

General Manager City of Parramatta Council 126 Church Street, PARRAMATTA NSW 2124

January 15, 2018

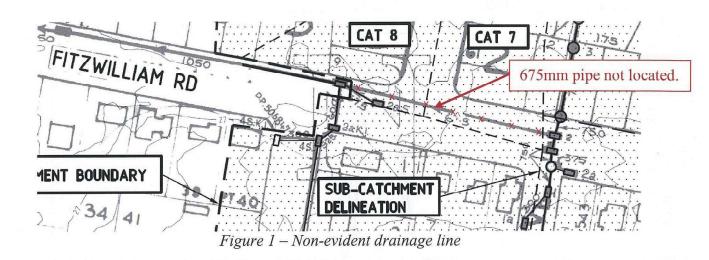
## **RE: 21 TUCKS ROAD, TOONGABBIE**

To whom it may concern,

I refer to Council's letter recommending the applicant to undertake a current flood study at the subject site to accurately determine flood planning levels for the proposed development proposal. Mance Arraj Engineers have been engaged by the applicant to conduct a 2D flood study as supplementary information for the planning proposal; this letter contains a brief summary of the calculation and considerations of the flood study.

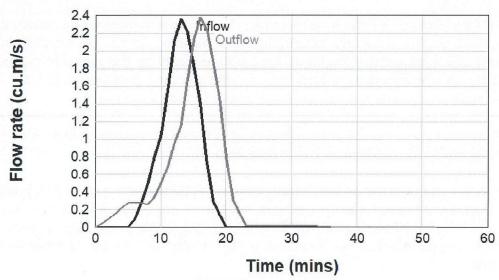
A detailed survey of the sites surrounding roads was prepared by SDG surveyors and was the basis of the 2D terrain model. (See attached)

A catchment plan was prepared using Council's drainage maps and LiDAR data. (See attached) Council's drainage infrastructure was visually inspected on site. All pipes sizes and locations were found to be consistent with Council's drainage maps with the exception of the following 675mm pipe, which was not evident at the intersection between Fitzwilliam Road and Tucks Roads.

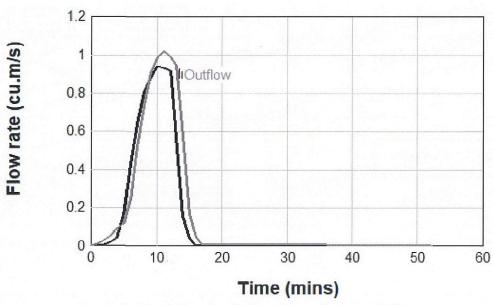




From the attached catchment plan, a DRAINS model (utilising an ILSAX Hydrological model for urban development) was then created to simulate the Council's drainage capacities in a 1% AEP storm event and the resulting overland flows. At the subject site, stormwater flows are conveyed via a 600mm diameter pipe in Tucks Road and a 1050mm diameter pipe in Rausch Street. These drainage pipes were modelled with a consideration for blockage by restricting their capacity by 50% to account for a flooding scenario where these pipes may be partially blocked by silt and debris. The model produced the following peak overland flow hydrographs for Tucks Road and Rausch Street.



Graph 1 - Peak Overland Flow Rates for Tucks Road



Graph 2 - Peak Overland Flow Rates for Rausch Street



A two-dimensional model was created using HEC-RAS Version 5.0.3 software and a hydraulic analysis of the sites terrain using the above mentioned flow rates computed the following results:

