

APPENDIX 3

Preliminary Noise Impact Assessment

Barneys Reef Wind Farm

Preliminary Noise Impact Assessment

S6763C6

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GLOSSARY

A-weighting	Frequency adjustment applied to measured noise levels to replicate the frequency response of the human ear.
Ambient noise level	The noise level of the existing noise sources in the environment (in the absence of the wind farm).
Associated Residence	A landowner with a commercial agreement with the wind farm.
Background noise level	The ambient noise level which excludes intermittent noise sources.
Bulletin	<i>Wind Energy: Noise Assessment Bulletin - For State significant wind energy development (NSW Department of Planning and Environment, December 2016)</i>
CONCAWE	<i>The oil companies' international study group for conservation of clean air and water - Europe, The propagation of noise from petrochemical complexes to neighbouring communities (May 1981).</i>
dB(A)	A-weighted noise or sound power level in decibels.
EIS	Environmental Impact Statement
Equivalent noise level	Energy averaged noise level over a prescribed period of time
Non-associated Residence	Not an Associated Residence
SEARs	Secretary's Environmental Assessment Requirements
Sound power level	A measure of the sound energy emitted from a source of noise.
The Project	Barneys Reef Wind Farm
Weather category 6	Weather category which is most conducive for the propagation of noise, resulting in highest predicted noise levels when using CONCAWE.
Worst-case	Conditions resulting in the highest noise level at residences.
WTG	Wind turbine generator comprising a three bladed, upstream facing, horizontal axis turbine mounted on steel towers with a common set of generic design components comprising a foundation, tower, nacelle, hub and blades

1 INTRODUCTION

A Preliminary Noise Impact Assessment has been made in accordance with the New South Wales Planning and Environment *Wind Energy: Noise Assessment Bulletin* (**the Bulletin**) for the proposed Barneys Reef Wind Farm (**the Project**), north of Gulgong in New South Wales (NSW).

This preliminary noise impact assessment has been prepared to assist the Project in applying for the Secretary's Environmental Assessment Requirements (**SEARs**) and to guide the preparation of the Environmental Impact Statement (**EIS**) for the Project.

2 PRELIMINARY NOISE IMPACT ASSESSMENT

The preliminary noise impact assessment is based on the following:

- Wind turbine generator (**WTG**) locations as summarised in Appendix A. The locations are for the purposes of a preliminary assessment only;
- Residence locations summarised in Appendix B, including the status of the residence (associated or non-associated), the nearest WTG to the residence, the distance to the nearest WTG and the preliminary predicted noise level;
- Local topographical contours;
- Noise level data for an indicative WTG (being the *Vestas V150-5.6*). The indicative WTG is for the purposes of a preliminary assessment only; and,
- The WTG being free of any excessive levels of tonality or any other special noise characteristics at the residences

2.1 Methodology

Predictions have been made using the CONCAWE noise propagation model and SoundPLAN noise modelling software. The sound propagation model considers the following influences:

- sound power levels and WTG locations;
- separation distances between WTGs and residences;
- topography of the area;
- influence of the ground;
- air absorption; and,
- meteorological conditions.

The CONCAWE system divides meteorological conditions into six separate “weather categories”, depending on wind speed, wind direction, time of day and level of cloud cover. Weather Category 6 provides “worst-case” (i.e. highest noise level) conditions.

The preliminary assessment has been based on the following input conditions:

- weather category 6 (representing a temperature inversion and wind conditions that assist with the propagation of noise);
- atmospheric conditions at 10°C and 80% relative humidity (representing conditions that result in low levels of noise absorption from the atmosphere);
- wind direction from all noise sources to the particular residence under consideration, even in circumstances where sources are located in opposite directions from the residence (representing the worst-case noise propagation due to wind);
- acoustically soft ground (representing the pastoral nature of the land); and,
- maximum barrier attenuation from topography of 2 dB(A) (representing a conservative assessment of any shielding provided by topography).

2.2 Criteria

The Bulletin provides a baseline noise criterion of 35 dB(A) at non-associated residences. The Bulletin enables the baseline criterion to be increased at associated residences.

