

Appendix H Flood Study



Water Research
Laboratory

School of Civil and
Environmental Engineering

1st September 2010

Our Ref: WRL 10090.01 GPS L100901

Infigen Pty Ltd
Level 22, 56 Pitt Street
SYDNEY NSW 2000

Attention: Chris McGrath

Dear Sir,

RE: NYNGAN FLOOD MAPPING

Infigen Pty Ltd (Infigen) commissioned the University of New South Wales (UNSW) Water Research Laboratory (WRL) to map the flood inundation extent at your site at Nyngan. Flood inundation contours were generated for the both the 1976 and 1990 historic floods. This letter provides a description of the data, methodology and outcomes of our analysis.

1.0 DATA

The data as listed were available to WRL for the analysis:

- Topographical data in the form of survey points spaced 5-20 m apart in Australian Height Datum (AHD) registered in Map Grid of Australia (MGA). This data was provided to WRL via email by Infigen on 25th August 2010 in CAD file format “Nyngan SF - model.dwg”; and
- The “Nyngan April 1990 Flood Investigation” prepared by the Catchment Management Unit, Department of Water Resources, NSW (DWR, 1990).



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2.0 METHODOLOGY

The following tasks were undertaken to develop flood inundation contours for the 1976 and 1990 historical floods:

1. A review of available flood levels from the “Nyngan April 1990 Flood Investigation”;
2. Interpretation of the reported flood levels in order to recommend an appropriate flood level for the Infigen site;
3. Development of a Triangulated Irregular Network (TIN) surface of the provided topographical data;
4. Creation of flood inundation extent contours by intersecting the recommended flood levels with the TIN surface of the Infigen site; and
5. Manual review of the generated inundation extent lines.

2.1 Review of 1976 and 1990 Historical Flood Levels

A review was undertaken of the available recorded flood levels for both the 1976 and 1990 historical floods as documented in the Nyngan April 1990 Flood Investigation (DWR, 1990). A range of recorded flood levels was sourced from the report and plotted relative to the Infigen site using GIS. While every care was exercised when locating these historical levels, the exact location of some of the levels was not explicitly noted in the DWR 1990 report. Where the exact location of the recorded levels was not explicitly noted, a best estimate of the location was determined on the basis of the descriptions in the report. Figure 1 presents this data interpretation along with the generated flood level inundation extents.

A summary of the recommended flood levels for the site is presented in Table 1. Additionally, the Annual Exceedence Percentage (AEP) and Annual Recurrence Interval (ARI) are presented. The AEP and ARI are based on the estimates published in the Nyngan April 1990 Flood Investigation (DWR, 1990).

Table 1
Summary of Flood Levels at Infigen Site

Flood Year	Water Level (m RL)	AEP (%)	ARI (Years)
1976	172.4	2	50
1990	173.5	0.4	250

The rationale for adopting the historical flood levels for the Infigen site is described below:

- 1976 – This value was based on survey points presented in Figure 12A.1 and Figure 8.3 of the Nyngan 1990 Flood Investigation Report (DWR, 1990). There are no recorded values in the Infigen area, however recorded levels are located in close proximity to the site and are upstream of the town levee banks. Based on the observed flood gradients for the 1990 flood published in the Nyngan 1990 Flood Investigation Report (DWR, 1990), these flood levels can be considered representative of the water level within the Infigen site. A small adjustment has been made to allow for the increasing hydraulic gradient of the floodwaters upstream of the levee towards the Infigen site;
- 1990 – This corresponds to the flood level recorded at Point 32 on Figure 12.2 of the Nyngan 1990 Flood Investigation Report (DWR, 1990). The flood levels at surrounding points are in good agreement with this recorded flood level.

2.2 Mapping

The adopted flood levels were mapped against the provided topographical data sets using ARCMAP v9.3 GIS software (ESRI, 2008). The process for the mapping was as follows:

- The points layer in “Nyngan SF - model.dwg” had all points with zero elevation removed.
- The remaining points were converted into a Triangulated Irregular Network (TIN) representation of the surface using standard features in the ARCMAP 3D Analyst software.
- The 3D Analyst toolbox routine “TIN Contour” was then used to interpolate land surface contours at the levels specified in Table 1.
- The generated contours were visually inspected and manually adjusted where there were obvious conflicts with the original data or the results of the interpolation were not physically realistic.

3.0 RESULTS

Lands surface contours at the specified levels are provided in ERSI shape file format. Separate files are provided for the 1976 and 1990 historical floods.

Table 2
Summary of Result files

Year of Flood	Contour File Name
1976	contour_1976_final.shp
1990	contour_1990_final.shp

4.0 QUALIFICATIONS

1. Interpretation of flood inundation levels for the Infigen site was based on the flood levels documented in the Nyngan April 1990 Flood Investigation (DWR, 1990). As there was a limited number of surveyed historical flood marks located within the Infigen site we recommend a nominal level accuracy +/- 0.1m be applied;
2. Contour mapping of the flood inundation levels has been developed using the GIS interpretation techniques as described in Section 2.2. Note that features such as farm dams which are below the flood inundation level, but not within the flow path of the flood have been omitted. As flow paths are variable between floods the spatial location of the contours as provided by WRL should be considered indicative only.
3. The presented flood contours are based on the provided survey information, the accuracy of which has not been assessed by WRL. If detailed design is required, we recommend that the flood extent be independently located on site by a suitably qualified surveyor.

5.0 REFERENCES

DWR (1990) Nyngan April 1990 Flood Investigation. *Catchment Management Unit, Department of Water Resources, New South Wales, October 1990.*

Please contact Mr Grantley Smith on 02 8071 9800 should you wish to discuss this investigation further.

Yours faithfully,

B M Miller
Manager.

