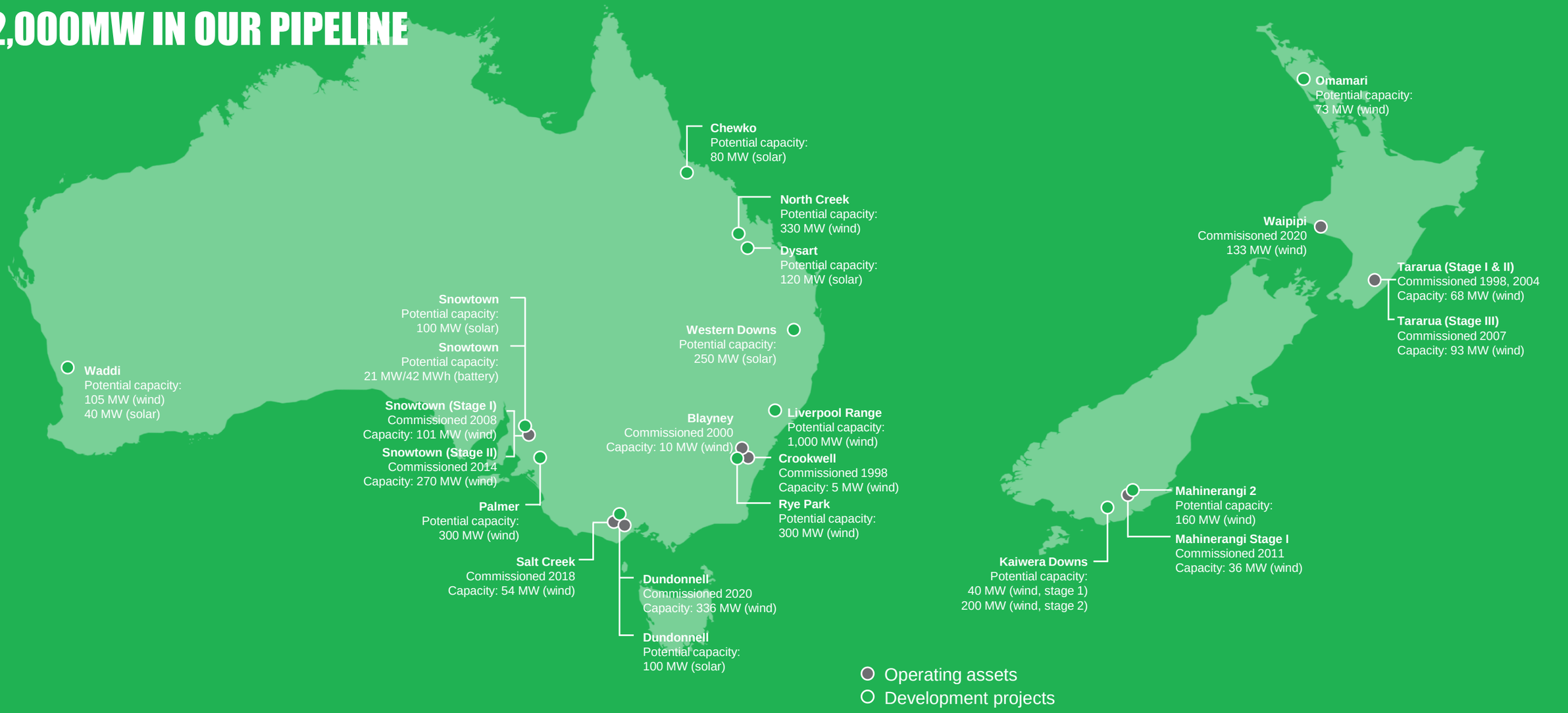

renewables
Delivering a Wind Farm
During a Global Pandemic.....
(amongst other challenges)
NZWEA 2021
12 MAY 2021

TILT RENEWABLES

- Independent Power Producer;
- Long track record of NZ wind farm development;
- Experienced in multi-contract projects;
- Best for project decision making with a lean multi-disciplinary team;
- We do what we say we’re going to do.

836 MW, 322 TURBINES OPERATIONAL
330MW, 179 TURBINES IN OPERATION IN NZ
+2,000MW IN OUR PIPELINE

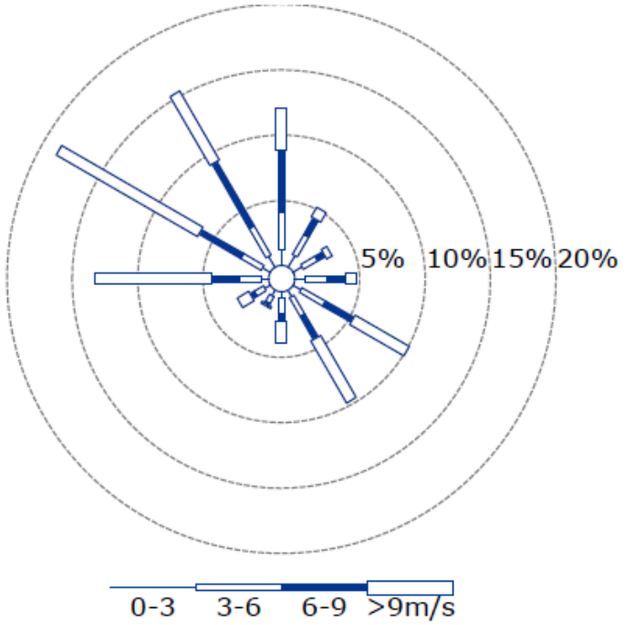


WAIPIPI WIND FARM
BACKGROUND

- The WWF is located 8km southwest of Waverley, within the South Taranaki District Council region;
- The 800ha project envelope covers four properties;
- The site is generally flat to gently undulating at 20m to 40m ASL;
- Located at the former Waipipi iron sands mining site;
- Working dry stock / winter grazing / cropping farm;
- Resource consents granted in July 2017;
  - Up to 48 WTG's and133.3 MW
  - 110kV transmission connection
- The resource consent dictates a maximum WTG tip height to 160m AGL with a ground clearance of 30m (i.e. maximum rotor size of 130m);
- Notice to Proceed granted on 4th Sep 2019;
- Project financed.

SITE PARAMETERS
AN EXCELLENT WIND RESOURCE

- Wind rose is dominated by winds from NW & SE;
- Mean hub height (95m) wind speed across turbine locations > 8.8 m/s;
- 30 year lifetime average capacity factor 39%.



WAIPIPI WIND FARM
PROJECT FUNDAMENTALS

Project Statistics	Waipipi Wind Farm (WWF)
Budget	NZ$277 million
Turbines	31 x Siemens Gamesa (SGRE) SWT-DD-130 4.3MW turbines
Project Structure	Multi-contract delivery model: • Wind turbine Supply & Installation – Siemens Gamesa Renewable Energy (SGRE) • Civil balance of plant Design & Build – Higgins Contractors • Electrical balance of plant & 110kV transmission line Design & Build – ElectroNet Services • Transmission connection – Transpower
Revenue contracting	100% volume, 20-yr tenor PPA with Genesis Energy
Capacity	133.3 MW
Turbine tip height/Hub height	160m / 95m
P50 GWh (lifetime average)	~455 GWh/yr
NTP	4th Sept 2019
COD	4th March 2021

DELIVERY PARTNERS

Construction and Asset Management

Tilt Renewables coordinated all elements of construction and operations with leading NZ and international partners

All Committed to a “Best for Project” approach

Delivery Partners

SIEMENS Gamesa RENEWABLE ENERGY

ElectroNet DESIGN.BUILD.DELIVER

HIGGINS

TRANSPOWER

icubed consulting

GOLDER

AECOM

WSP

Mitton ElectroNet

Offtake & Dispatch Services

genesis

O&M Partners

SIEMENS Gamesa RENEWABLE ENERGY

ElectroNet DESIGN.BUILD.DELIVER

Turbine Locations
Substation
Site Boundary
Proposed Transmission Line

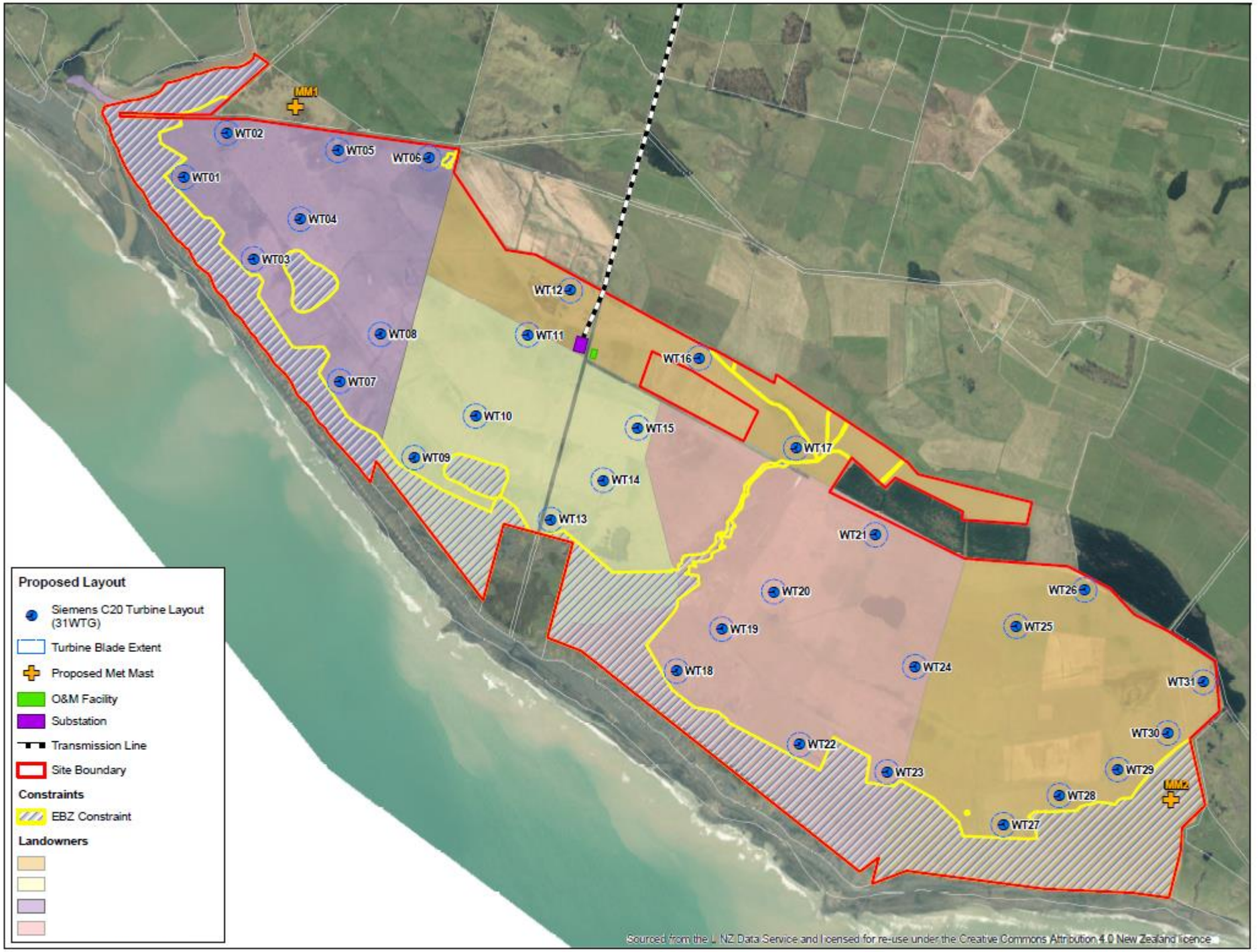
Date: 7/06/2019
Version: A

Data Sources: Parcels (LINZ Data Service, 22/2/2017);