The background noise level monitoring to be conducted as part of the EIS process may result in an increase in the noise assessment criteria above that provided by the baseline.

2.3 Results

The 35 dB(A) noise contour (the baseline noise level criterion in the Bulletin) and the residences are shown in Figure 1 below for the times when the proposed wind farm is producing the highest level of noise (corresponding to hub height wind speeds of 11m/s and above).

The results at non-associated residences have been compared against the baseline criterion of the Bulletin. The baseline criterion of 35 dB(A) is achieved at all non-associated residences with the exception of residences 2, 126, and 346.

The Project will be refined during the preparation of the EIS to ensure compliance at all residences when compared against the noise criteria determined from the background noise monitoring. Modifications to the WTG layout (such as removing turbines) or the development of a curtailment strategy are options that could be used to ensure compliance at all associated and non-associated residences.

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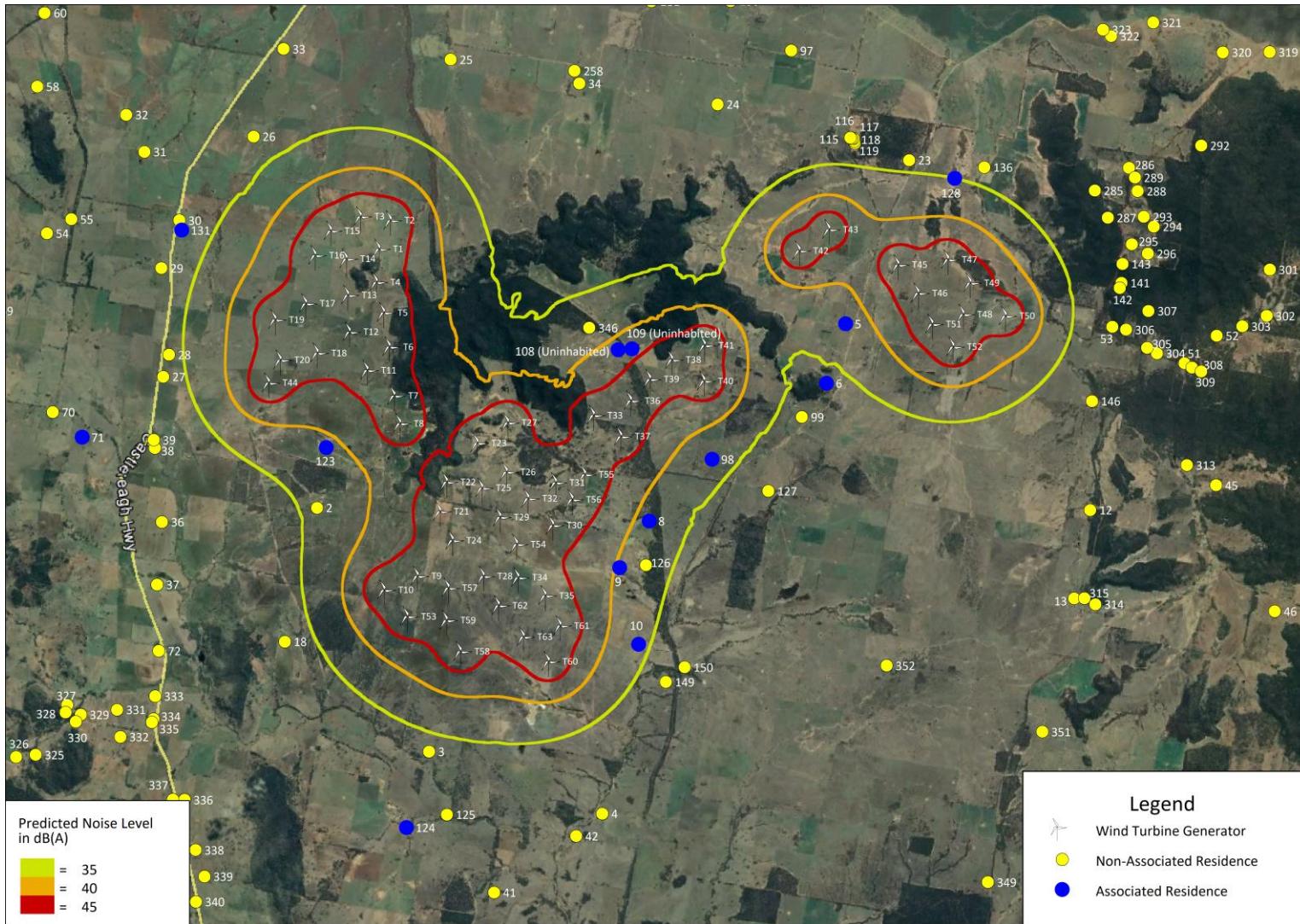


