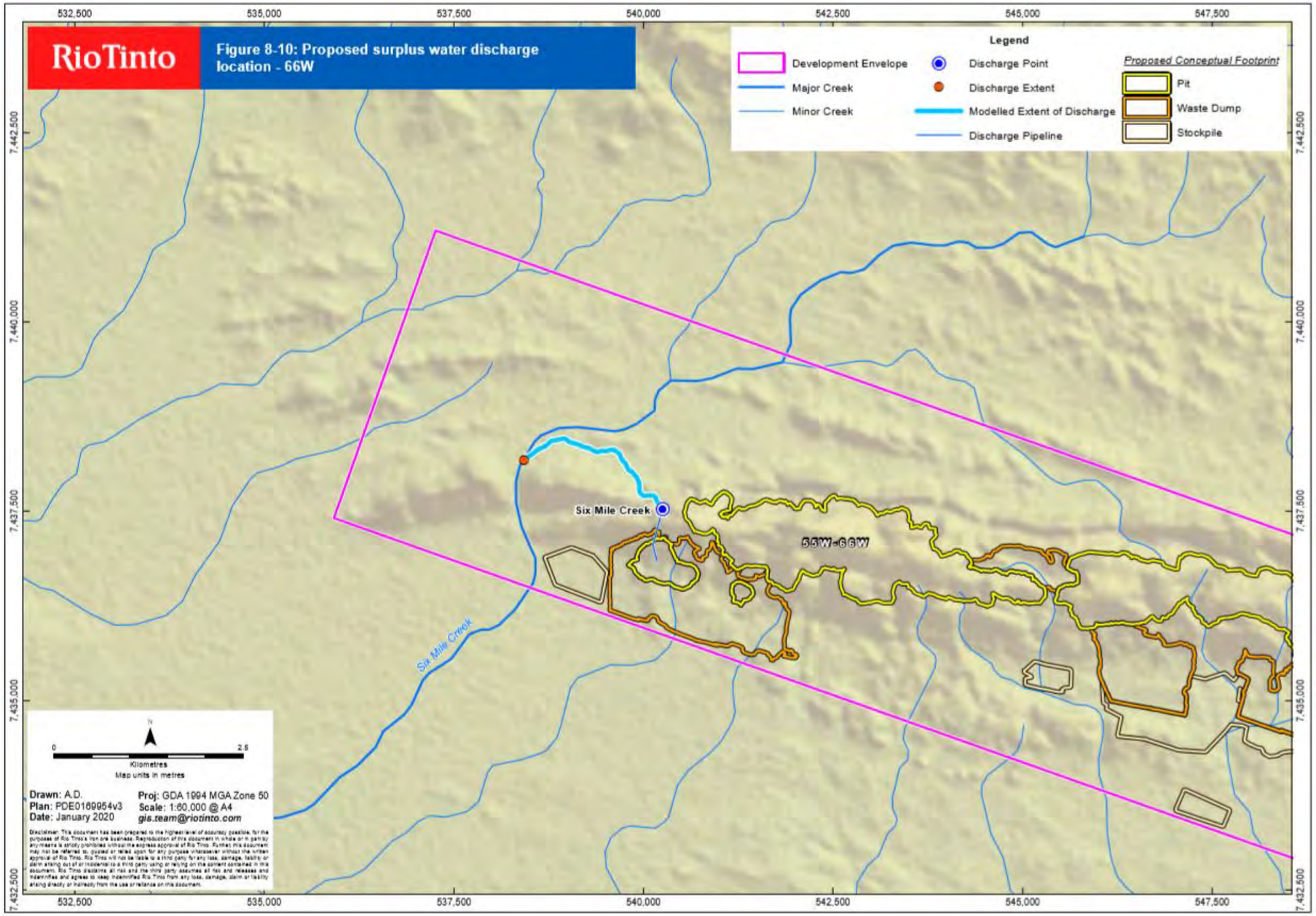

Figure 11-4 - Section 66W Pit Surplus Disposal Options and Discharge Extent Estimates

12. Assessment of potential change

An assessment of the potential change imposed by the development on the hydrologic regime has been undertaken. This assessment considers change after the implementation of recommended surface water management approaches.

Hydraulic models have been used to support assessments of potential changes to the baseline hydrology. By applying rainfall directly to the altered terrain, the hydraulic models effectively describe the rainfall runoff and routing for the developed cases. Frequent low magnitude events (up to a 20% AEP magnitude) have been modelled. These events are considered more representative of environmental flows than larger events more applicable for engineering design of major structures and waterway crossings.