NZGD 2000 New Zealand Transverse Mercator
Page Size: A3
1:35,000

N

0 1 2 Kilometers


MM1
WT02
WT05
WT06
WT01
WT04
WT03
WT12
WT08
WT11
WT16
WT07
WT10
WT15
WT17
WT09
WT14
WT13
WT21
WT20
WT26
WT19
WT25
WT18
WT24
WT31
WT30
WT22
WT29
WT23
MM2
WT28
WT27
Proposed Layout
Siemens C20 Turbine Layout (31WTG)
Turbine Blade Extent
Proposed Met Mast
O&M Facility
Substation
Transmission Line
Site Boundary
Constraints
EBZ Constraint
Landowners
Sourced from the L NZ Data Service and licensed for re-use under the Creative Commons Attribution 4.0 New Zealand licence

COMMUNITY AND STAKEHOLDERS
OUR FOCUS

Stakeholders:

- Te Kaahui O Rauru;
- Te Runanga O Ngati Ruanui Trust;
- Project landowners (4);
- Neighbours & the community;
- Genesis Energy;
- Transpower;
- South Taranaki District Council;
- Taranaki Regional Council;
- Department of Conservation;
- KiwiRail;
- NZTA.

CHALLENGES
THE SITE

- Farm operations
  - Working dry stock / winter grazing / cropping farm, operational during construction;
  - Hawera milk plant - Transpower outages, Kiwirail scheduling, RTO's, etc.;

- Geotechnical
  - Subsurface conditions requiring ground improvement to mitigate liquification & lateral spread risk;
  - Sesimic shot across the site and pre / post CPT's at all 31 sites;
  - Rammed aggregate piers and dynamic compaction designed specific to each site;

- Ground Conditions & Environment
  - Water table;
  - Black sand & shell rock;
  - Coastal environment;
  - Environmental & ecological buffer zones, site / offsite works & work seasons.

CHALLENGES
THE SITE

- Farm operations
  - Working farm dry stock / winter grazing farm, operational during construction;
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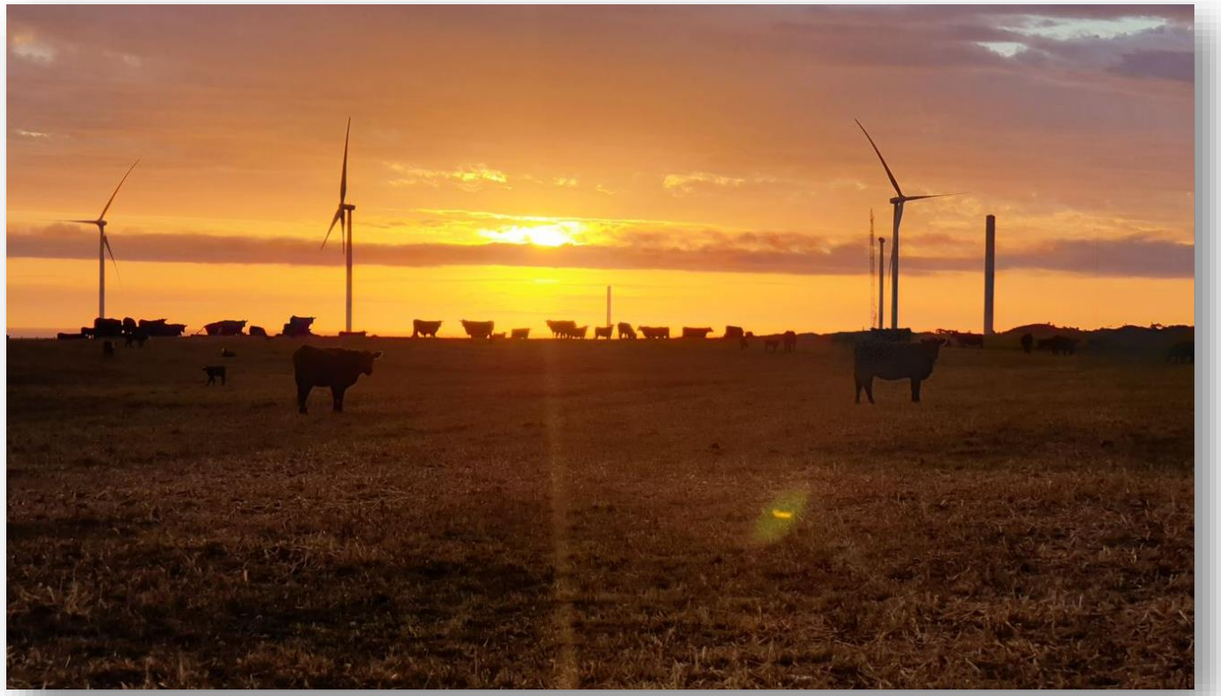


CAT
CAT


100 m
100 m


9141

CHALLENGES
THE SITE

- Farm operations
  - Working farm dry stock / winter grazing farm, operational during construction;
  - Hawera milk plant - Transpower outages, Kiwirail scheduling, RTO's, etc.;

- Geotechnical
  - Subsurface conditions requiring ground improvement to mitigate liquification & lateral spread;
  - Seismic shot across the site and pre / post CPT's at all 31 sites;
  - Rammed aggregate piers and dynamic compaction designed specific to each site;

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  - Water table;
  - Black sand & shell rock;
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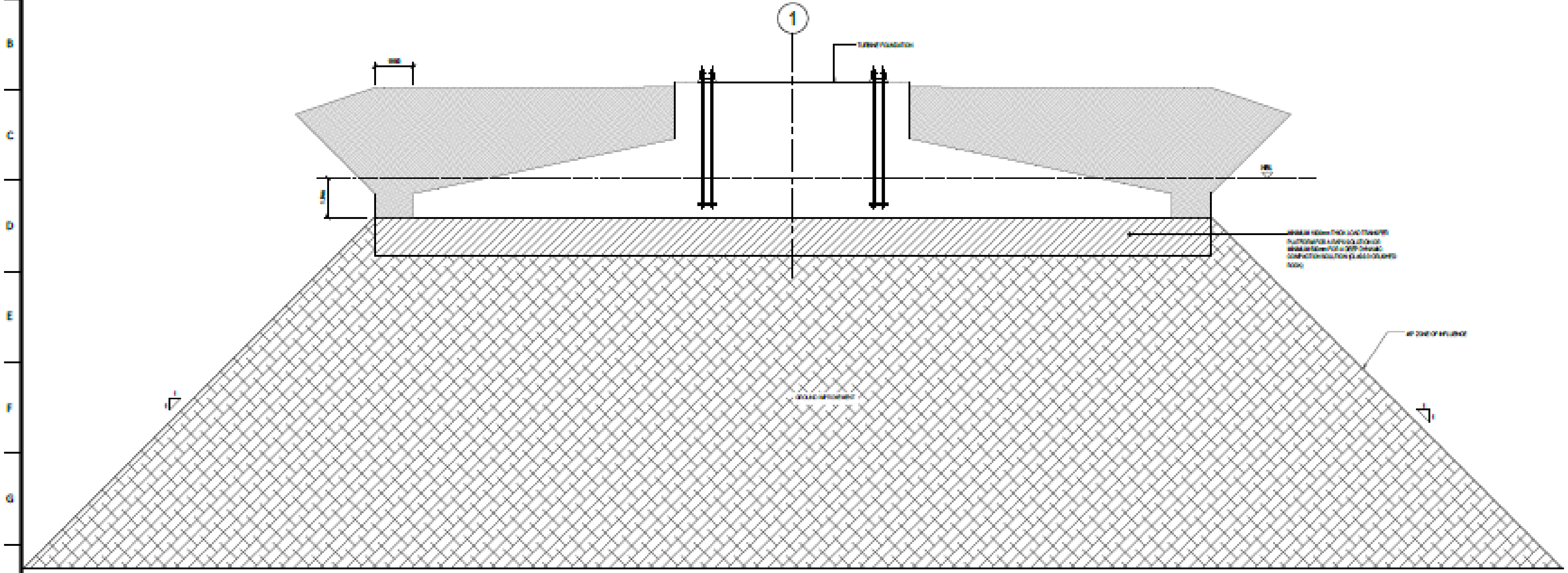
NOTES:



GROUND IMPROVEMENT SECTION

SCALE 1:100

REVISION HISTORY

No	DESCRIPTION	DATE
0	FOR REVIEW	

i³ consulting pty ltd
engineering consultants
innovation, ingenuity, inspiration

tilt renewables

GOLDER

PROJECT	WAVERLEY WIND FARM
DRAWING TITLE	WTG GROUND IMPROVEMENT CROSS-SECTION

DRAWN	S.M.M.	CHECKED	DBA	APPROVED	GAC
DRAWING STATUS	FOR REVIEW				
SCALE	SHOWN	SIZE	A3		
DRAWING CODE	18104250-013-R-02			REV	0

WTG08 RAP SETOUT

Mark	Length (m)	Easting (m)	Northing (m)
8-001	1.06	1731036.400	5594345.824
8-002	1.03	1731038.200	5594345.824
8-003	1.11	1731040.000	5594345.824
8-004	1.03	1731041.800	5594345.824
8-005	1.06	1731043.600	5594345.824
8-006	1.11	1731031.900	5594344.265
8-007	1.71	1731033.700	5594344.265
8-008	2.17	1731035.500	5594344.265
8-009	2.49	1731037.300	5594344.265
8-010	2.65	1731039.100	5594344.265
8-011	2.65	1731040.900	5594344.265
8-012	2.49	1731042.700	5594344.265
8-013	2.17	1731044.500	5594344.265
8-014	1.71	1731046.300	5594344.265
8-015	1.11	1731048.100	5594344.265
8-016	1.33	1731029.200	5594342.706
8-017	2.17	1731031.000	5594342.706
8-018	2.89	1731032.800	5594342.706
8-019	3.46	1731034.600	5594342.706
8-020	3.88	1731036.400	5594342.706

