Floodplain Impact Assessment
Former Hoxton Park Airport Site
Cowpasture Road, Hoxton Park

For Mirvac Projects Pty. Limited

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Document Control

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APPENDICES

1.0 Background

Mirvac Projects Pty Limited has submitted to the Minster for Planning a Concept Plan and Project applications for approval on the former Hoxton Park Airport site. A locality sketch is shown in Figure 1.

Figure 1 – Hoxton Park Airport site

The area around the subject site including Hinchinbrook Creek has been the subject of a number of previous floodplain studies. The design development and construction of the Westlink M7 significantly altered the flooding behaviour of the Hinchinbrook Creek and

surrounding ephemeral watercourses. As a result, SMEC were engaged to update a previous TUFLOW hydraulic simulation model to both improve the finite difference grid discretisation and assess the impacts the construction of the M7 has on the regional flooding behaviour. TUFLOW is a 2D finite difference hydraulic model accepted as appropriate for modelling complex floodplain hydraulics.

As part of the rezoning process for the Hoxton Park Airport site, URS were engaged to assess the impacts of the proposed industrial zoning and residential zoning on the flooding behaviour of Hinchinbrook Creek. This report was entitled "Hoxton Park Airport – Hydraulic Modelling of Flooding, 13 September 2006". This study was to determine if there were any adverse impacts of developing the site in a regional flood plain context and recommend any mitigation measures. The results of this investigation indicated that filling all of the proposed industrial land to a flood planning standard of greater than the 1:100ARI storm would result in increases to both existing flooding levels and floodplain velocities. Based on the information available at the time of the rezoning, a line was created in the hydraulic model to represent the limit of filling to be undertaken to ensure no significant increase in flooding levels in the floodplain. This line created the zone boundary between the IN1 (industrial zone) and the E3 (Environmental Management) zones in the Liverpool LEP 2008.

Subsequent to the rezoning process, RTA resolved to upgrade Cowpasture Road to link into the M7 interchange as part of a design alliance with URS. The design proposal lifted surface levels on Cowpasture Road and as such, drainage measures were proposed to ameliorate the impacts the Cowpasture Road upgrade would have on regional flood behaviour. Part of these drainage measures involved the construction of high flow floodway culverts immediately adjacent to the proposed site access, with another bank of high flow culverts to the north of the existing service station site. The main Hinchinbrook Creek channel was designed as a multi span bridge.

As part of the RTA - URS design alliance, the TUFLOW model from the URS rezoning study was upgraded to include the new Cowpasture Road levels and drainage structures to validate the design. The design philosophy was to not adversely affect floodplain behaviour due to the RTA works. This modelling was undertaken by Golder Associates (Golders) as sub consultants to URS and a report was prepared by Golders entitled "Hydraulic Analysis Of Cowpasture Road At Hoxton Park, April 2008" The purpose of this modelling was to validate the RTA upgrade works and did not alter the development footprint envisaged for the industrial lands on the former Hoxton Park Airport from the original URS rezoning study.

2.0 Development Proposal Modelling and Scenario Testing

2.1 General

As part of the detailed design development for the Hoxton Park Airport site, the initial small lot industrial subdivision was replaced with a proposal to develop the site as two large national distribution centre warehouses. Due to design constraints, the access road from Cowpasture Road in the south was proposed to be located partially within the E3 zoned land and raised above the design 1:100ARI flooding level. Whilst roads are permissible within the E3 zone, the filling of this area to provide flood free access to the industrial subdivision and future residential development to the north was not modelled in detail as part of the rezoning study, nor as part of the updated study to reflect the RTA Cowpasture Road upgrade.

To determine the impacts on flooding levels regionally as a consequence of the development proposal, URS have been engaged to modify the TUFLOW model to include "as built" RTA works and the current industrial development proposal in detail.

As discussed in the previous URS and Golder studies, the hydraulic structures of the area were implemented as 1D elements within the 2D domain in TUFLOW. The modelling also scenario tested impacts of channel training works on the hydraulic regime of the Hinchinbrook Creek floodplain. A drawing of the arrangement of the major hydraulic structures is shown in Figure 2.

TUFLOW modelling was undertaken by Golder Associates based on the revised larger lot subdivision under the direction of URS. Golder Associates were engaged due to the familiarity of the Golders staff with the TUFLOW model development due to previous works undertaken in the project when employed at URS.

2.2 Scenarios Modelled – Baseline Condition

The previously calibrated and validated TUFLOW model was updated with field survey and improved representation of ground features. The survey was provided to Golder by ADW Johnson as both a 12d model TIN and surface string features. This model did not introduce the proposed filling and included the airport site in its current state. This model included the now constructed Hinchinbrook creek bridge as well as the two floodway culverts, Culvert 1 and Culvert 2 as shown in Figure 2. Additional field survey was undertaken by ADW Johnson to better define the as built structures inclding the approaches and entries to the major hydraulic structures.

2.3 Scenarios Modelled – Simulation 1 Development Proposal.

The effect of the filling proposal was introduced into the baseline model along with a proposed high flow floodway between the main access road (Road 1) and the existing service station to ameliorate the impacts of the filling and road embankment. ADW Johnson undertook the preliminary design and provided Golders with a 12d model TIN of the proposed works which was introduced into the TUFLOW model.

The methodology adopted was to raise the main access road levels within the TUFLOW model above the flooding levels to effectively make these cells dry in the 1:100ARI event and allow flow into the proposed floodway and hence into the Culvert 1 entry. This was done to achieve flood free access in 1:100ARI storm event.

The alignment of the main access road was in accordance with the Concept Plan and Project Applications and is shown in Figure 2. The proposed floodway out of future Basin 6 controlling flood flows from beneath the M7 was also implemented in the model as per the previous modelling work undertaken for the rezoning.