Modelling to assess change in the rainfall runoff regime for environmental flows at 1) Western Range, 2) Paraburdoo and 3) Eastern Range for the LOM plans included in the Greater Paraburdoo Iron Ore Hub Proposal, Figure 8-6. The models described in section 8.4 have been used this assessment.

The altered case has been derived from the base case by overlaying pit and dump designs. Waste dumps are assumed to shed. The changes are described in relation to "base case" conditions.

Models highlight environment flows downstream of dumps and in some pool areas. Culverts have not been included in the models so blockage is over predicted, and false ponding zones occur at locally.

12.1 Western Range

Figure 12-1 to 12-4 highlight the anticipated change in rainfall runoff at Western Range for the LOM scenario. Localised false depressions on the eastern dumps require refinement at feasibility stage. These locations have been flagged as "false ponding" zones.

The difference palate within the mapping legend defines the change in depths. Blue zones exhibiting increased ponding e.g. pits that were not there before, or obstructed ponding from downstream dumps etc. Pool G13_2 for example will likely see increased rainfall runoff as flow to the south of the gorge is terminated by the proposed dump footprint.

Green, yellow, red zones will see a reduction or elimination of rainfall runoff where the zones are proposed to be infilled, or less runoff as the upper catchment flow has decreased. G13_4 is an example situated in a waste dump.