WTG08 RAP SETOUT

Mark	Length (m)	Easting (m)	Northing (m)
8-021	4.14	1731038.200	5594342.706
8-022	4.23	1731040.000	5594342.706
8-023	4.14	1731041.800	5594342.706
8-024	3.88	1731043.600	5594342.706
8-025	3.46	1731045.400	5594342.706
8-026	2.89	1731047.200	5594342.706
8-027	2.17	1731049.000	5594342.706
8-028	1.33	1731050.800	5594342.706
8-029	1.11	1731026.500	5594341.147
8-030	2.17	1731028.300	5594341.147
8-031	3.13	1731030.100	5594341.147
8-032	3.97	1731031.900	5594341.147
8-033	4.66	1731033.700	5594341.147
8-034	5.20	1731035.500	5594341.147
8-035	5.57	1731037.300	5594341.147
8-036	5.76	1731039.100	5594341.147
8-037	5.76	1731040.900	5594341.147
8-038	5.57	1731042.700	5594341.147
8-039	5.20	1731044.500	5594341.147
8-040	4.66	1731046.300	5594341.147

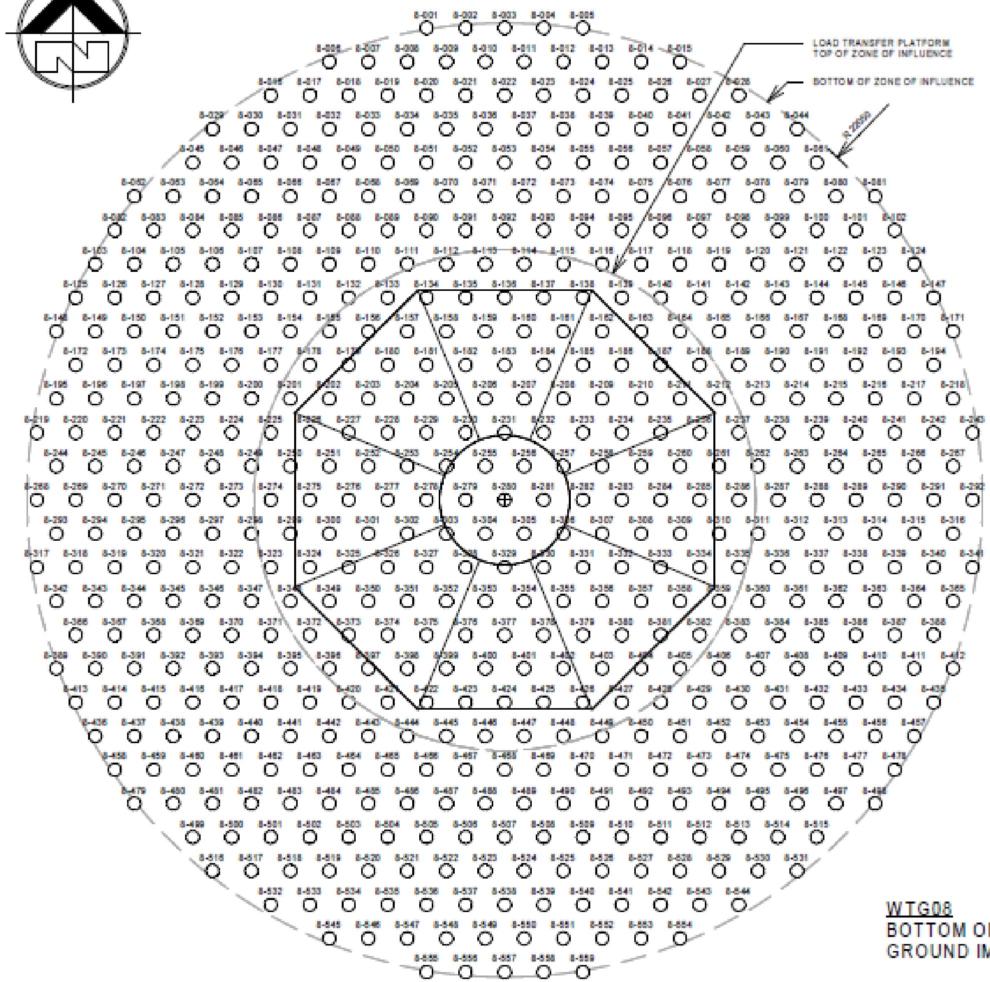
WTG08 RAP SETOUT

Mark	Length (m)	Easting (m)	Northing (m)
8-041	3.97	1731048.100	5594341.147
8-042	3.13	1731049.900	5594341.147
8-043	2.17	1731051.700	5594341.147
8-044	1.11	1731053.500	5594341.147
8-045	1.71	1731025.600	5594339.588
8-046	2.89	1731027.400	5594339.588
8-047	3.97	1731029.200	5594339.588
8-048	4.93	1731031.000	5594339.588
8-049	5.76	1731032.800	5594339.588
8-050	6.43	1731034.600	5594339.588
8-051	6.93	1731036.400	5594339.588
8-052	7.24	1731038.200	5594339.588
8-053	7.34	1731040.000	5594339.588
8-054	7.24	1731041.800	5594339.588
8-055	6.93	1731043.600	5594339.588
8-056	6.43	1731045.400	5594339.588
8-057	5.76	1731047.200	5594339.588
8-058	4.93	1731049.000	5594339.588
8-059	3.97	1731050.800	5594339.588
8-060	2.89	1731052.600	5594339.588

WTG08 RAP SETOUT

Mark	Length (m)	Easting (m)	Northing (m)
8-061	1.71	1731054.400	5594339.588
8-062	1.00	1731022.900	5594338.029
8-063	2.17	1731024.700	5594338.029
8-064	3.46	1731026.500	5594338.029
8-065	4.66	1731028.300	5594338.029
8-066	5.76	1731030.100	5594338.029
8-067	6.73	1731031.900	5594338.029
8-068	7.55	1731033.700	5594338.029
8-069	8.20	1731035.500	5594338.029
8-070	8.64	1731037.300	5594338.029
8-071	8.87	1731039.100	5594338.029
8-072	8.87	1731040.900	5594338.029
8-073	8.64	1731042.700	5594338.029
8-074	8.20	1731044.500	5594338.029
8-075	7.55	1731046.300	5594338.029
8-076	6.73	1731048.100	5594338.029
8-077	5.76	1731049.900	5594338.029
8-078	4.66	1731051.700	5594338.029
8-079	3.46	1731053.500	5594338.029
8-080	2.17	1731055.300	5594338.029

NOTES:
1. ALL TABLE MEASUREMENTS ARE IN METERS (m).
2. REFER 18104250-013-R-01 FOR GROUND IMPROVEMENT DETAILS.



WTG08
BOTTOM OF FOOTING RL: 26.75m
GROUND IMPROVEMENT RL: 15.40m

WTG08 RAP SETOUT

Mark	Length (m)	Easting (m)	Northing (m)
8-081	1.00	1731057.100	5594338.029
8-082	1.03	1731022.000	5594336.471
8-083	2.49	1731023.800	5594336.471
8-084	3.88	1731025.600	5594336.471
8-085	5.20	1731027.400	5594336.471
8-086	6.43	1731029.200	5594336.471
8-087	7.55	1731031.000	5594336.471
8-088	8.53	1731032.800	5594336.471
8-089	9.34	1731034.600	5594336.471
8-090	9.95	1731036.400	5594336.471
8-091	10.33	1731038.200	5594336.471
8-092	10.46	1731040.000	5594336.471
8-093	10.33	1731041.800	5594336.471
8-094	9.95	1731043.600	5594336.471
8-095	9.34	1731045.400	5594336.471
8-096	8.53	1731047.200	5594336.471
8-097	7.55	1731049.000	5594336.471
8-098	6.43	1731050.800	5594336.471
8-099	5.20	1731052.600	5594336.471
8-100	3.88	1731054.400	5594336.471
8-101	2.49	1731056.200	5594336.471
8-102	1.03	1731058.000	5594336.471
8-103	1.11	1731021.100	5594334.912
8-104	2.65	1731022.900	5594334.912
8-105	4.14	1731024.700	5594334.912
8-106	5.57	1731026.500	5594334.912
8-107	6.93	1731028.300	5594334.912
8-108	8.20	1731030.100	5594334.912
8-109	9.34	1731031.900	5594334.912
8-110	10.33	1731033.700	5594334.912
8-111	11.13	1731035.500	5594334.912
8-112	10.35	1731037.300	5594334.912
8-113	10.35	1731039.100	5594334.912
8-114	10.35	1731040.900	5594334.912
8-115	10.35	1731042.700	5594334.912
8-116	11.13	1731044.500	5594334.912
8-117	10.33	1731046.300	5594334.912
8-118	9.34	1731048.100	5594334.912
8-119	8.20	1731049.900	5594334.912
8-120	6.93	1731051.700	5594334.912
8-121	5.57	1731053.500	5594334.912
8-122	4.14	1731055.300	5594334.912
8-123	2.65	1731057.100	5594334.912
8-124	1.11	1731058.900	5594334.912
8-125	1.03	1731020.200	5594333.353
8-126	2.65	1731022.000	5594333.353
8-127	4.23	1731023.800	5594333.353
8-128	5.76	1731025.600	5594333.353
8-129	7.24	1731027.400	5594333.353
8-130	8.64	1731029.200	5594333.353
8-131	9.95	1731031.000	5594333.353
8-132	11.13	1731032.800	5594333.353
8-133	10.35	1731034.600	5594333.353
8-134	10.35	1731036.400	5594333.353
8-135	10.35	1731038.200	5594333.353
8-136	10.35	1731040.000	5594333.353
8-137	10.35	1731041.800	5594333.353
8-138	10.35	1731043.600	5594333.353
8-139	10.35	1731045.400	5594333.353
8-140	11.13	1731047.200	5594333.353
8-141	9.95	1731049.000	5594333.353
8-142	8.64	1731050.800	5594333.353
8-143	7.24	1731052.600	5594333.353
8-144	5.76	1731054.400	5594333.353
8-145	4.23	1731056.200	5594333.353
8-146	2.65	1731058.000	5594333.353
8-147	1.03	1731059.800	5594333.353
8-148	0.92	1731019.300	5594331.794
8-149	2.49	1731021.100	5594331.794
8-150	4.14	1731022.900	5594331.794
8-151	5.76	1731024.700	5594331.794
8-152	7.34	1731026.500	5594331.794
8-153	8.87	1731028.300	5594331.794
8-154	10.33	1731030.100	5594331.794
8-155	10.35	1731031.900	5594331.794
8-156	10.35	1731033.700	5594331.794
8-157	10.35	1731035.500	5594331.794
8-158	10.35	1731037.300	5594331.794
8-159	10.35	1731039.100	5594331.794
8-160	10.35	1731040.900	5594331.794
8-161	10.35	1731042.700	5594331.794
8-162	10.35	1731044.500	5594331.794
8-163	10.35	1731046.300	5594331.794
8-164	10.35	1731048.100	5594331.794
8-165	10.33	1731049.900	5594331.794
8-166	8.87	1731051.700	5594331.794
8-167	7.34	1731053.500	5594331.794
8-168	5.76	1731055.300	5594331.794
8-169	4.14	1731057.100	5594331.794
8-170	2.49	1731058.900	5594331.794