The TUFLOW model simulated this development scenario and flooding levels, velocities and hazard categories were compared with the baseline condition. The graphical representations of the impact of the proposed Scenario 1 earthworks from baseline conditions prepared by Golders are reproduced in Appendix A.

2.4 Scenarios Modelled – Simulation 2 Development Proposal.

The model implemented in the Simulation 1 run was modified to include minor floodplain training works. These works consisted of minor earthworks at the approach to the Culvert 2 inlet. The aim of these works and addition model run was to assess the impacts on the behaviour of the floodplain with additional works within Hinchinbrook Creek. These works were intended to supplement the works undertaken on behalf of the RTA from the URS previous investigation of the Cowpasture Road upgrade impacts. These works were designed by ADW Johnson and provided to Golders as a 12d model TIN and design string features

The TUFLOW model was then re run under this development scenario and flooding levels, velocities and hazard categories compared with the baseline condition.

3.0 Results

3.1 Hinchinbrook Creek – 2D Domain Simulation 1

The proposed filling on the periphery of the Hinchinbrook Creek floodplain adjacent to the proposed main access road alters the hydraulic behaviour of the area. The filling proposed has the effect of increasing flood levels and velocities within the floodplain itself with the flood waters contained between the proposed main access road and the upgraded Cowpasture Road upstream of the Hinchinbrook Creek bridge. These increases are fully contained within the Hinchinbrook Creek boundaries between the proposed access road and Cowpasture Road and do not impinge on external properties.

The effect on the flow behaviour due to the filling changes the hydraulic behaviour on the approach to the Hinchinbrook Creek Bridge and culvert structure (Culvert 1). The change in flow behaviour results in minor decreases in flow depth at the Culvert 1 entry and minor localised increases in flood levels downstream of the bridge. These increases are a maximum of 0.1m along the frontage of Ward Place to the floodplain Ward place is located to the east of Cowpasture Road and north of the downstream Hinchinbrook Creek Bridge as shown on Figure 2. Following interrogation of field survey data, the minimum freeboard from the flood level post development to the existing floor levels for dwellings on Ward Road is greater than 2m. As such, the minor increase is not considered to adversely affect the flood free status of the dwellings. All other locations downstream of the Hinchinbrook Creek Bridge exhibit either no increase in flood level or a slight reduction in flood level. This applies also to the flooding levels in Basin 18 downstream of the Hinchinbrook Creek Bridge.

Similarly, floodplain velocities and hazard categories are increased by virtue of the impact of the filling localised about the Mirvac site. These increases are limited to the Hinchinbrook Creek floodplain upstream of the Hinchinbrook Creek Bridge. It is noted that there are some decreases in flow velocities downstream of the bridge.

The model reports some minor flood increases in the area near the "Bus Depot" to the west of Cowpasture Road. A bridge is proposed as part of a VPA between council and the developer and as such is subject to detailed investigation currently being progressed.

Graphical representations of the difference in flowing elevation for Simulation 1 compared to baseline are shown in Appendix A. The difference model results compared to finished floor levels are shown in Figure 3.

3.2 Cowpasture Road – 2D Domain Simulation 1

Due to the proposed filling, the hydraulic regime in and around the Culvert 1 and Culvert 2 area has been altered. The flood modelling undertaken indicates no significant changes to both the flow depth and hazard category of flood flows on Cowpasture Road. It is further noted that the duration of inundation remains essentially after the introduction of the filling into the flood model.

3.3 Hinchinbrook Creek and Cowpasture Road – Simulation 2

The Simulation 2 results were compared with Simulation 1. The changes introduced into the model associated with additional channel training works altered the behaviour of the bridge and high flow culverts however the change in performance was very minor and this scenario was not pursued further.

3.3 Major Hydraulic Structures – 1D Domain – Simulation 1

The major hydraulic structures in the vicinity are the Hinchinbrook Creek Bridge and flood culverts 1 and 2. These structures are embedded as 1D elements within the TUFLOW model. The applicability of this modelling approach was discussed and validated in the previous Golder study. Appendix B shows the model configuration taken from the earlier Golders report.

The flow velocities produced within these structures for both the baseline condition and the simulation 1 run have been reproduced from the Golders modelling and are presented in Table 1 below.

Table 1 – Flow velocities within hydraulic structures

Structure	Existing	Developed
Hinchinbrook Creek		
2004	1.12	1.15
2000	1.17	1.22
2001	1.75	2.28
2002	1.92	2.14
2003	1.85	2.34
Culvert 2		
1110	1.76	1.96
1111	1.68	1.68
1112	2.77	2.23
Culvert 1		
3000	2.2	2.48
3001	2.69	2.39

Note; From Golders 2010 modelling

From the results, the introduction of the filling and road proposal results in minor increases in maximum flow velocity within the 1D elements. It is noted that these increases are small and the overall maximum velocity encountered for all of the structures is reduced (Element ID 3001). It is further noted that there is not a significant increase in flow velocity downstream in the 2D domain.

4.0 Conclusion

The modelling results undertaken by Golders indicate areas that experience water surface level increases >0.15m from the baseline condition with the addition of the proposed filling and road construction are limited to the fringe immediately adjacent to the proposed filling and are with contained between the development site and Cowpasture Road. Flooding levels external to these areas exhibit less increase and in some areas a decrease. The area fronting Ward Place to the east of the development site exhibits a small increase in flood elevation however based on field survey, retaining freeboard to finished slab level in excess of 2m. It is noted that there is no increase and in some localised areas, a decrease in flood levels within the regional retarding basin downstream of Cowpasture Road.