Flood Levels 25.161 25.13 25.137 25.175 25.187 25.149 25.2 25.222 25.243 25.195 25.245 25.218 25.244 25.235 25.235 25.254 25.235 25.275 25.272 25.235 25.304 111 25.293 25.235 25.235 25.334 25.235 25.235 25.345 25.345 25.235 25.235 25.235 25.235 25.375 25.442 25.354 25.235 25.4 25.441 25.396 25.235 25.235 25.235 25.235 25.439 25.235 25.235 25.235 25.52 25.235 25.235 25.468 25.496 25.539 25.235 25.551 25.235 25.528 25 235 25.235 25.235 25.561 25.547 25.235 25.235 25.566 25.561 25.57 25.571 25.235 25.235 25.573 25.578 25.235 25.235 25.576 25.579 25.235 25.235 25.235 25.235 25.235 25.578 25 58 25.579 25 58 25.235 25.235 25.58 25.58 25.235 25.58 25.581 25.58 25.235 25.58 25.235 25.58 25 581 25.235 25.235 25.58 25.58 25.581 25.581 25.235 25.235 25.58 25.58 25.581 25.581 25.235 25.235 25.58 25.58 25.581 25.581 25.58 25.581 25.581 25.58 25.235 25.235 25.235 25.235 25.58 25.581 25.581 25 58 25.581 25.235 25.581 | 25.581 | 25.581 25.235 25.235 25.235 25.235 25.235 25.235 25.235 25.235 25.235 25.235 25.581 25.235 | 25.235 25.581 25.581 25.581 25.235 25.235 25.581 25.581 25.581 25.581 25.581 25.235 25.235 25.581 25.581 25.235 25.235 25.235 25.235 25.581 25.581 25.235 25.581 25.238 25.24 25.581 25.581 25.581 25.246 25.248 25.583 25.59 25.588 25.264 25.259 25.631 25 614 25.281 25.278 25.68 25 696 25.304 25.292 25.6\_ 25.739 25 338 25.304 25.5 25.317 25 378 25.4\_ 25.393 25.423 25.417 25.3\_ 25.45 25.2\_ 25.449 25.1\_ 25.0\_

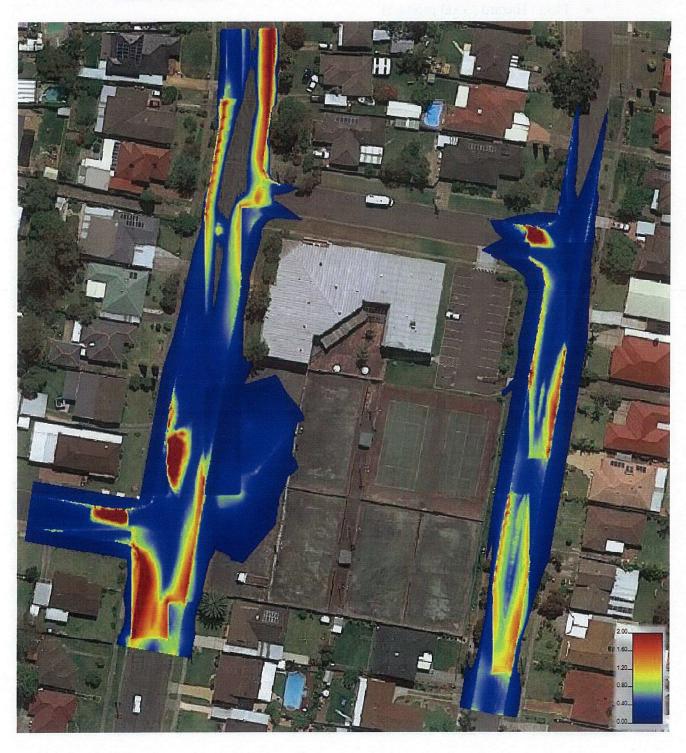


• Flood Depths





Flood Velocities



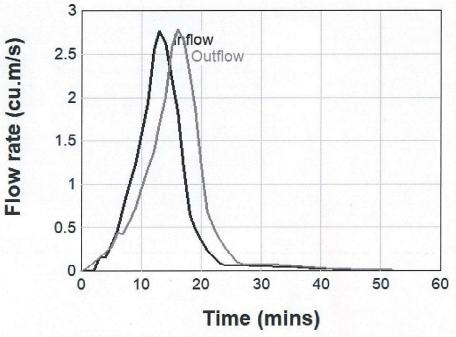


• Flood Hazard (VxD product)