WTG08 RAP SETOUT

Mark	Length (m)	Easting (m)	Northing (m)
8-171	0.92	1731060.700	5594331.794
8-172	2.17	1731020.200	5594330.235
8-173	3.88	1731022.000	5594330.235
8-174	5.57	1731023.800	5594330.235
8-175	7.24	1731025.600	5594330.235
8-176	8.87	1731027.400	5594330.235
8-177	10.46	1731029.200	5594330.235
8-178	10.35	1731031.000	5594330.235
8-179	10.35	1731032.800	5594330.235
8-180	10.35	1731034.600	5594330.235
8-181	10.35	1731036.400	5594330.235
8-182	10.35	1731038.200	5594330.235
8-183	10.35	1731040.000	5594330.235
8-184	10.35	1731041.800	5594330.235
8-185	10.35	1731043.600	5594330.235
8-186	10.35	1731045.400	5594330.235
8-187	10.35	1731047.200	5594330.235
8-188	10.35	1731049.000	5594330.235
8-189	10.46	1731050.800	5594330.235
8-190	8.87	1731052.600	5594330.235
8-191	7.24	1731054.400	5594330.235
8-192	5.57	1731056.200	5594330.235
8-193	3.88	1731058.000	5594330.235
8-194	2.17	1731059.800	5594330.235
8-195	1.71	1731019.300	5594328.676
8-196	3.46	1731021.100	5594328.676
8-197	5.20	1731022.900	5594328.676
8-198	6.93	1731024.700	5594328.676
8-199	8.64	1731026.500	5594328.676
8-200	10.33	1731028.300	5594328.676
8-201	10.35	1731030.100	5594328.676
8-202	10.35	1731031.900	5594328.676
8-203	10.35	1731033.700	5594328.676
8-204	10.35	1731035.500	5594328.676
8-205	10.35	1731037.300	5594328.676
8-206	10.35	1731039.100	5594328.676
8-207	10.35	1731040.900	5594328.676
8-208	10.35	1731042.700	5594328.676
8-209	10.35	1731044.500	5594328.676
8-210	10.35	1731046.300	5594328.676
8-211	10.35	1731048.100	5594328.676
8-212	10.35	1731049.900	5594328.676
8-213	10.33	1731051.700	5594328.676
8-214	8.64	1731053.500	5594328.676
8-215	6.93	1731055.300	5594328.676
8-216	5.20	1731057.100	5594328.676
8-217	3.46	1731058.900	5594328.676
8-218	1.71	1731060.700	5594328.676
8-219	1.11	1731018.400	5594327.117
8-220	2.89	1731020.200	5594327.117
8-221	4.66	1731022.000	5594327.117
8-222	6.43	1731023.800	5594327.117
8-223	8.20	1731025.600	5594327.117
8-224	9.95	1731027.400	5594327.117
8-225	10.35	1731029.200	5594327.117
8-226	10.35	1731031.000	5594327.117
8-227	10.35	1731032.800	5594327.117
8-228	10.35	1731034.600	5594327.117
8-229	10.35	1731036.400	5594327.117
8-230	10.35	1731038.200	5594327.117
8-231	10.35	1731040.000	5594327.117
8-232	10.35	1731041.800	5594327.117
8-233	10.35	1731043.600	5594327.117
8-234	10.35	1731045.400	5594327.117
8-235	10.35	1731047.200	5594327.117
8-236	10.35	1731049.000	5594327.117
8-237	10.35	1731050.800	5594327.117
8-238	9.95	1731052.600	5594327.117
8-239	8.20	1731054.400	5594327.117
8-240	6.43	1731056.200	5594327.117
8-241	4.66	1731058.000	5594327.117
8-242	2.89	1731059.800	5594327.117
8-243	1.11	1731061.600	5594327.117
8-244	2.17	1731019.300	5594325.559
8-245	3.97	1731021.100	5594325.559
8-246	5.76	1731022.900	5594325.559
8-247	7.55	1731024.700	5594325.559
8-248	9.34	1731026.500	5594325.559
8-249	11.13	1731028.300	5594325.559
8-250	10.35	1731030.100	5594325.559
8-251	10.35	1731031.900	5594325.559
8-252	10.35	1731033.700	5594325.559
8-253	10.35	1731035.500	5594325.559
8-254	10.35	1731037.300	5594325.559
8-255	10.35	1731039.100	5594325.559
8-256	10.35	1731040.900	5594325.559
8-257	10.35	1731042.700	5594325.559
8-258	10.35	1731044.500	5594325.559
8-259	10.35	1731046.300	5594325.559
8-260	10.35	1731048.100	5594325.559
8-261	10.35	1731049.900	5594325.559
8-262	11.13	1731051.700	5594325.559
8-263	9.34	1731053.500	5594325.559
8-264	7.55	1731055.300	5594325.559
8-265	5.76	1731057.100	5594325.559
8-266	3.97	1731058.900	5594325.559
8-267	2.17	1731060.700	5594325.559
8-268	1.33	1731018.400	5594324.000
8-269	3.13	1731020.200	5594324.000
8-270	4.93	1731022.000	5594324.000

WTG08 RAP SETOUT

Mark	Length (m)	Easting (m)	Northing (m)
8-271	6.73	1731023.800	5594324.000
8-272	8.53	1731025.600	5594324.000
8-273	10.33	1731027.400	5594324.000
8-274	10.35	1731029.200	5594324.000
8-275	10.35	1731031.000	5594324.000
8-276	10.35	1731032.800	5594324.000
8-277	10.35	1731034.600	5594324.000
8-278	10.35	1731036.400	5594324.000
8-279	10.35	1731038.200	5594324.000
8-280	10.35	1731040.000	5594324.000
8-281	10.35	1731041.800	5594324.000
8-282	10.35	1731043.600	5594324.000
8-283	10.35	1731045.400	5594324.000
8-284	10.35	1731047.200	5594324.000
8-285	10.35	1731049.000	5594324.000
8-286	10.35	1731050.800	5594324.000
8-287	10.33	1731052.600	5594324.000
8-288	8.53	1731054.400	5594324.000
8-289	6.73	1731056.200	5594324.000
8-290	4.93	1731058.000	5594324.000
8-291	3.13	1731059.800	5594324.000
8-292	1.33	1731061.600	5594324.000
8-293	2.17	1731019.300	5594322.441
8-294	3.97	1731021.100	5594322.441
8-295	5.76	1731022.900	5594322.441
8-296	7.55	1731024.700	5594322.441
8-297	9.34	1731026.500	5594322.441
8-298	11.13	1731028.300	5594322.441
8-299	10.35	1731030.100	5594322.441
8-300	10.35	1731031.900	5594322.441
8-301	10.35	1731033.700	5594322.441
8-302	10.35	1731035.500	5594322.441
8-303	10.35	1731037.300	5594322.441
8-304	10.35	1731039.100	5594322.441
8-305	10.35	1731040.900	5594322.441
8-306	10.35	1731042.700	5594322.441
8-307	10.35	1731044.500	5594322.441
8-308	10.35	1731046.300	5594322.441
8-309	10.35	1731048.100	5594322.441
8-310	10.35	1731049.900	5594322.441
8-311	11.13	1731051.700	5594322.441
8-312	9.34	1731053.500	5594322.441
8-313	7.55	1731055.300	5594322.441
8-314	5.76	1731057.100	5594322.441
8-315	3.97	1731058.900	5594322.441
8-316	2.17	1731060.700	5594322.441
8-317	1.11	1731018.400	5594320.882
8-318	2.89	1731020.200	5594320.882
8-319	4.66	1731022.000	5594320.882
8-320	6.43	1731023.800	5594320.882
8-321	8.20	1731025.600	5594320.882
8-322	9.95	1731027.400	5594320.882
8-323	10.35	1731029.200	5594320.882
8-324	10.35	1731031.000	5594320.882
8-325	10.35	1731032.800	5594320.882
8-326	10.35	1731034.600	5594320.882
8-327	10.35	1731036.400	5594320.882
8-328	10.35	1731038.200	5594320.882
8-329	10.35	1731040.000	5594320.882
8-330	10.35	1731041.800	5594320.882
8-331	10.35	1731043.600	5594320.882
8-332	10.35	1731045.400	5594320.882
8-333	10.35	1731047.200	5594320.882
8-334	10.35	1731049.000	5594320.882
8-335	10.35	1731050.800	5594320.882
8-336	9.95	1731052.600	5594320.882
8-337	8.20	1731054.400	5594320.882
8-338	6.43	1731056.200	5594320.882
8-339	4.66	1731058.000	5594320.882
8-340	2.89	1731059.800	5594320.882
8-341	1.11	1731061.600	5594320.882
8-342	1.71	1731019.300	5594319.323
8-343	3.46	1731021.100	5594319.323
8-344	5.20	1731022.900	5594319.323
8-345	6.93	1731024.700	5594319.323
8-346	8.64	1731026.500	5594319.323
8-347	10.33	1731028.300	5594319.323
8-348	10.35	1731030.100	5594319.323
8-349	10.35	1731031.900	5594319.323
8-350	10.35	1731033.700	5594319.323
8-351	10.35	1731035.500	5594319.323
8-352	10.35	1731037.300	5594319.323
8-353	10.35	1731039.100	5594319.323
8-354	10.35	1731040.900	5594319.323
8-355	10.35	1731042.700	5594319.323
8-356	10.35	1731044.500	5594319.323
8-357	10.35	1731046.300	5594319.323
8-358	10.35	1731048.100	5594319.323
8-359	10.35	1731049.900	5594319.323
8-360	10.33	1731051.700	5594319.323
8-361	8.64	1731053.500	5594319.323
8-362	6.93	1731055.300	5594319.323
8-363	5.20	1731057.100	5594319.323
8-364	3.46	1731058.900	5594319.323
8-365	1.71	1731060.700	5594319.323
8-366	2.17	1731020.200	5594317.764
8-367	3.88	1731022.000	5594317.764
8-368	5.57	1731023.800	5594317.764
8-369	7.24	1731025.600	5594317.764
8-370	8.87	1731027.400	5594317.764