Figure 1: Noise contours with WTGs and nearby Residences

3 ACOUSTIC IMPACT ASSESSMENT

A detailed acoustic assessment will be prepared for inclusion in the EIS addressing the following components:

- WTG noise in accordance with the Bulletin;
- Ancillary noise in accordance with the *NSW Noise Policy for Industry, 2017*;
- Construction noise in accordance with the *Interim Construction Noise Guideline, 2009*;
- Traffic noise in accordance with the *NSW Road Noise Policy, 2011*; and
- Vibration in accordance with *Assessing Vibration: A Technical Guideline, 2006*.

The EIS will incorporate the following information to assist in considering the detailed assessment:

1. Background noise monitoring results;
2. Establishment of criteria in accordance with the background noise monitoring results;
3. Predictions which account for the sound power levels and locations of WTGs and ancillary infrastructure using the assumptions outlined in this preliminary assessment;
4. A construction noise assessment and framework for a management plan;
5. A traffic noise assessment and input to a management plan where required;
6. Commentary on vibration impacts; and,
7. Noise reduction measures (including modifying the WTG layout and/or applying a curtailment strategy) where the relevant operational or construction assessment criteria cannot be achieved.

APPENDIX A:

WTG ID	WTG Coordinates (UTM WGS84 55H)	
	Easting	Northing
T1	733714	6438204
T2	733937	6438763
T3	733353	6438839
T4	733664	6437558
T5	733806	6436963
T6	733914	6436296
T7	734010	6435344
T8	734121	6434803
T9	734463	6431828
T10	733814	6431556
T11	733482	6435839
T12	733139	6436588
T13	733105	6437306
T14	733076	6438012
T15	732771	6438559
T16	732469	6438081
T17	732288	6437142
T18	732513	6436176
T19	731688	6436825
T20	731791	6436040
T21	734899	6433085
T22	735030	6433660
T23	735631	6434422
T24	735143	6432522
T25	735719	6433547
T26	736197	6433856
T27	736224	6434819
T28	735749	6431825
T29	736072	6432975
T30	737100	6432817
T31	737154	6433649
T32	736620	6433339

WTG ID	WTG Coordinates (UTM WGS84 55H)	
	Easting	Northing
T33	737895	6434962
T34	736424	6431799
T35	736953	6431446
T36	738622	6435244
T37	738427	6434550
T38	739422	6436044
T39	738993	6435668
T40	740048	6435629
T41	740061	6436325
T42	741905	6438170
T43	742485	6438583
T44	731561	6435595
T45	743831	6437897
T46	744223	6437343
T47	744800	6437999
T48	745099	6436931
T49	745236	6437544
T50	745923	6436900
T51	744494	6436740
T52	744903	6436298
T53	734261	6431040
T54	736396	6432446
T55	737724	6433807
T56	737478	6433319
T57	735064	6431595
T58	735300	6430358
T59	735028	6430965
T60	737016	6430160
T61	737245	6430858
T62	736043	6431253
T63	736528	6430642

APPENDIX B:

Residences ID	Residence Coordinates (UTM WGS84 55H)		Associated (Yes/No)	Nearest WTG	Distance to Nearest WTG (m)	Predicted Level (dB(A))
	Easting	Northing				
2	732504	6433152	NO	T10	2064	36
3	734688	6428398	NO	T58	2053	33
4	738063	6427187	NO	T60	3151	27
5	742809	6436739	YES	T46	1538	38
6	742436	6435580	YES	T51	2363	34
8	738978	6432893	YES	T55	1552	39
9	738403	6431982	YES	T35	1546	40
10	738773	6430490	YES	T61	1572	36
12	747573	6433108	NO	T50	4135	<25
13	747261	6431386	NO	T52	5449	<25
18	731877	6430541	NO	T10	2187	32
23	744044	6439931	NO	T45	2045	34
24	740309	6441017	NO	T42	3264	26
25	735108	6441894	NO	T2	3343	26
26	731267	6440390	NO	T15	2370	32
27	729507	6435706	NO	T44	2057	33
28	729618	6436136	NO	T44	2017	33
29	729469	6437826	NO	T19	2435	32
30	729820	6438757	NO	T19	2688	31
31	729138	6440094	NO	T16	3892	26
32	728786	6440815	NO	T15	4580	<25
33	731850	6442100	NO	T3	3591	26
34	737615	6441427	NO	T2	4541	<25
35	733369	6443537	NO	T3	4698	<25
36	729482	6432876	NO	T44	3422	27
37	729387	6431653	NO	T10	4428	<25
38	729341	6434318	NO	T44	2561	29
39	729320	6434477	NO	T44	2504	30
40	732545	6443215	NO	T3	4450	<25
41	735956	6425650	NO	T60	4633	<25
42	737556	6426750	NO	T60	3452	26
43	740051	6424314	NO	T60	6587	<25
44	740171	6424541	NO	T60	6444	<25
45	750027	6433591	NO	T50	5272	<25
46	751170	6431134	NO	T50	7796	<25
47	750461	6425712	NO	T52	11956	<25
48	751494	6426597	NO	T50	11713	<25
49	751728	6426998	NO	T50	11478	<25
50	752043	6426885	NO	T50	11737	<25
51	749411	6435972	NO	T50	3609	<25
52	750038	6436507	NO	T50	4133	<25
53	748003	6436683	NO	T50	2091	30
54	727239	6438505	NO	T19	4756	<25
55	727715	6438780	NO	T19	4428	<25
56	724694	6439865	NO	T19	7626	<25
57	724069	6439656	NO	T19	8128	<25
58	727051	6441366	NO	T16	6336	<25
59	725978	6441411	NO	T16	7296	<25

Residences ID	Residence Coordinates (UTM WGS84 55H)		Associated (Yes/No)	Nearest WTG	Distance to Nearest WTG (m)	Predicted Level (dB(A))
	Easting	Northing				
60	727194	6442802	NO	T15	7007	<25
61	727682	6443286	NO	T15	6945	<25
62	729497	6444044	NO	T15	6388	<25
63	728865	6444874	NO	T15	7425	<25
64	724845	6444535	NO	T15	9926	<25
65	727505	6447820	NO	T15	10654	<25
66	726919	6449974	NO	T15	12828	<25
67	722866	6445522	NO	T15	12108	<25
68	722759	6450102	NO	T15	15280	<25
69	726157	6436996	NO	T19	5534	<25
70	727353	6435018	NO	T44	4247	<25
71	727927	6434527	YES	T44	3787	<25
72	729420	6430361	NO	T10	4554	<25
73	725541	6451643	NO	T15	14948	<25
74	718753	6449415	NO	T15	17730	<25
75	725726	6454170	NO	T3	17124	<25
76	725790	6454154	NO	T3	17081	<25
77	725938	6454123	NO	T3	16987	<25
78	726208	6454123	NO	T3	16871	<25
79	726271	6454112	NO	T3	16835	<25
80	724737	6454414	NO	T15	17774	<25
81	724652	6454557	NO	T15	17940	<25
82	726703	6454008	NO	T3	16563	<25
83	724042	6453242	NO	T15	17082	<25
84	724106	6452992	NO	T15	16834	<25
85	724113	6453155	NO	T15	16971	<25
86	720012	6446160	NO	T16	14848	<25
87	719898	6446398	NO	T15	15072	<25
88	717593	6448931	NO	T15	18384	<25
89	720582	6444960	NO	T16	13734	<25
90	719334	6443106	NO	T19	13859	<25
91	720805	6443864	NO	T19	12961	<25
92	721682	6443935	NO	T16	12273	<25
93	722585	6442859	NO	T19	10921	<25
94	731113	6446208	NO	T3	7702	<25
95	722037	6452020	NO	T15	17217	<25
96	722478	6452532	NO	T15	17355	<25
97	741745	6442068	NO	T43	3563	<25
98	740205	6434097	YES	T40	1540	37
99	741954	6434922	NO	T40	2033	33
108 (Uninhabited)	738373	6436233	YES	T39	839	42
109 (Uninhabited)	738643	6436250	YES	T39	679	43
115	742985	6440263	NO	T43	1753	33
116	742976	6440299	NO	T43	1784	32
117	742960	6440354	NO	T43	1833	32
118	742928	6440354	NO	T43	1825	32
119	742898	6440368	NO	T43	1832	32
123	732685	6434324	YES	T8	1514	39
124	734249	6426916	YES	T58	3599	26