Increases in velocity and flood hazard are also contained to the Hinchinbrook Creek floodplain upstream of the Hinchinbrook Creek Bridge.

The development of the Hoxton Park Airport site as currently proposed could take place with flood impacts confined to the Environmental Zone east of the proposed development and west of Cowpasture Road. Flood impacts are confined to areas that will not be subject to future development.

References

BMT WBM, *TUFLOW User Manual 2008*.

URS, *Hoxton Park Airport – Hydraulic Modeling of Flooding, 13 September 2006*

Golder Associates , *Hydraulic Analysis Of Cowpasture Road At Hoxton Park, April 2008*

Figures

150126_REP_002

MGA

M7 MOTORWAY

FUTURE BASIN

PROPOSED BIG W

PROPOSED DSE

ROAD 3

BASIN 6

ROAD 2

COWPASTURE ROAD

PROPOSED FLOODWAY

ACCESS ROAD

CULVERT 1

CULVERT 2

HINCHINBROOK CREEK FLOODPLAIN

HINCHINBROOK CREEK BRIDGE

WARD PLACE

COWPASTURE ROAD

100mm AT FULL SIZE

REV.	DATE	AMENDMENT	DRAWN	CHECK	DESIGN	VERIFY
A	9/3/2010	ISSUED WITH PRELIMINARY DRAFT OF REPORT	HW	ND	HW	PJ

ALL DIMENSIONS ARE IN METRES. DO NOT SCALE

SCALES

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CLIENT

mirvac

PROPERTY DESCRIPTION

PART LOT 400 D.P. 1141990
COW PASTURE ROAD
HOXTON PARK

SURVEYED N\A

DATUM N\A

PROJECT FORMER HOXTON PARK AIRPORT

PLAN TITLE
FIGURE 2
DEVELOPMENT PROPOSAL AND MAJOR
HYDRAULIC STRUCTURES SHEET 1 OF 2

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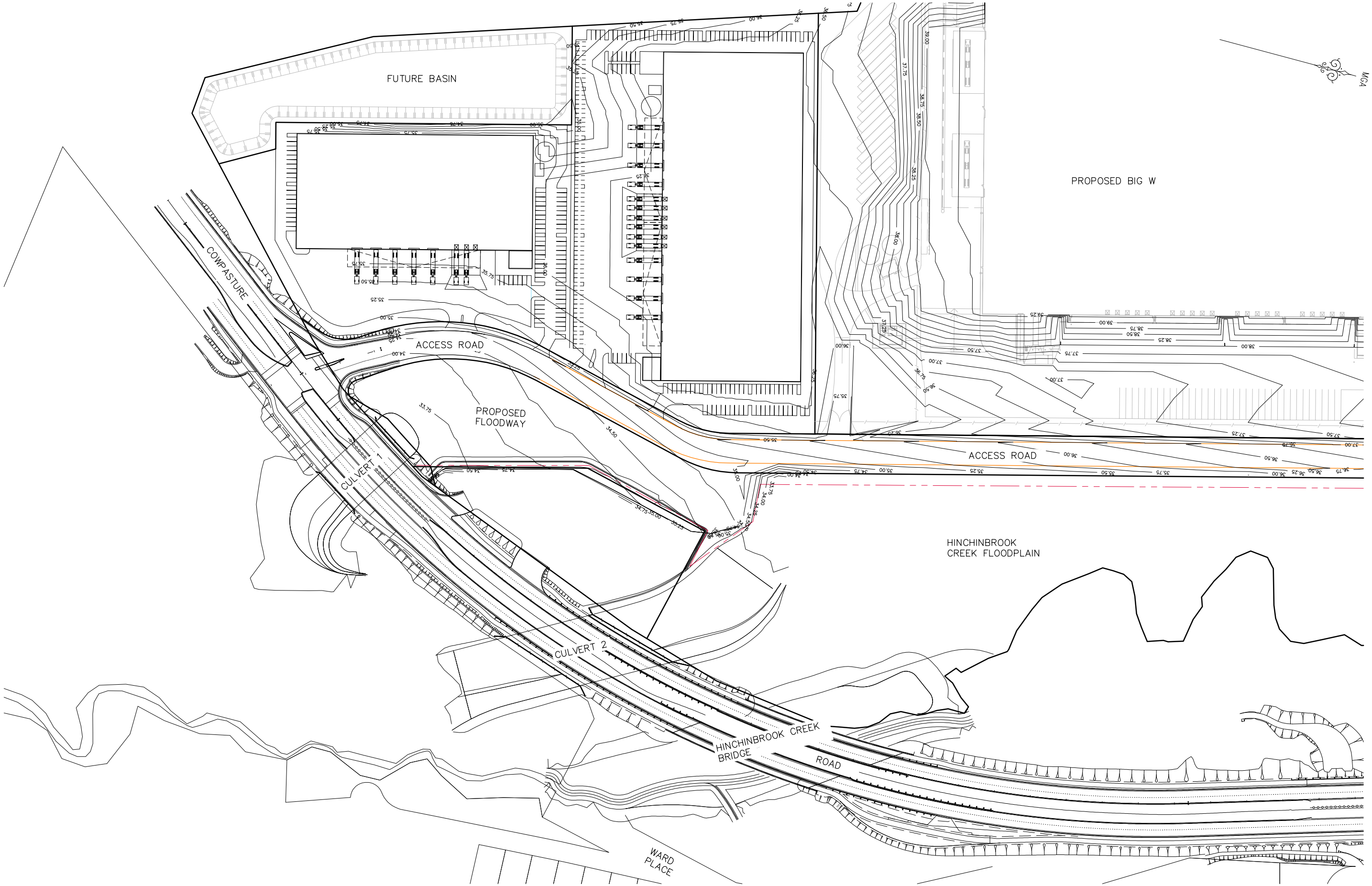