WTG08 RAP SETOUT

Mark	Length (m)	Easting (m)	Northing (m)
8-371	10.46	1731029.200	5594317.764
8-372	10.35	1731031.000	5594317.764
8-373	10.35	1731032.800	5594317.764
8-374	10.35	1731034.600	5594317.764
8-375	10.35	1731036.400	5594317.764
8-376	10.35	1731038.200	5594317.764
8-377	10.35	1731040.000	5594317.764
8-378	10.35	1731041.800	5594317.764
8-379	10.35	1731043.600	5594317.764
8-380	10.35	1731045.400	5594317.764
8-381	10.35	1731047.200	5594317.764
8-382	10.35	1731049.000	5594317.764
8-383	10.46	1731050.800	5594317.764
8-384	8.87	1731052.600	5594317.764
8-385	7.24	1731054.400	5594317.764
8-386	5.57	1731056.200	5594317.764
8-387	3.88	1731058.000	5594317.764
8-388	2.17	1731059.800	5594317.764
8-389	0.92	1731019.300	5594316.206
8-390	2.49	1731021.100	5594316.206
8-391	4.14	1731022.900	5594316.206
8-392	5.76	1731024.700	5594316.206
8-393	7.34	1731026.500	5594316.206
8-394	8.87	1731028.300	5594316.206
8-395	10.33	1731030.100	5594316.206
8-396	10.35	1731031.900	5594316.206
8-397	10.35	1731033.700	5594316.206
8-398	10.35	1731035.500	5594316.206
8-399	10.35	1731037.300	5594316.206
8-400	10.35	1731039.100	5594316.206
8-401	10.35	1731040.900	5594316.206
8-402	10.35	1731042.700	5594316.206
8-403	10.35	1731044.500	5594316.206
8-404	10.35	1731046.300	5594316.206
8-405	10.35	1731048.100	5594316.206
8-406	10.33	1731049.900	5594316.206
8-407	8.87	1731051.700	5594316.206
8-408	7.34	1731053.500	5594316.206
8-409	5.76	1731055.300	5594316.206
8-410	4.14	1731057.100	5594316.206
8-411	2.49	1731058.900	5594316.206
8-412	0.92	1731060.700	5594316.206
8-413	1.03	1731020.200	5594314.647
8-414	2.65	1731022.000	5594314.647
8-415	4.23	1731023.800	5594314.647
8-416	5.76	1731025.600	5594314.647
8-417	7.24	1731027.400	5594314.647
8-418	8.64	1731029.200	5594314.647
8-419	9.95	1731031.000	5594314.647
8-420	11.13	1731032.800	5594314.647
8-421	10.35	1731034.600	5594314.647
8-422	10.35	1731036.400	5594314.647
8-423	10.35	1731038.200	5594314.647
8-424	10.35	1731040.000	5594314.647
8-425	10.35	1731041.800	5594314.647
8-426	10.35	1731043.600	5594314.647
8-427	10.35	1731045.400	5594314.647
8-428	11.13	1731047.200	5594314.647
8-429	9.95	1731049.000	5594314.647
8-430	8.64	1731050.800	5594314.647
8-431	7.24	1731052.600	5594314.647
8-432	5.76	1731054.400	5594314.647
8-433	4.23	1731056.200	5594314.647
8-434	2.65	1731058.000	5594314.647
8-435	1.03	1731059.800	5594314.647
8-436	1.11	1731021.100	5594313.088
8-437	2.65	1731022.900	5594313.088
8-438	4.14	1731024.700	5594313.088
8-439	5.57	1731026.500	5594313.088
8-440	6.93	1731028.300	5594313.088
8-441	8.20	1731030.100	5594313.088
8-442	9.34	1731031.900	5594313.088
8-443	10.33	1731033.700	5594313.088
8-444	11.13	1731035.500	5594313.088
8-445	10.35	1731037.300	5594313.088
8-446	10.35	1731039.100	5594313.088
8-447	10.35	1731040.900	5594313.088
8-448	10.35	1731042.700	5594313.088
8-449	11.13	1731044.500	5594313.088
8-450	10.33	1731046.300	5594313.088
8-451	9.34	1731048.100	5594313.088
8-452	8.20	1731049.900	5594313.088
8-453	6.93	1731051.700	5594313.088
8-454	5.57	1731053.500	5594313.088
8-455	4.14	1731055.300	5594313.088
8-456	2.65	1731057.100	5594313.088
8-457	1.11	1731058.900	5594313.088
8-458	1.03	1731022.000	5594311.529
8-459	2.49	1731023.800	5594311.529
8-460	3.88	1731025.600	5594311.529
8-461	5.20	1731027.400	5594311.529
8-462	6.43	1731029.200	5594311.529
8-463	7.55	1731031.000	5594311.529
8-464	8.53	1731032.800	5594311.529
8-465	9.34	1731034.600	5594311.529
8-466	9.95	1731036.400	5594311.529
8-467	10.33	1731038.200	5594311.529
8-468	10.46	1731040.000	5594311.529
8-469	10.33	1731041.800	5594311.529
8-470	9.95	1731043.600	5594311.529

WTG08 RAP SETOUT

Mark	Length (m)	Easting (m)	Northing (m)
8-471	9.34	1731045.400	5594311.529
8-472	8.53	1731047.200	5594311.529
8-473	7.55	1731049.000	5594311.529
8-474	6.43	1731050.800	5594311.529
8-475	5.20	1731052.600	5594311.529
8-476	3.88	1731054.400	5594311.529
8-477	2.49	1731056.200	5594311.529
8-478	1.03	1731058.000	5594311.529
8-479	1.00	1731022.900	5594309.970
8-480	2.17	1731024.700	5594309.970
8-481	3.46	1731026.500	5594309.970
8-482	4.66	1731028.300	5594309.970
8-483	5.76	1731030.100	5594309.970
8-484	6.73	1731031.900	5594309.970
8-485	7.55	1731033.700	5594309.970
8-486	8.20	1731035.500	5594309.970
8-487	8.64	1731037.300	5594309.970
8-488	8.87	1731039.100	5594309.970
8-489	8.87	1731040.900	5594309.970
8-490	8.64	1731042.700	5594309.970
8-491	8.20	1731044.500	5594309.970
8-492	7.55	1731046.300	5594309.970
8-493	6.73	1731048.100	5594309.970
8-494	5.76	1731049.900	5594309.970
8-495	4.66	1731051.700	5594309.970
8-496	3.46	1731053.500	5594309.970
8-497	2.17	1731055.300	5594309.970
8-498	1.00	1731057.100	5594309.970
8-499	1.71	1731025.600	5594308.411
8-500	2.89	1731027.400	5594308.411
8-501	3.97	1731029.200	5594308.411
8-502	4.93	1731031.000	5594308.411
8-503	5.76	1731032.800	5594308.411
8-504	6.43	1731034.600	5594308.411
8-505	6.93	1731036.400	5594308.411
8-506	7.24	1731038.200	5594308.411
8-507	7.34	1731040.000	5594308.411
8-508	7.24	1731041.800	5594308.411
8-509	6.93	1731043.600	5594308.411
8-510	6.43	1731045.400	5594308.411
8-511	5.76	1731047.200	5594308.411
8-512	4.93	1731049.000	5594308.411
8-513	3.97	1731050.800	5594308.411
8-514	2.89	1731052.600	5594308.411
8-515	1.71	1731054.400	5594308.411
8-516	1.11	1731026.500	5594306.852
8-517	2.17	1731028.300	5594306.852
8-518	3.13	1731030.100	5594306.852
8-519	3.97	1731031.900	5594306.852
8-520	4.66	1731033.700	5594306.852
8-521	5.20	1731035.500	5594306.852
8-522	5.57	1731037.300	5594306.852
8-523	5.76	1731039.100	5594306.852
8-524	5.76	1731040.900	5594306.852
8-525	5.57	1731042.700	5594306.852
8-526	5.20	1731044.500	5594306.852
8-527	4.66	1731046.300	5594306.852
8-528	3.97	1731048.100	5594306.852
8-529	3.13	1731049.900	5594306.852
8-530	2.17	1731051.700	5594306.852
8-531	1.11	1731053.500	5594306.852
8-532	1.33	1731029.200	5594305.294
8-533	2.17	1731031.000	5594305.294
8-534	2.89	1731032.800	5594305.294
8-535	3.46	1731034.600	5594305.294
8-536	3.88	1731036.400	5594305.294
8-537	4.14	1731038.200	5594305.294
8-538	4.23	1731040.000	5594305.294
8-539	4.14	1731041.800	5594305.294
8-540	3.88	1731043.600	5594305.294
8-541	3.46	1731045.400	5594305.294
8-542	2.89	1731047.200	5594305.294
8-543	2.17	1731049.000	5594305.294
8-544	1.33	1731050.800	5594305.294
8-545	1.11	1731031.900	5594303.735
8-546	1.71	1731033.700	5594303.735
8-547	2.17	1731035.500	5594303.735
8-548	2.49	1731037.300	5594303.735
8-549	2.65	1731039.100	5594303.735
8-550	2.65	1731040.900	5594303.735
8-551	2.49	1731042.700	5594303.735
8-552	2.17	1731044.500	5594303.735
8-553	1.71	1731046.300	5594303.735
8-554	1.11	1731048.100	5594303.735
8-555	1.06	1731036.400	5594302.176
8-556	1.03	1731038.200	5594302.176
8-557	1.11	1731040.000	5594302.176
8-558	1.03	1731041.800	5594302.176
8-559	1.06	1731043.600	5594302.176
	3782.62		