Residences ID	Residence Coordinates (UTM WGS84 55H)		Associated (Yes/No)	Nearest WTG	Distance to Nearest WTG (m)	Predicted Level (dB(A))
	Easting	Northing				
125	735034	6427170	NO	T58	3199	28
126	738915	6432033	NO	T56	1929	37
127	741301	6433480	NO	T40	2488	32
128	744931	6439575	YES	T47	1581	35
131	729868	6438566	YES	T19	2519	32
136	745508	6439792	NO	T47	1928	33
141	748180	6437538	NO	T50	2345	29
142	748149	6437439	NO	T50	2290	30
143	748202	6437908	NO	T50	2492	29
146	747607	6435232	NO	T50	2371	29
149	739303	6429755	NO	T60	2323	32
150	739667	6430043	NO	T61	2556	31
154	723808	6435047	NO	T44	7772	<25
156	723799	6435931	NO	T44	7769	<25
157	724475	6435698	NO	T44	7086	<25
158	724798	6435472	NO	T44	6764	<25
161	722401	6433970	NO	T44	9303	<25
162	724232	6434264	NO	T44	7449	<25
163	723776	6434835	NO	T44	7823	<25
164	725372	6433349	NO	T44	6584	<25
254	738318	6446188	NO	T2	8621	<25
256	740562	6443034	NO	T43	4848	<25
258	737523	6441673	NO	T2	4618	<25
259	735590	6445547	NO	T2	6983	<25
260	735405	6445436	NO	T2	6833	<25
261	733024	6445516	NO	T3	6685	<25
262	733622	6445092	NO	T3	6259	<25
263	732814	6443761	NO	T3	4951	<25
264	732871	6443693	NO	T3	4878	<25
265	732823	6443619	NO	T3	4809	<25
266	732760	6443551	NO	T3	4750	<25
267	732651	6443585	NO	T3	4797	<25
268	732711	6443485	NO	T3	4690	<25
269	732681	6443453	NO	T3	4663	<25
271	732663	6443426	NO	T3	4639	<25
272	732649	6443401	NO	T3	4616	<25
273	731877	6443172	NO	T3	4577	<25
274	731193	6446384	NO	T3	7848	<25
275	730541	6446229	NO	T3	7907	<25
276	736223	6444614	NO	T2	6282	<25
277	736832	6444161	NO	T2	6125	<25
278	735422	6443234	NO	T2	4711	<25
279	739298	6445477	NO	T43	7595	<25
280	739771	6444712	NO	T43	6703	<25
281	739018	6443028	NO	T43	5637	<25
282	741187	6444130	NO	T43	5697	<25
283	743040	6445670	NO	T43	7109	<25
285	747661	6439337	NO	T50	2993	26
286	748328	6439782	NO	T50	3753	<25