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CLIENT
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PROPERTY DESCRIPTION
PART LOT 400 D.P. 1141990
COW PASTURE ROAD
HOXTON PARK

SURVEYED N\A
DATUM N\A

PROJECT
FORMER HOXTON PARK AIRPORT

PLAN TITLE
FIGURE 2
DEVELOPMENT PROPOSAL AND MAJOR
HYDRAULIC STRUCTURES SHEET 2 OF 2

PROJECT No.	DISCIPLINE	NUMBER	REV.
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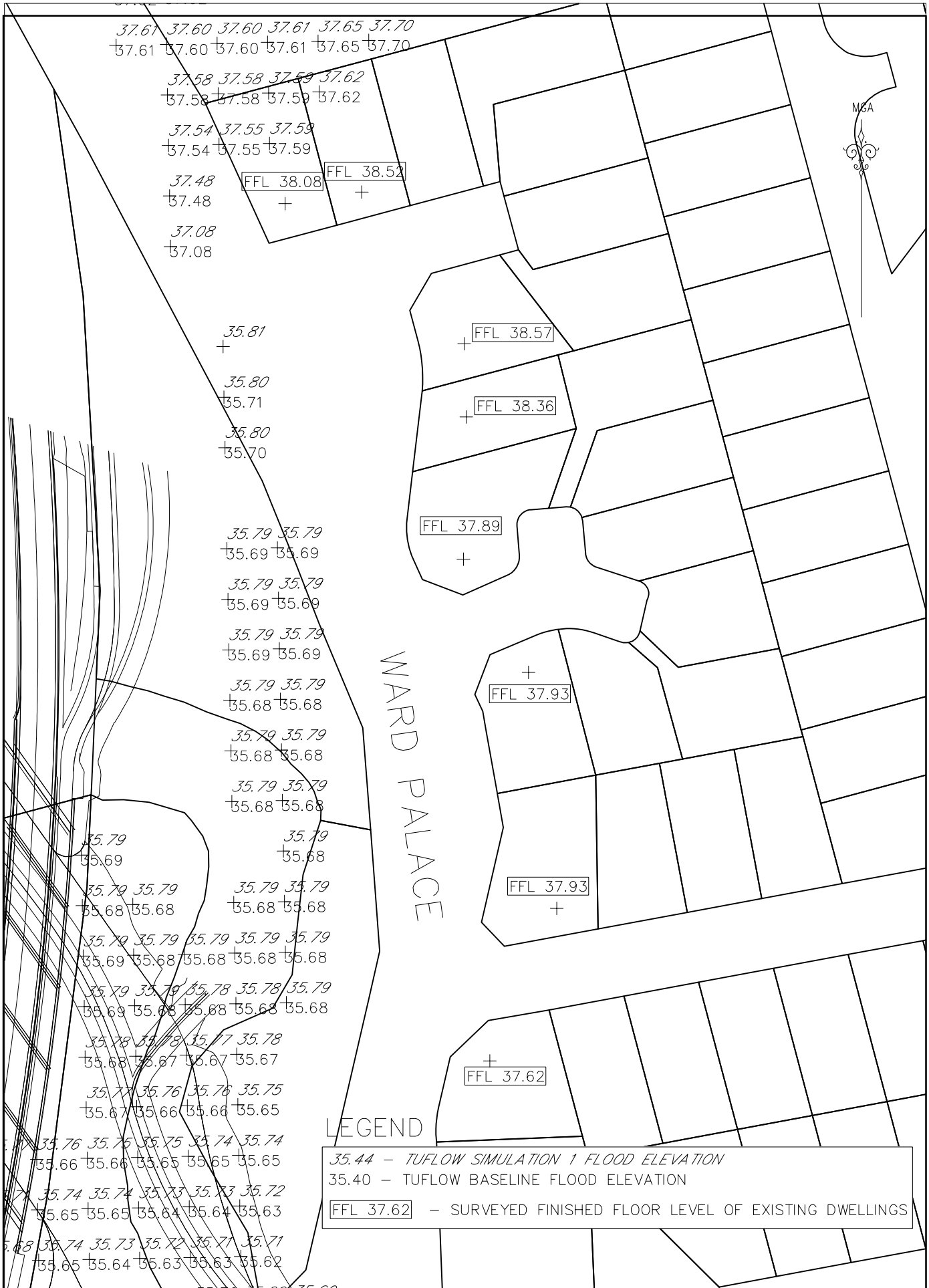