No	DESCRIPTION	DATE
0	FOR REVIEW	18.11.19

REVISION HISTORY

i3 consulting pty ltd
engineering consulants
innovation, ingenuity, inspiration

GOLDER

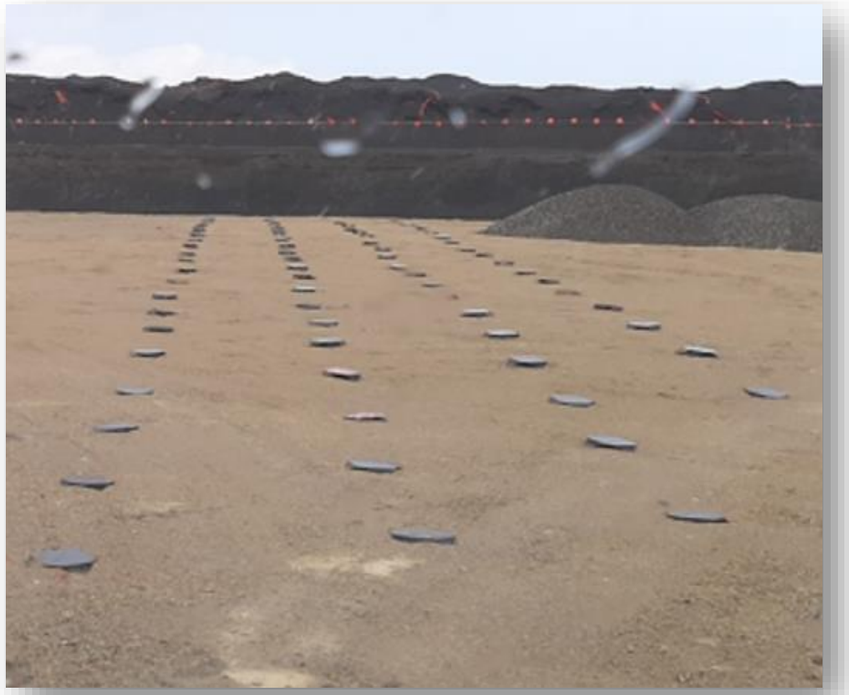
PROJECT
WAVERLEY WIND FARM

DRAWING TITLE
WTG GROUND IMPROVEMENT RAP SETOUT PLAN
WTG08

DRAWN	B.M.R.	CHECKED	D.B.A.	APPROVED	G.A.C.
DRAWING STATUS		FOR REVIEW			
SCALE 1 : 250	SIZE A3				

DRAWING CODE 18104250-013-R-03-WTG08 REV 0


CLL

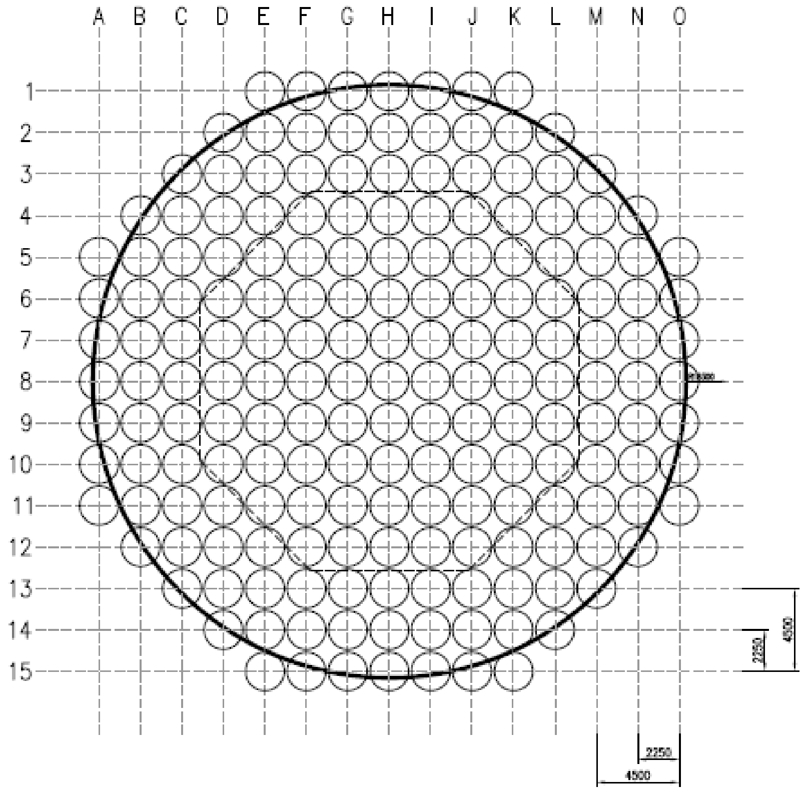



CLL

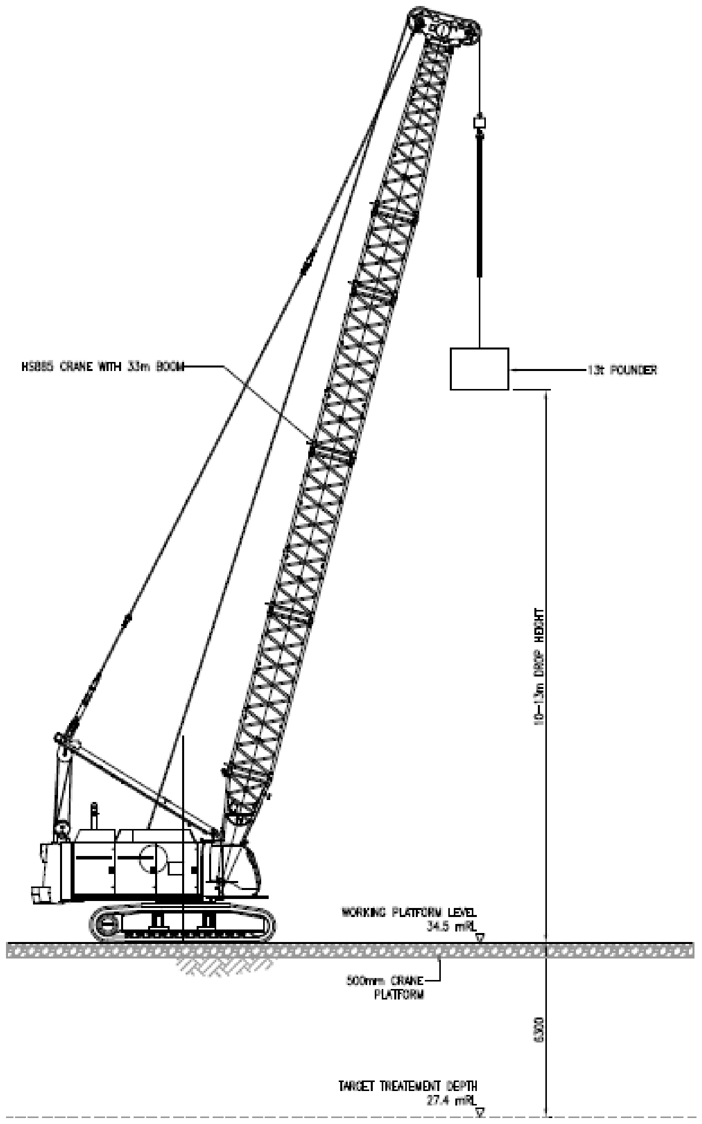
TABLE 1 – WTG31 DC PASS SEQUENCE					
PASS	GRID (mxm)	WEIGHT (t)	DROP HEIGHT (m)	NO. OF DROPS PER POINT	TOTAL POINTS
1	4.5x4.5	13	13	10	44
2	4.5x4.5	13	13	10	44
3	4.5x4.5	13	10	10	45
4	4.5x4.5	13	10	10	52

NOTE:

1. REFER TO TILT CONSTRUCTION DRAWINGS FOR WTG DIMENSIONS AND REQUIRED GROUND IMPROVEMENT TREATMENT EXTENTS AND DEPTHS.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE BPC DYNAMIC COMPACTION SPECIFICATION GP236-01-SPC-001.
3. A DC METHOD STATEMENT AND ITP SHALL BE REVIEWED AND APPROVED BY THE DC DESIGNER AND PROJECT MANAGER BEFORE STARTING WORK ON ANY BASE.
4. CRANE PLATFORM MATERIAL TO CONSIST OF COMPACTED FACE ROCK (OR EQUIVALENT APPROVED) WITH LIMITED FINES AND NO CLAY OR SILT.
5. THE POINTS FOR EACH SUBSEQUENT PASS SHALL BE OFFSET FROM THE PREVIOUS PASS.
6. IMPRINTS SHALL BE PROGRESSIVELY FILLED IN WITH CRANE PLATFORM MATERIAL TO MAINTAIN THE SAME WORKING LEVEL THROUGHOUT TREATMENT.
7. REFER TO TABLE 1 FOR DC PASS SCHEDULE.



A DC POINT LAYOUT



A SECTION 1:100

THIS DRAWING HAS BEEN PREPARED FOR FLETCHER CONSTRUCTION USE ONLY. USE BY OTHER PARTIES IS AT THEIR OWN RISK UNLESS AGREED TO IN WRITING.

No.	Date	Revision	By
0	20.01.20	FOR CONSTRUCTION	CT

	By	Date
Design	CT	JAN–20
Drawn	CT	JAN–20
Dsg Chk	TP	JAN–20
Dwg Chk	TP	JAN–20
Approved For Construction	TP	JAN–20