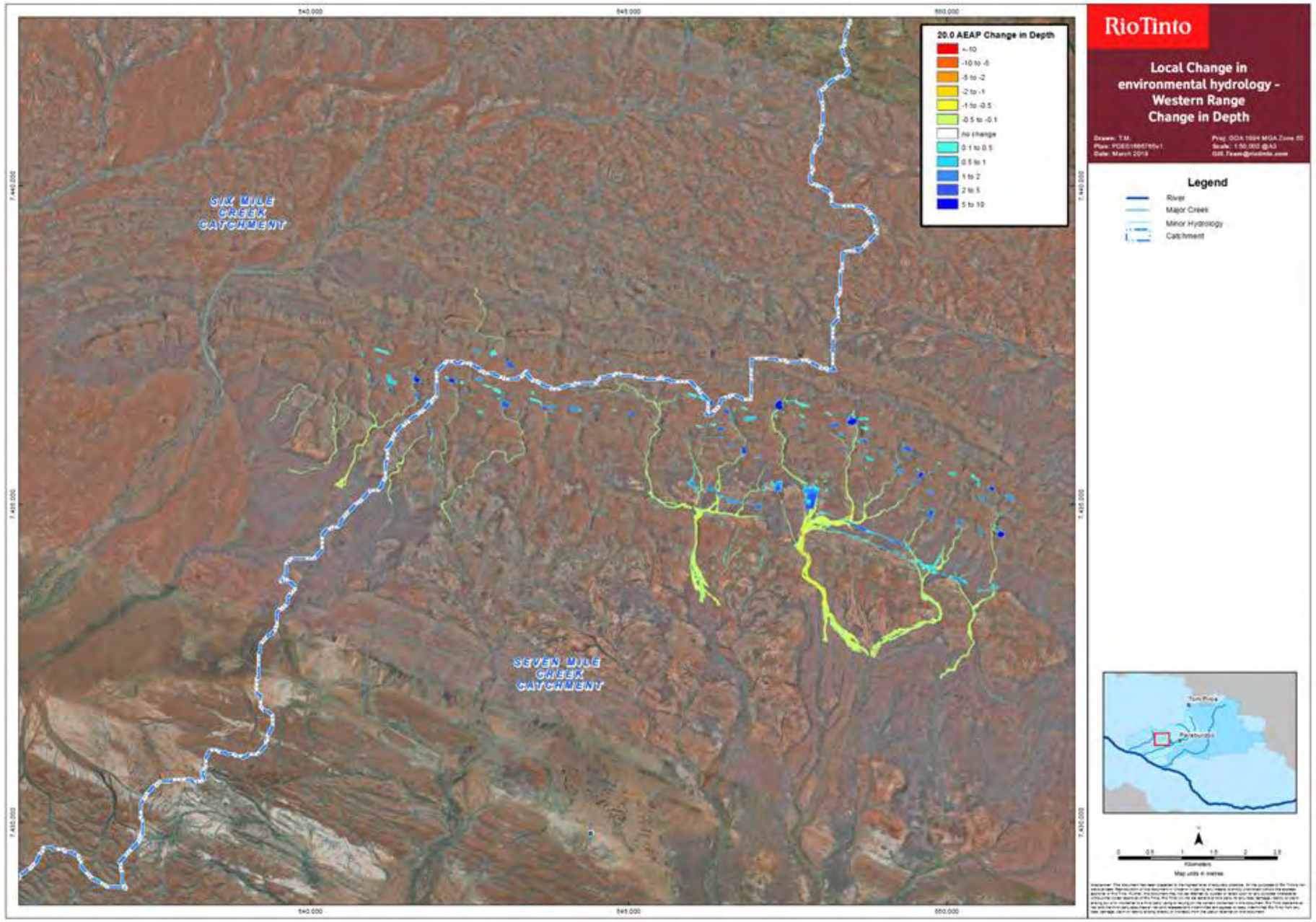

Figure 12-1 Change in environmental rainfall runoff regime at Western Range (frequent event)

12.2 Paraburdoo

The expanded 4EE dump effectively provides flood protection for the main 4EE pit by raising ground levels on the east side of Seven Mile Creek. The southern section of the 4EE dump will reduce run off to the minor tributary south-east of Joe's South Crossing.

Closure scenarios at Paraburdoo involve a series of flood protection measures for pits and dumps adjacent to Pirraburdu and Seven Mile Creek. These sit outside the 1% AEP floodplain and will not alter frequent, low magnitude environmental flows in these creeks. Other changes such as flattening dump batters have minimal influence on flows and have not been modelled.

The pits adjacent to Pirraburdu Creek sit outside the 1% AEP floodplain and will not alter frequent, low magnitude environmental flows in these creeks. Mining on contour is prone to release of sediment to the natural environment. Sediment has been observed in analogous scenarios (e.g. 11W at Para and upstream of Howie's Hole at Eastern Range). Based on the pit footprints shown below, mining is likely to result in some minor sedimentation shedding from 14W, 16W and 20W reaching the Pirraburdu Creek floodplain. Similar minor sedimentation from 27W may reach Pirraburdu Creek floodplain, but over a longer time frame, given the 2.5km distance from pit to creek.

12.3 Eastern Range (42EE and 47E)

Aside from the main gully between 42E and 42EE, no significant changes arise from the LoM development at Eastern Range. Minor depth increases show areas of ponding predicted by the models in the base of the 42EE and 47E pits, as shown in Figure 12-2.

The gully between 42E and 42EE has both ponding upstream of the two landbridges and reductions in flows downstream. The 42EE landbridge has minor ponding and the gully between the two landbridges receives additional flows form the local catchments. Significant ponding upstream of the 47E landbridge includes inundation of the ERP5 pool during the 20% AEP event. This is consistent with the analysis in section 10.3. Flows are effectively ceased downstream of the 47E landbridge for the section of creek within the model domain (450 metres).

At closure, the creek through 47E landbridge is reinstated. Sections of the landbridge away from the creek are battered down and rehabilitated. In this scenario, the two pits and the 42EE landbridge are blocking flows and no pools are impacted by ponding. At the point the creeks around 42EE and 47E leave the model domain, reduction in flow depths is less than 10cm. The depth differences for the closure scenario are shown in Figure 12-2.

Mining on contour as at 42E and proposed for 42EE and 47E is prone to release of sediment to the natural environment. Sediment has been observed in the pools around 42E. Based on the pit footprint shown in section 10.3, mining is likely to result in some sedimentation shedding from 42EE into the gullies either side of the pit.