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PROJECT HOXTON PARK AIRPORT

PLAN TITLE
FIGURE 3 – TUFLOW FLOOD ELEVATION DIFFERENCES

PROJECT No.	DISCIPLINE	NUMBER	REV.
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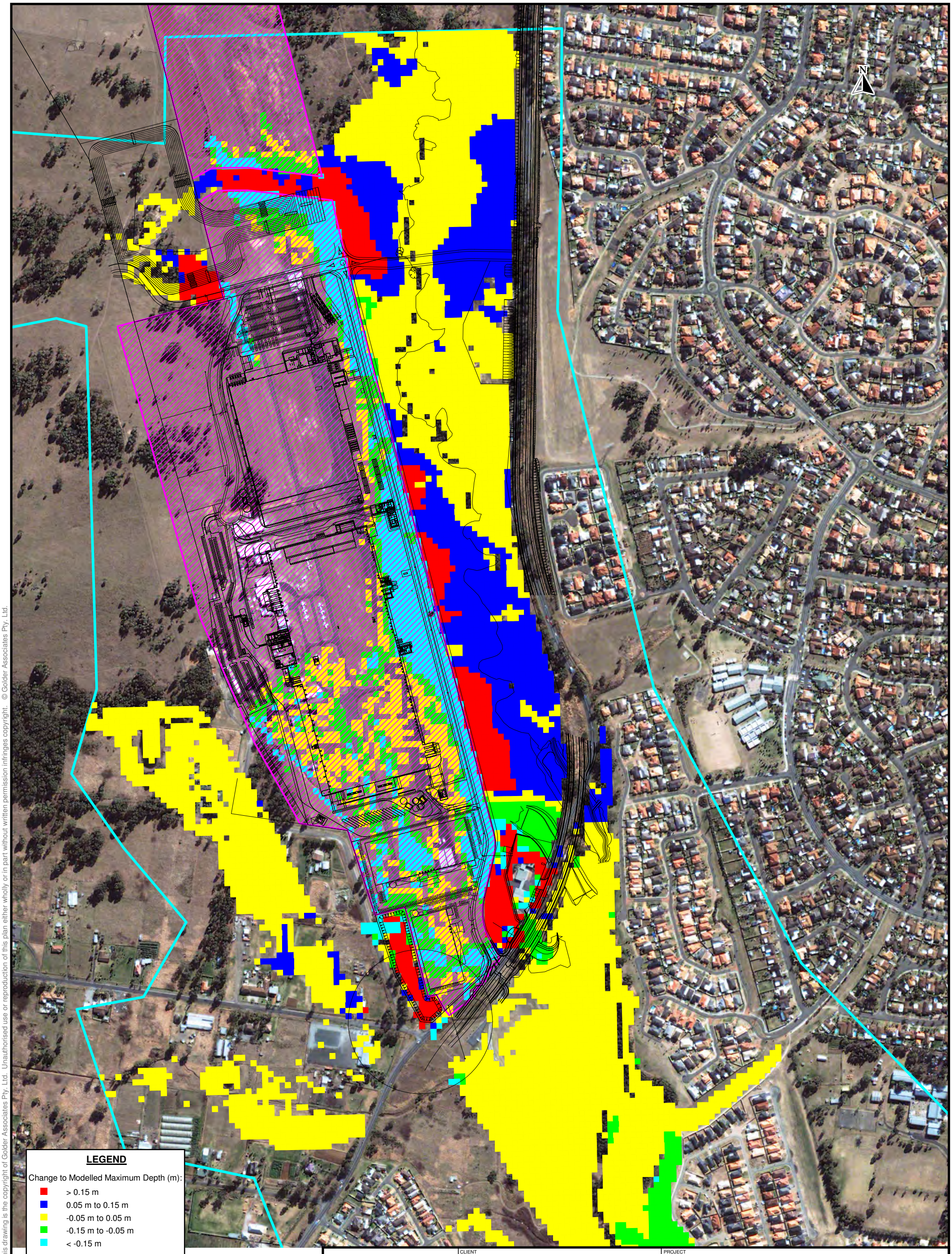
Appendix A
Golder Associates Flood Impacts Baseline Condition to Scenario 1



Golder Associates

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CHECKED	HR	DATE 19-02-10	
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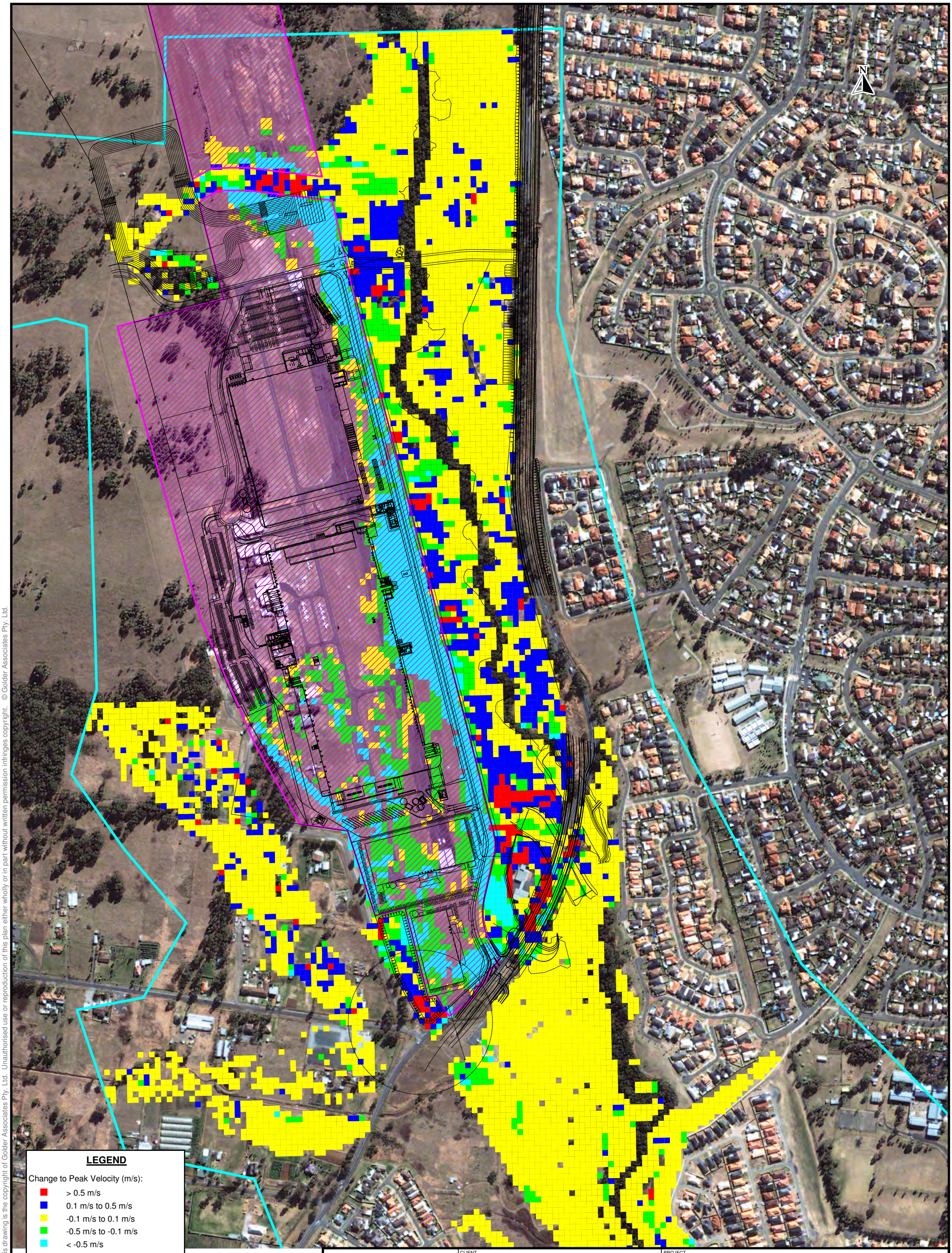