DATE PLOTTED: Fri Jan 17 11:18:43 2020 BY: ChrisT

BRIAN PERRY CIVIL

PROJECT: WAVERLEY WIND FARM

TITLE: WGT31 DYNAMIC COMPACTION GROUND IMPROVEMENT GENERAL ARRANGEMENT

DRAWING No: GP236-31-DWG-001 REVISION: 0

STAMP: FOR CONSTRUCTION

ORIGINAL SIZE A1

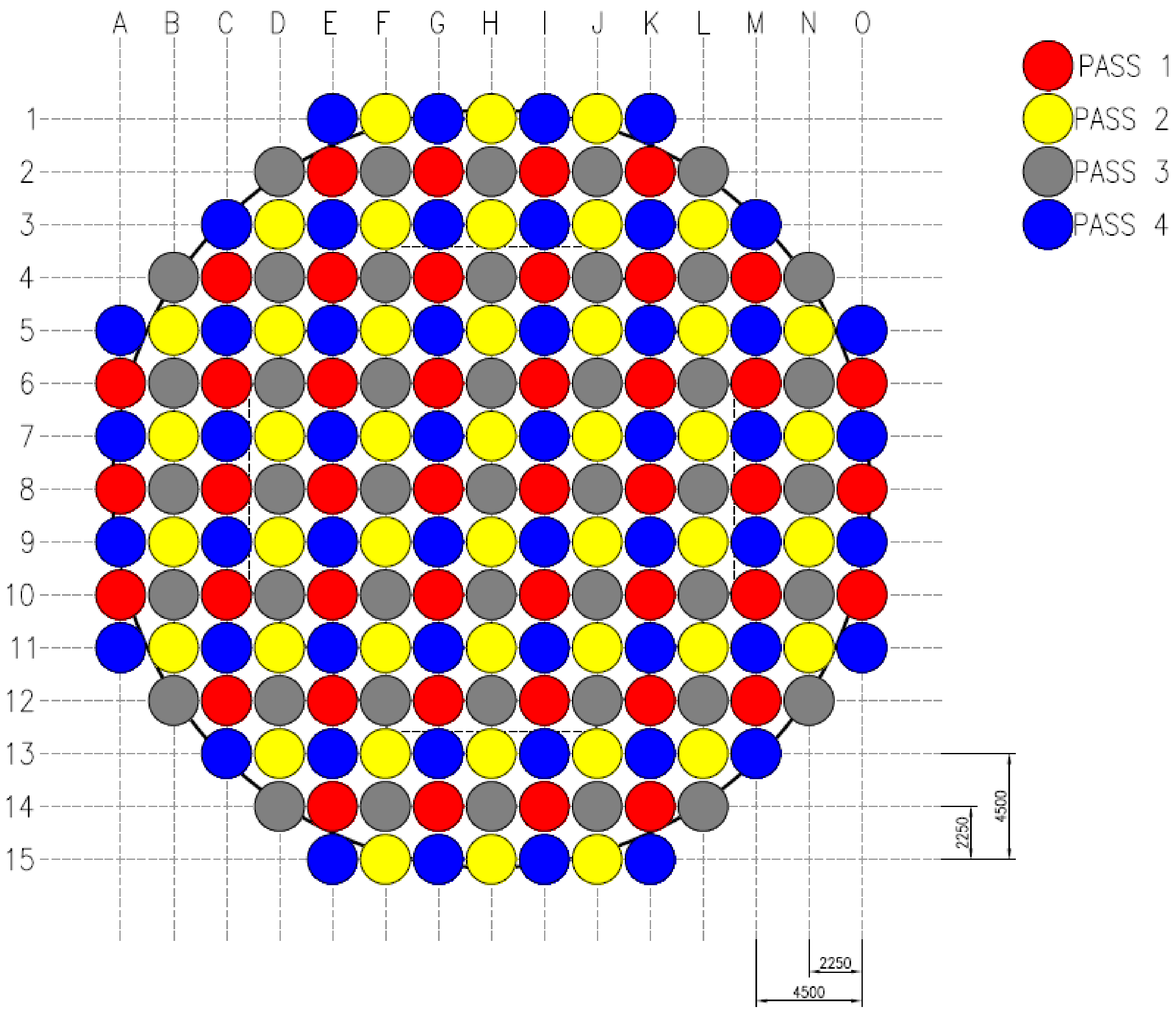


TABLE 1 — WTG31 DC PASS SEQUENCE					
PASS	GRID (mxm)	WEIGHT (t)	DROP HEIGHT (m)	NO. OF DROPS PER POINT	TOTAL POINTS
1	4.5x4.5	13	13	10	44
2	4.5x4.5	13	13	10	44
3	4.5x4.5	13	10	10	45
4	4.5x4.5	13	10	10	52

No.	Date	Revision	By
0	20.01.20	FOR CONSTRUCTION	CT

	By	Date
Design	CT	JAN-20
Drawn	CT	JAN-20
Dsg Chk	TP	JAN-20
Dwg Chk	TP	JAN-20
Approved For Construction	TP	JAN-20

BRIAN PERRY CIVIL

PROJECT: WAVERLEY WIND FARM

TITLE: WGT31 DYNAMIC COMPACTION GROUND IMPROVEMENT DC PASSES – SUMMARY

FCI DRAWING No: GP236-31-DWG-002 REVISION: 0

STAMP: FOR CONSTRUCTION

DATE PLOTTED: Fri Jan 17 11:18:43 2020 BY: ChrisT

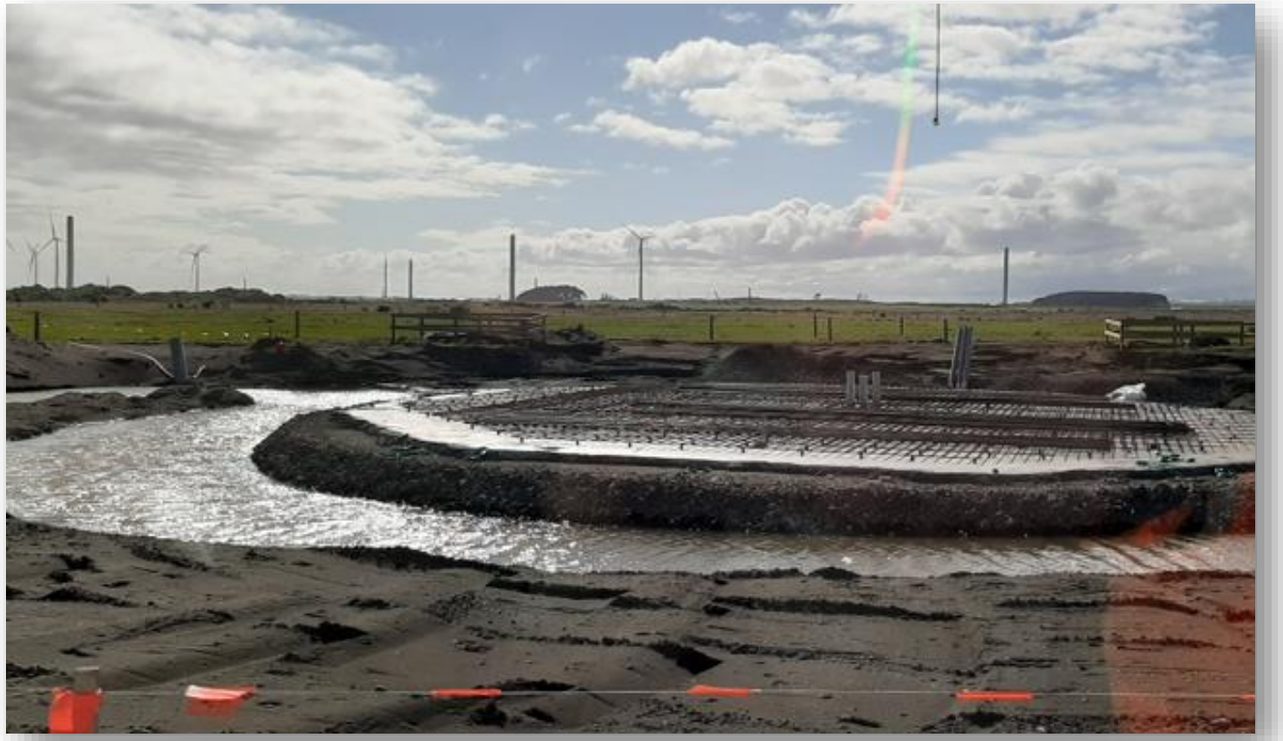
ORIGINAL SIZE A1

CHALLENGES
THE SITE

- Farm operations
  - Working farm dry stock / winter grazing farm, operational during construction
  - Hawera milk plant - Transpower outages, Kiwirail scheduling, RTO’s, etc.

- Geotechnical
  - Subsurface conditions requiring ground improvement to mitigate liquification & lateral spread
  - Sesimic shot across the site and pre / post CPT’s at all 31 sites
  - Rammed aggregate piers and dynamic compaction designed specific to each site

- Ground Conditions & Environment
  - Water table
  - Black sand & shell rock
  - Coastal environment
  - Environmental & ecological buffer zones, site / offsite works & work seasons



CHALLENGES
COVID-19

- COVID-19 - Level 4 / Level 3 / Level 2 restrictions;
  - Ensure the health and well being of the community and workforce;
  - Manage global supply chain disruption;
  - Manage local supply chain disruption;
  - Optimise NZ resources & skills base;
  - Optimise overseas resources & essential worker scheduling, quarantine, etc.

Adjust, Adapt, Review

Before arriving on site

- Each contractor must have a **plan** detailing the steps they will take to mitigate risks, including those presented by COVID-19. The details of the plan must be communicated to workers before they start work.
- Where possible, conduct a remote induction before arrival on site, this can be done via video conferencing or by phone. If an in-person induction is required, the physical distancing and hygiene protocol must be followed.
- All workers should follow the personal health flowchart to confirm they are safe to be on site.
- Employers must have an understanding of how workers will travel to and from site and will communicate the site transportation protocol to all.
- Ensure all workers understand when additional PPE may be required due to COVID-19 and that workers have access to the correct PPE as per the Ministry of Health PPE Guide and Worksafe guidelines. When required to use face masks or gloves please follow these processes.

Site entry

- Only essential personnel are to access the site. All office employees supporting a project will work remotely, where possible.
- A daily register of workers entering and leaving site must be completed along with a health declaration. If electronic sign in machines are used, these must be cleaned and sanitised after each use. Use your existing sign in register or the example sign-in register.
- Signage reminding workers of the COVID-19 physical distancing and hygiene protocol will be posted at the site entrance and in common areas as appropriate.
- If an in-person induction is required, the physical distancing and hygiene protocol must be followed.

Site operations

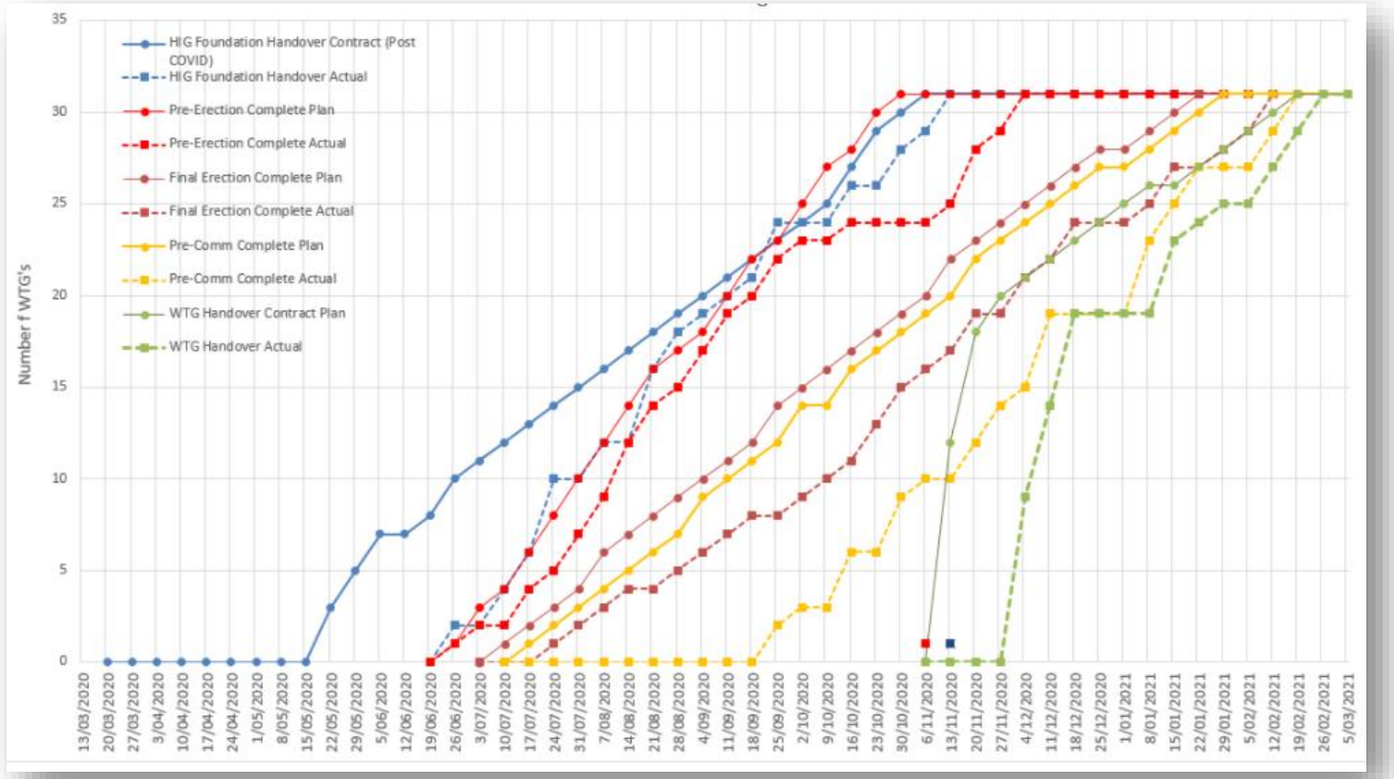
- All work is to be undertaken in such a way as to reduce any possible contact between workers and to promote physical distancing wherever possible, as per the physical distancing and hygiene protocol.
- All visitors to the site, such as necessary delivery workers, will be restricted to one person wherever possible. These workers must follow the site transportation protocol.
- All offices and jobsites must implement cleaning measures as per the Cleaning Guide.
- All tools, equipment, plant and vehicles must be used in alignment with the Cleaning Guide.
- Toolbox talks should be held with physical distancing in place as per the physical distancing and hygiene protocol. A COVID-19 level 3 Toolbox Talk is available for use to assist with your Toolbox Talks.
- Additional sanitary measures are to be implemented on site to prevent the spread of COVID-19 e.g. hand washing stations, provision of additional hand sanitizer, provision of disinfectant wiping