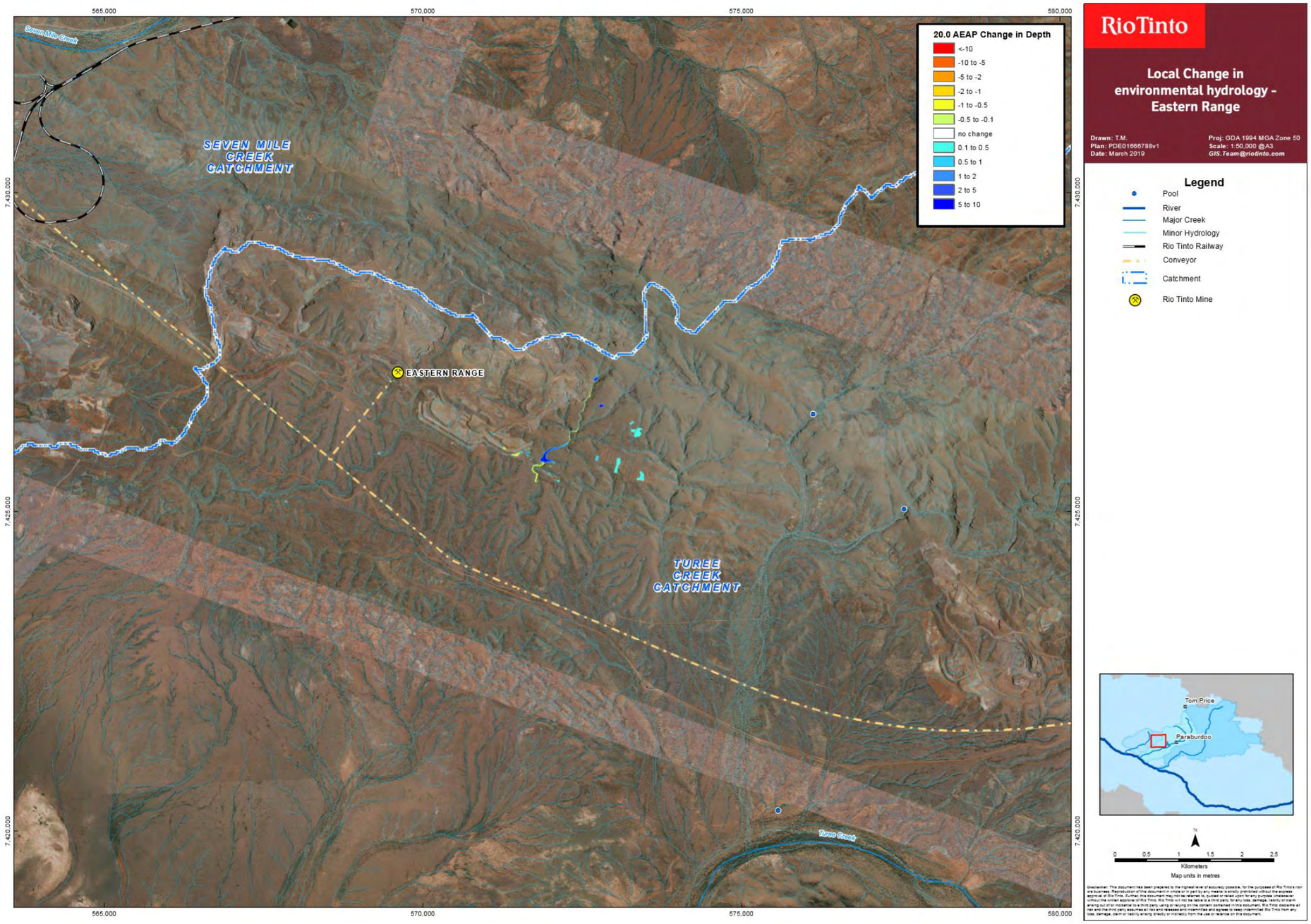

Figure 12-2 Change in environmental rainfall runoff regime at Eastern Range (frequent event) – Life of Mine Comparison

12.4 Linear Infrastructure Changes

Based on the design criteria, environmental flows (lower magnitude than a 20% AEP event) would not be impeded by the design.

Where waterway crossings are installed, minor alterations to the flow regime are expected. These typically included increases in water depth upstream of the crossing and increases in velocity downstream. Culvert design typically includes outlet apron rock protection to prevent scour form these increased velocities. In most cases, significant change from the baseline depth and velocity values are confined to those areas a short distance up and downstream of the crossings. Overall flow volume and flow rates are typically unchanged for at-grade crossings and culvert installations.

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Appendix A: Pit catchment flow characteristic summary

Table 3: Total runoff volumes potentially reporting to deposits, using basic runoff coefficients as described in the Pilbara Surface Water Management Strategy (RTIO-PDE-0053914).

