Energy at the Arts Centre, Christchurch



Te Matatiki Toi Ora







S

SITE ARTESIAN WELL LANDUT

Andre Lovatt, CEO, is excited to see green renewable energy adopted as part of the ≈\$300 Million restoration and redevelopment of the Arts Centre in Christchurch. The restoration is to repair significant damage suffered to most of the buildings in the 22nd February 2011 magnitude 6.3 earthquake. The design of the energy system has been undertaken by Powell Fenwick a Christchurch Engineering Consultancy firm with specialist expertise in aquifer water energy systems.

Multiple buildings on the Arts Centre site are being supplied with green energy. Energy use is primarily to heat the facilities during cooler periods with only a small amount of cooling needed to supply three buildings in the south eastern part of the site. The energy systems use efficient state of the art water to water heat pumps. Greatest demand for the aquifer water is expected to be during the winter with a lower level requirement during the summer. The consents permit 2 megawatts of heat extraction from, or heat rejection to, the aquifer water.

The renewable energy to the facilities is supplied from two plant rooms: Library (GC) Plant Room and the Mechanical Services (WS) Plant Room. The aquifer water is drawn from 2 extraction wells (BX24/0506 and /0508) and returned through two injection wells (BX24/0507 and / 0509). The extraction and injection wells are located in two open spaces in central areas of the Arts Centre facilities. The wells were drilled between December 2013 and September 2015. Extraction is from deeper underground from screened depths of 122 to 127m and injection is to shallower formations, to depths of between 22 to 36m. The extraction wells are artesian with about a 6m head above the top of the casing with specific delivery capacities of 15 and 30 litres per sec per metre. The measured water temperatures are between 13 to 14 °C. The extraction consent 154729 permits an annual take of 1.5 million cubic meters of water at a rate no great than 80 litres per second. The maximum permitted temperature change (consent 154730) is plus or minus 6 °C from the incoming water temperature.

Each of the plant rooms has a designated extraction and injection well but with aquifer water ring main interconnectivity to provide some redundancy. Each plant room has aquifer water pumps and filters supplying two heat exchangers. The primary side aquifer water systems are constructed in stainless steel. The evaporator water systems are in mild steel with dosing to condition the water and eliminate corrosion.

| Library | | | | | | | | | | | | |
|-----------------|--------------------------|----------|------------|----------------|------------------------|--------------|---------|-----|--|--|--|--|
| Heat Exchangers | | | Heat Pumps | | | | Cooling | | | | | |
| # | Aquifer Water Flow | Capacity | # | Secondary Flow | Individual Capacity | Cum Capacity | Y/N | Сар | | | | |
| | l/sec | kW | | l/sec | kW | kW | | kW | | | | |
| 2 | 20 | 215 | 5 | 10.5 | 215 | 1075 | Y | ? | | | | |

| Mechanical Services (Building WS) | | | | | | | | | | | | |
|-----------------------------------|--------------------------|----------|---|----------------|------------------------|--------------|---------|--|--|--|--|--|
| Heat Exchangers | | | | Cooling | | | | | | | | |
| # | Aquifer Water Flow | Capacity | # | Secondary Flow | Individual Capacity | Cum Capacity | Y/N | | | | | |
| | l/sec | kW | | l/sec | kW | kW | Y | | | | | |
| 2 | 20 | 512 | 2 | 32 | 660 | 1320 | Via VRF | | | | | |









Poster prepared by Sue Shaw and Brian Carey from GNS Science