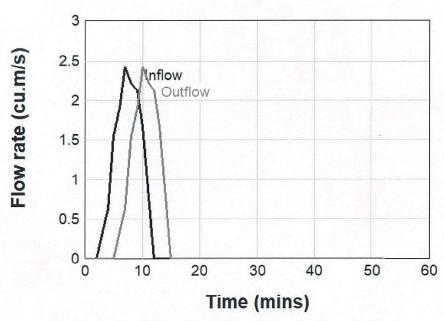




Council has requested that flood scenario of full pipe blockage be modelled as a sensitivity test. As such the following flow rates was determined:



Graph 3 - Peak Overland Flow Rates for Tucks Road



Graph 4 - Peak Overland Flow Rates for Rausch Street



The following results have been computed from a full pipe blockage scenario:

Flood Levels 25.148 25 186 25.171 25.203 25.187 25.222 25.198 25.246 25.21 25.284 25.221 25.315 25.233 25.319 25.333 25.332 25.249 25.328 25.27 25.34 25.337 25.34 25.341 25.34 25.356 25.32 25.342 25.341 25.377 25.346 25.342 25.342 25.4 25.364 25.342 25.342 25.446 25.401 25.366 25.432 25.342 25.343 - 1 25.456 25.343 25.343 25.343 25.343 25.343 25.343 25.343 25.483 25.459 25.408 25.51 25.538 25.343 25.343 25.343 25.343 25.541 25.562 25.343 25.344 25.343 25.564 25.578 25.344 25.584 25.344 25.344 25.591 25.344 25.344 25.598 25.603 25.345 25.344 25.61 25.61 25.345 25.62 25.345 25.615 25.345 25.624 25.345 25.62 25.345 | 25.345 25.625 25.623 25.345 25.346 25.346 25.346 25.346 25.626 25.625 25.627 25.626 25.626 25.627 25,628 25.626 25.627 25.346 25.627 25.627 25.628 25.628 25.346 25.346 25.627 25.627 25.628 25.628 25.346 25.346 25.627 25.628 25.628 25.627 25.628 25.346 25.346 25.628 25.628 25.628 25.628 25.346 25.346 25.628 25.628 25.628 25.346 25.346 25 628 25.628 25.628 25.347 25.346 25.628 25.628 25.628 25.628 25.348 25.35 25.628 25.628 25.628 25.628 25.348 25.628 25 25.628 25.353 25.351 25.354 25.353 25.354 25.354 25.628 25 25.355 25.355 25.355 25.355 25.628 25.628 25.628 25.356 25.356 25.629 25.628 25.628 25.629 25.357 25.357 25.629 25.358 25.358 25.629 25.359 25.359 25.63 25.629 25.361 25.361 25.632 25.631 25.364 25.363 25.636 25.639 25.367 25.643 25.369 25.66 25.376 25.372 25.711 25.718 25.393 25.38 25.6. 25.443 25.5. 25.417 25.4 25.5 25.3\_ 25.542 25.541 25.2

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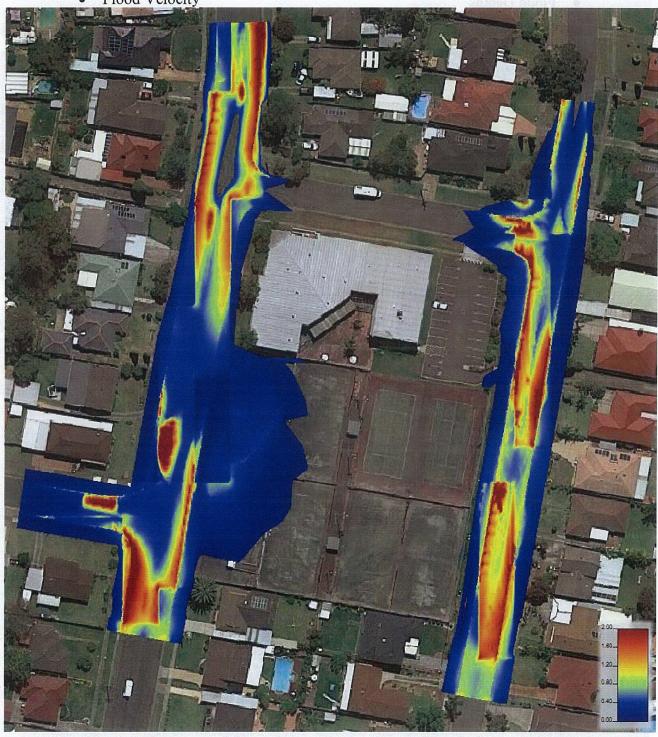