Residences ID	Residence Coordinates (UTM WGS84 55H)		Associated (Yes/No)	Nearest WTG	Distance to Nearest WTG (m)	Predicted Level (dB(A))
	Easting	Northing				
287	747915	6438808	NO	T50	2758	26
288	748497	6439327	NO	T50	3538	25
289	748444	6439591	NO	T50	3688	<25
292	749735	6440216	NO	T50	5053	<25
293	748617	6438827	NO	T50	3312	25
294	748812	6438635	NO	T50	3370	25
295	748382	6438291	NO	T50	2825	27
296	748696	6438109	NO	T50	3025	26
301	751072	6437797	NO	T50	5227	<25
302	751013	6436894	NO	T50	5090	<25
303	750536	6436692	NO	T50	4618	<25
304	748873	6436163	NO	T50	3041	25
305	748681	6436272	NO	T50	2829	27
306	748271	6436626	NO	T50	2364	29
307	748708	6436990	NO	T50	2786	26
308	749554	6435888	NO	T50	3769	<25
309	749736	6435812	NO	T50	3965	<25
313	749458	6433983	NO	T50	4583	<25
314	747674	6431269	NO	T52	5741	<25
315	747459	6431388	NO	T52	5535	<25
319	751070	6442039	NO	T50	7274	<25
320	750157	6442033	NO	T50	6654	<25
321	748801	6442615	NO	T47	6109	<25
322	747981	6442350	NO	T47	5390	<25
323	747822	6442476	NO	T47	5402	<25
324	746827	6445854	NO	T47	8112	<25
325	727020	6428335	NO	T10	7518	<25
326	726639	6428293	NO	T10	7882	<25
327	727634	6429309	NO	T10	6576	<25
328	727602	6429161	NO	T10	6657	<25
329	727899	6429118	NO	T10	6398	<25
330	727804	6428981	NO	T10	6539	<25
331	728608	6429214	NO	T10	5709	<25
332	728671	6428685	NO	T10	5890	<25
333	729349	6429478	NO	T10	4925	<25
334	729317	6429031	NO	T10	5157	<25
335	729285	6428970	NO	T10	5215	<25
336	729923	6427457	NO	T53	5627	<25
337	729693	6427462	NO	T53	5803	<25
338	730137	6426478	NO	T53	6150	<25
339	730309	6425962	NO	T53	6435	<25
340	730145	6425470	NO	T53	6926	<25
341	732684	6423592	NO	T58	7254	<25
342	735105	6423288	NO	T58	7073	<25
344	739792	6424217	NO	T60	6559	<25
346	737809	6436663	NO	T39	1546	38
348	743814	6424600	NO	T60	8782	<25
349	745579	6425851	NO	T60	9586	<25
350	746392	6425699	NO	T60	10383	<25

Residences ID	Residence Coordinates (UTM WGS84 55H)		Associated (Yes/No)	Nearest WTG	Distance to Nearest WTG (m)	Predicted Level (dB(A))
	Easting	Northing				
351	746640	6428785	NO	T52	7711	<25
352	743604	6430074	NO	T52	6358	<25
353	730522	6424253	NO	T53	7749	<25
354	732106	6421009	NO	T58	9880	<25
355	732142	6422641	NO	T58	8338	<25
356	733284	6422912	NO	T58	7714	<25
357	735434	6422789	NO	T60	7539	<25
358	729814	6423678	NO	T53	8601	<25
359	730728	6423051	NO	T58	8619	<25
360	731440	6422851	NO	T58	8441	<25
361	730032	6423036	NO	T58	9020	<25
362	731093	6423464	NO	T58	8076	<25
363	731165	6423282	NO	T58	8196	<25
364	731230	6423122	NO	T58	8302	<25
365	731334	6422726	NO	T58	8601	<25
366	730521	6423219	NO	T58	8591	<25
367	730065	6423581	NO	T53	8558	<25
368	730769	6422847	NO	T58	8772	<25
369	730977	6422599	NO	T58	8882	<25
370	734857	6420346	NO	T58	10022	<25
371	730120	6420846	NO	T58	10831	<25
372	729949	6421114	NO	T58	10681	<25
373	731518	6421970	NO	T58	9202	<25
374	732655	6443475	NO	T3	4688	<25