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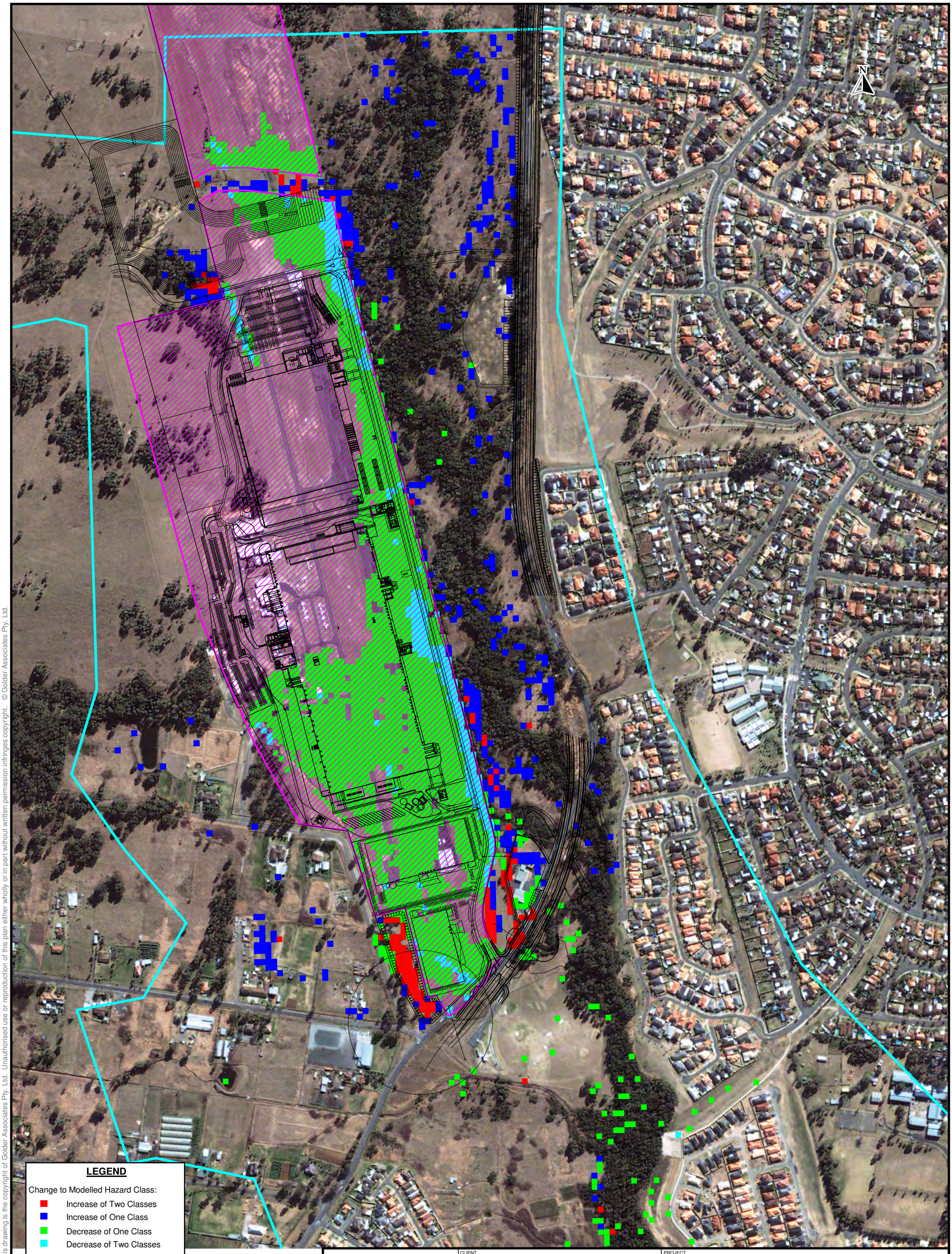