Flood Depths



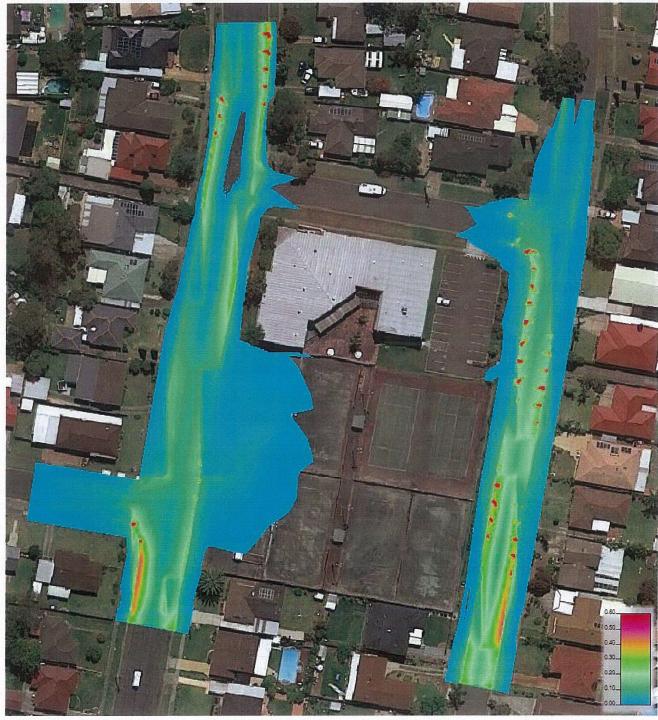








• Flood VxD Product





The results of the 2D flood study shows that the site is subjected to localised overland flows from both Tucks Road and Rausch Street with top water levels of RL.25.58 and RL.25.235 respectively.

In accordance with the city of Parramatta Council's flood matrix requirements, the proposed development shall provide a minimum of 500mm freeboard to the flood level. Therefore, a flood planning level of RL.26.18 shall be adopted for the proposal.

The development proposes the entry to basement carpark from Rausch Street, thus it is necessary to protect the basement from inundation. Flood waters in Rausch Street are static and rise to RL.25.235 before eventually overtopping a high point in Rausch Street. Therefore, it is recommended that provisions for flood gates or a driveway crest at RL.25.835 be incorporated into the schematics of the proposed development.

In comparison to Council's issued flood levels (see attached) we note the following differences in flood levels, when 50% pipe blockage is taken into consideration:

Chainage	Flood Levels (metres AHD) – 1% AEP		
	Council Issued	2D HEC-RAS Model	+\- Difference
169	25.65	25.581	-0.069
602	25.40	25.235	-0.165
62	25.40	25.235	-0.165

In comparison to Council's issued flood levels (see attached) we note the following differences in flood levels, when **full pipe blockage** is taken into consideration:

Chainage	Flood Levels (metres AHD) – 1% AEP		
	Council Issued	2D HEC-RAS Model	+\- Difference
169	25.65	25.628	-0.022
602	25.40	25.346	-0.054
62	25.40	25.343	-0.057

We trust this explains our position regarding this matter. If you have any queries, please do not hesitate to contact me on 8897 8800.

Sincerely Yours,

Steve Arraj

Director - Civil Engineering