Leaving site

- Workers must use the sign-in register to sign out.
- When returning home, workers will need to follow the necessary hygiene measures.
- Each site must be cleaned and sanitised at the end of the working day or end of each shift, as per the Cleaning Guide.
- All waste and disposable PPE must be must be removed from site and securely disposed of as per the Cleaning Guide. Cleaning Guide.
- Workers must follow the site transportation protocol

Management Protocols

- Have an up to date **site plan** that is communicated and agreed with the appropriate persons.
- Review contractors site plans
- Communicate the site expectations and prevention measures to all workers and contractors
- **A risk register** must be compiled for every project before work starts on site and kept current throughout the project.
- Maintain a sign-in register and detailed work schedule to understand the movements and activities of all workers in the event of an exposure to COVID-19.
- Have a **COVID-19 emergency response plan** must be in place.
- Have a protocol for workers who may feel unwell, as per the **COVID-19 emergency response plan.**
- Complete an **Exposure Report** in the event of a potential or actual exposure.
- Stay in contact with workers who may be in isolation or working remotely.
- Assist workers to access mental health and wellbeing information– e.g. Mates in Construction etc.
- Don't forget your normal health and safety obligations still apply. These Protocols are in addition to your usual health and safety controls.
- A site separation map detailing access and exit points will be completed.
- Hold toolbox talks regularly to keep workers up to date with COVID-19 protocols as we progress through stages.


HIG Foundation Handover Contract (Post COVID)
HIG Foundation Handover Actual
Pre-Erection Complete Plan
Pre-Erection Complete Actual
Final Erection Complete Plan
Final Erection Complete Actual
Pre-Comm Complete Plan
Pre-Comm Complete Actual
WTG Handover Contract Plan
WTG Handover Actual
Number f WTG's
0
5
10
15
20
25
30
35
13/03/2020
20/03/2020
27/03/2020
3/04/2020
10/04/2020
17/04/2020
24/04/2020
1/05/2020
8/05/2020
15/05/2020
22/05/2020
29/05/2020
5/06/2020
12/06/2020
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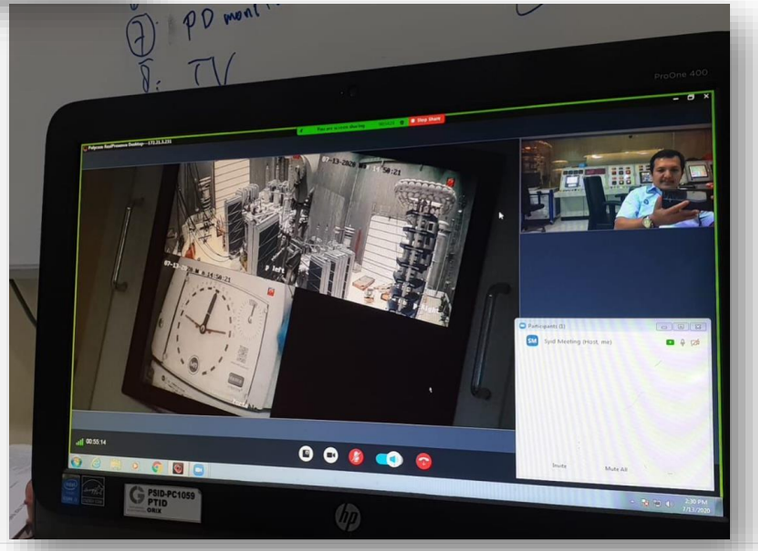
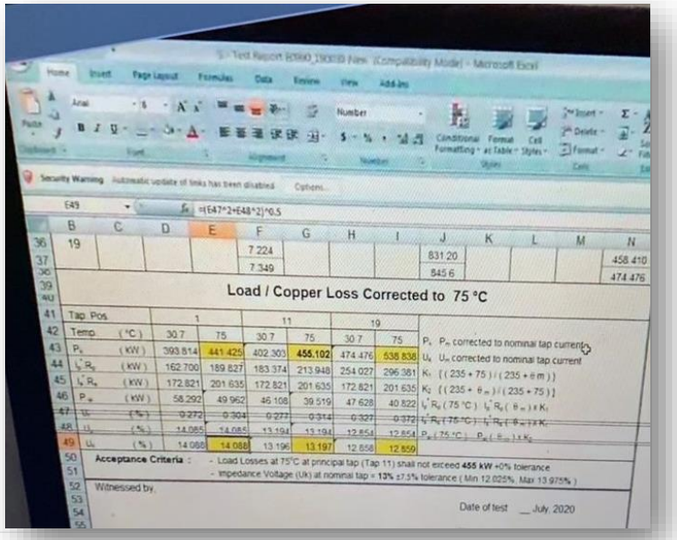
26/02/2021
5/03/2021


MCINTOSH
Big Bill


CHIPOL





Load / Copper Loss Corrected to 75 °C

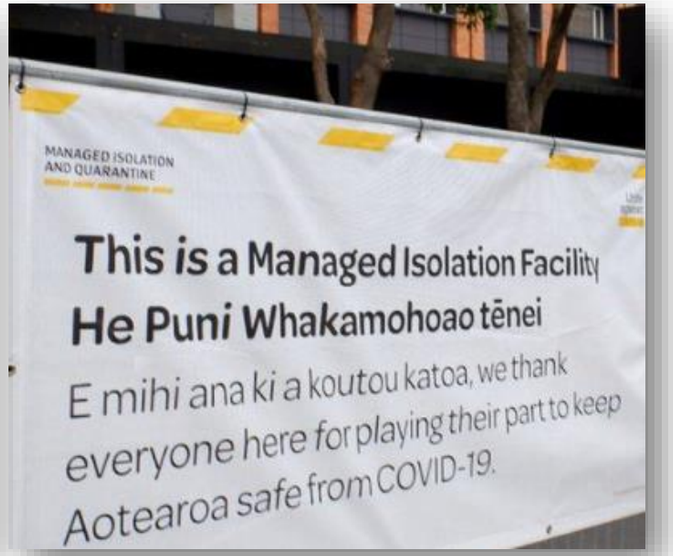
Tap Pos.		1		11		19	
Temp.	(°C)	30.7	75	30.7	75	30.7	75
P_c	(kW)	393.814	441.425	402.303	455.102	474.476	538.838
$I_r^2 R_w$	(kW)	162.700	189.827	183.374	213.948	254.027	296.381
$I_r^2 R_w$	(kW)	172.821	201.635	172.821	201.635	172.821	201.635
P_w	(kW)	58.292	49.962	46.108	39.519	47.628	40.822
U_r	(%)	0.272	0.304	0.277	0.314	0.327	0.372
U_x	(%)	14.085	14.085	13.194	13.194	12.854	12.854
U_k	(%)	14.088	14.088	13.196	13.197	12.858	12.859

P_c P_w corrected to nominal tap current
U_x U_w corrected to nominal tap current
K_c $\{ (235 + 75) / (235 + \theta_m) \}$
K_2 $\{ (235 + \theta_m) / (235 + 75) \}$
$I_r^2 R_r (75\,°C)$ $I_r^2 R_r (\theta_m) \times K_c$
$P_x (75\,°C)$ $P_x (\theta_m) \times K_2$

Acceptance Criteria :
- Load Losses at 75°C at principal tap (Tap 11) shall not exceed **455 kW** +0% tolerance
- Impedance Voltage (Uk) at nominal tap = **13%** ±7.5% tolerance (Min 12.025%, Max 13.975%)

Witnessed by,

Date of test __ July, 2020


MANAGED ISOLATION
AND QUARANTINE
This is a Managed Isolation Facility
He Puni Whakamohoao tēnei
E mihi ana ki a koutou katoa, we thank
everyone here for playing their part to keep
Aotearoa safe from COVID-19.

THE RESULT

Early works:	3rd Aug 2019
NTP:	4th Sept 2019
First pour:	24th Jan 2020
First lift:	10th Jul 2020
Last pour:	15th Oct 2020
First generation:	16th Nov 2020
Last lift:	12th Feb 2021
Full generation:	25th Feb 2021
Full takeover:	4th Mar 2021

WAIPIPI WIND FARM
RESULTS

- Under budget;
- Final Takeover granted 5th March (with 5 week Level 4 impact & 2.5 week Level 3 impact);
- >310,000 on site man-hrs (156 FTE) during 18 month construction period;
- 1 LTI;
- 830 inspections, audits, observations, interventions;
- No environmental incidents;
- No citations;
- No community complaints;
- Est $70M into regional economy.


WAIPIPI WIND FARM
DRY GIN
COMMISSIONED NOV. 2020


renewables
THANK YOU