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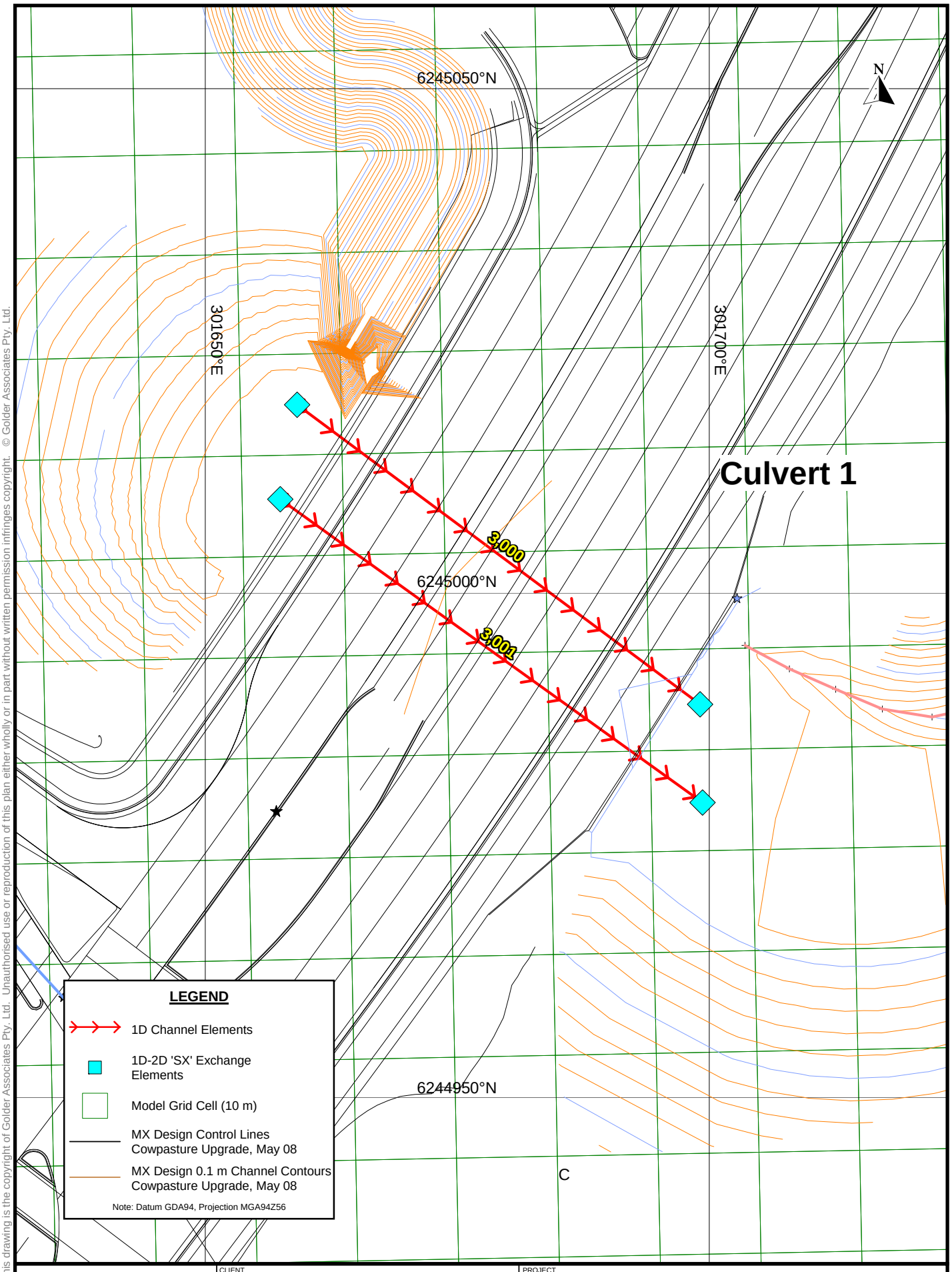
Appendix B

Golder Associates
Location and Identification of 1D Model Elements



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	CHECKED: RKH — DATE: 02-05-08		
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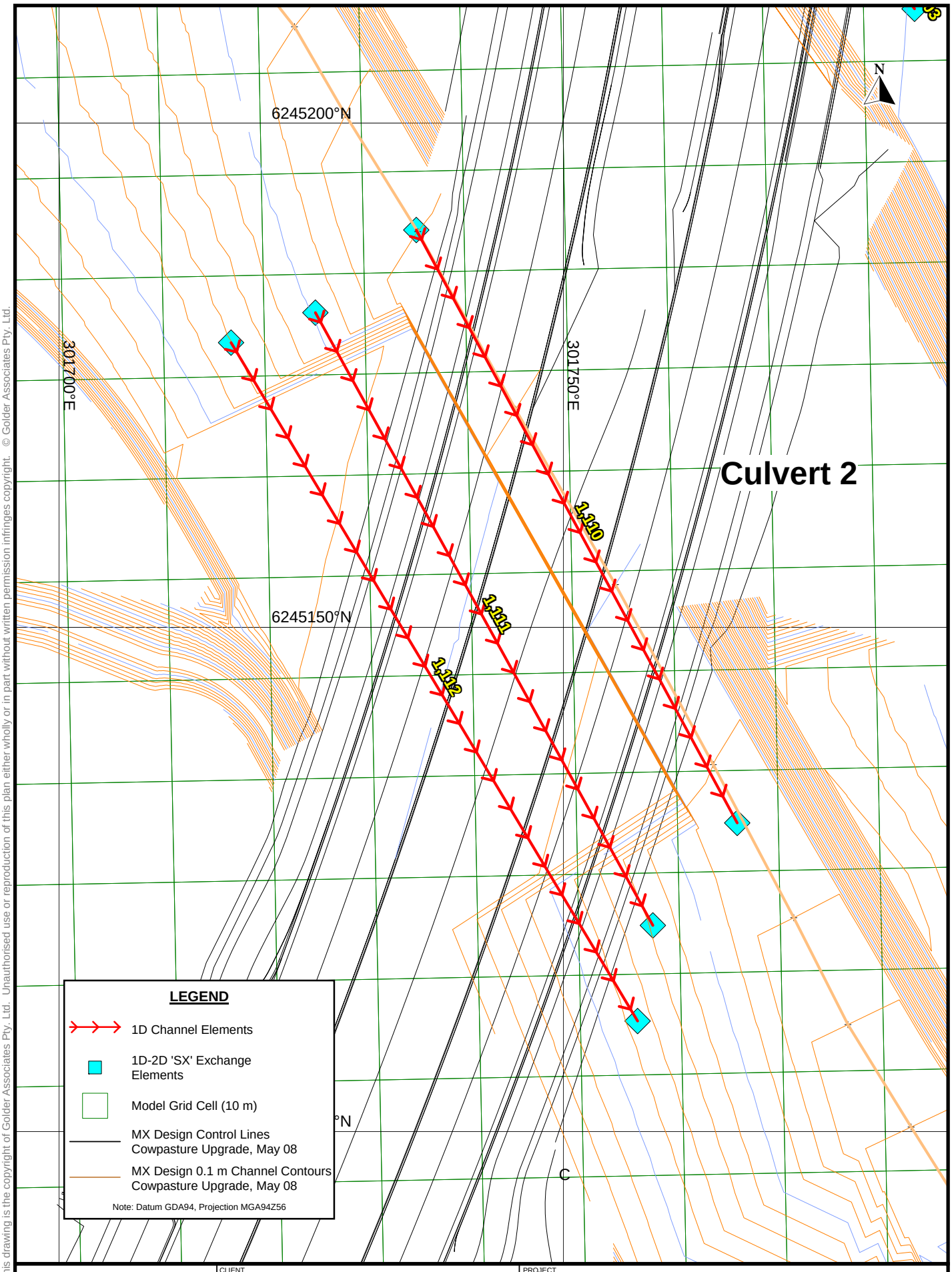

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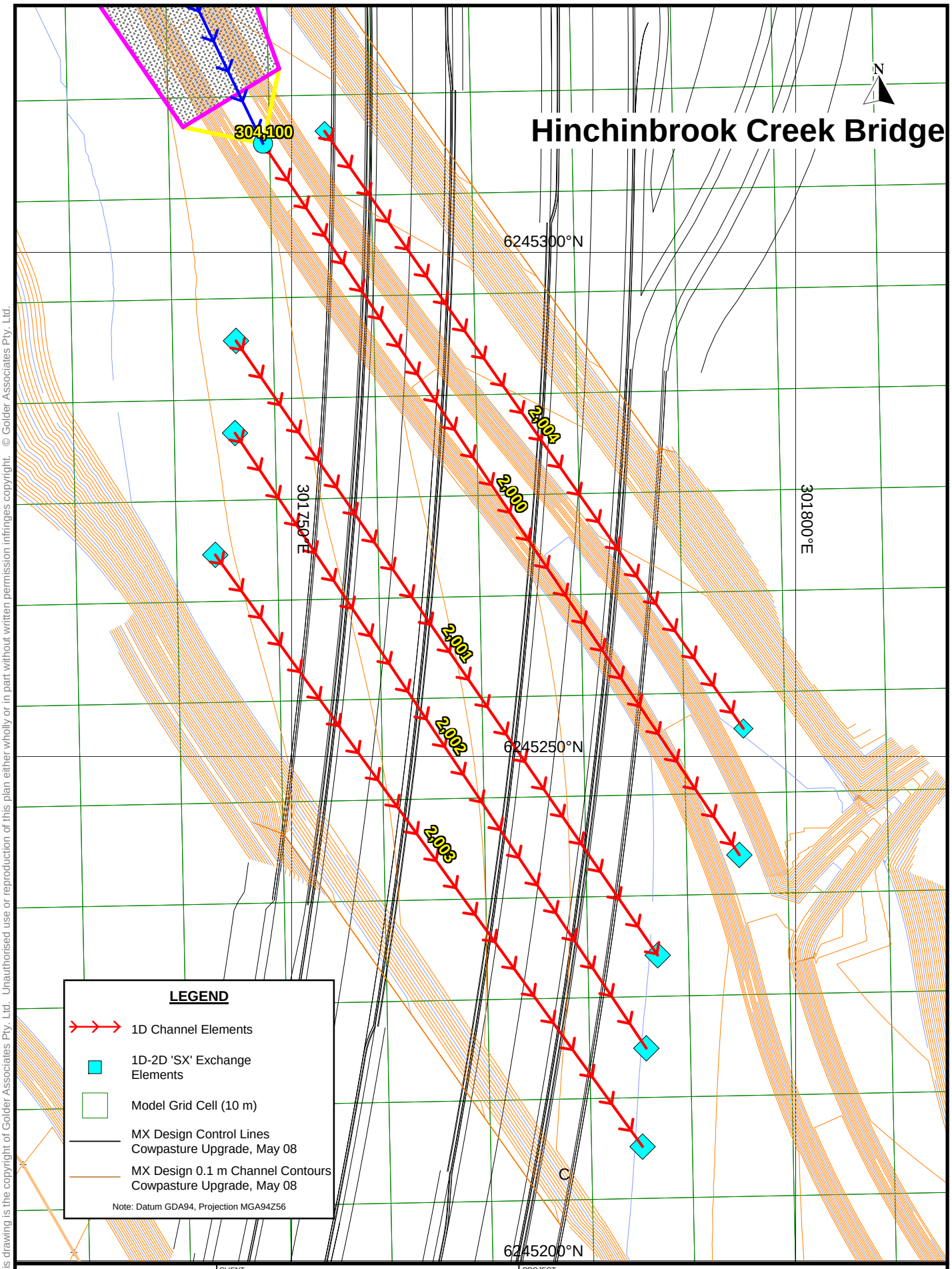

Golder Associates

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