	Likelihood	Almost Certain (1 yr.)	Likely (2 yr.)	Possible (10 yr.)	Unlikely (50 yr.)	Rare (500 yr.)	100 yr. 24 hours
	Rainfall	**45**	**65**	**120**	**210**	**300**	**227**
Catchment	Area (km^2)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)
Western Range (66W, 61W &55W)							
55-66_1	0.20	5,000	8,000	18,000	35,000	50,000	39,000
55-66_2	0.03	1,000	1,000	3,000	5,000	7,000	6,000
55-66_3	0.03	1,000	1,000	3,000	6,000	9,000	7,000
55-66_4	0.04	1,000	2,000	3,000	7,000	10,000	8,000
55-66_5	0.01	0	0	1,000	1,000	2,000	2,000
55-66_6	0.04	1,000	2,000	3,000	7,000	10,000	8,000
55-66_7	0.09	2,000	4,000	8,000	16,000	23,000	18,000
55-66_8	0.05	1,000	2,000	4,000	8,000	11,000	9,000
55-66_9	0.43	12,000	18,000	38,000	76,000	108,000	84,000
55-66_10	0.03	1,000	1,000	3,000	6,000	8,000	7,000
55-66_11	0.27	7,000	11,000	24,000	47,000	67,000	52,000
55-66_12	0.07	2,000	3,000	6,000	12,000	18,000	14,000
55-66_13	0.02	1,000	1,000	2,000	3,000	5,000	4,000
55-66_14	0.09	2,000	4,000	8,000	16,000	23,000	18,000
55-66_15	0.35	9,000	15,000	31,000	62,000	88,000	68,000
55-66_16	0.29	8,000	12,000	25,000	50,000	72,000	56,000
55-66_17	0.18	5,000	8,000	16,000	32,000	46,000	36,000
55-66_18	0.01	0	0	1,000	2,000	3,000	2,000
55-66_19	0.12	3,000	5,000	10,000	21,000	30,000	23,000
55-66_20	0.16	4,000	7,000	14,000	28,000	40,000	29,000
55-66_21	0.05	1,000	2,000	5,000	9,000	14,000	10,000
55-66_22	0.01	0	1,000	1,000	2,000	3,000	2,000
55-66_23	0.02	0	1,000	2,000	3,000	4,000	3,000

	Likelihood	Almost Certain (1 yr.)	Likely (2 yr.)	Possible (10 yr.)	Unlikely (50 yr.)	Rare (500 yr.)	100 yr. 24 hours
	Rainfall	**45**	**65**	**120**	**210**	**300**	**227**
Catchment	Area (km^2)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)
Western Range (66W, 61W &55W)							
55-66_24	0.09	2,000	4,000	8,000	16,000	23,000	17,000
55-66_25	0.12	3,000	5,000	11,000	22,000	31,000	23,000

36-50_26	0.01	0	1,000	1,000	3,000	4,000	3,000
36-50_27	0.02	0	1,000	1,000	3,000	4,000	3,000
36-50_28	0.49	13,000	20,000	43,000	86,000	122,000	95,000
36-50_29	0.13	3,000	5,000	11,000	22,000	32,000	25,000
36-50_30	0.06	2,000	2,000	5,000	10,000	14,000	11,000
36-50_31	0.20	5,000	8,000	18,000	35,000	50,000	39,000
36-50_32	0.10	3,000	4,000	9,000	18,000	25,000	20,000
36-50_33	0.03	1,000	1,000	3,000	5,000	7,000	6,000
36-50_34	1.17	32,000	49,000	104,000	206,000	294,000	228,000
36-50_35	0.06	2,000	2,000	5,000	10,000	14,000	11,000
36-50_36	0.17	5,000	7,000	15,000	31,000	44,000	34,000
36-50_37	0.05	1,000	2,000	4,000	8,000	11,000	9,000
36-50_38	0.10	3,000	4,000	8,000	17,000	24,000	19,000
36-50_39	0.05	1,000	2,000	4,000	9,000	12,000	10,000
36-50_40	1.32	36,000	55,000	117,000	231,000	330,000	257,000
36-50_41	0.04	1,000	2,000	4,000	7,000	10,000	8,000
36-50_42	0.01	0	0	1,000	2,000	2,000	2,000
36-50_43	0.02	1,000	1,000	2,000	4,000	6,000	5,000
36-50_44	0.26	7,000	11,000	23,000	46,000	65,000	51,000
36-50_45	0.35	9,000	14,000	31,000	61,000	87,000	64,000
36-50_46	0.07	2,000	3,000	6,000	11,000	16,000	12,000
36-50_47	0.04	1,000	2,000	4,000	7,000	10,000	7,000
36-50_48	0.04	1,000	2,000	3,000	6,000	9,000	7,000
36-50_49	0.21	6,000	9,000	19,000	37,000	53,000	39,000
36-50_50	0.06	2,000	3,000	6,000	11,000	16,000	12,000
36-50_51	0.71	19,000	30,000	63,000	125,000	179,000	139,000
36-50_52	0.09	2,000	4,000	8,000	15,000	22,000	17,000

	Likelihood	Almost Certain (1 yr.)	Likely (2 yr.)	Possible (10 yr.)	Unlikely (50 yr.)	Rare (500 yr.)	100 yr. 24 hours
	Rainfall	**45**	**65**	**120**	**210**	**300**	**227**
Catchment	Area (km^2)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)	Vol Captured (m^3)
(27W, 20W, 14-16W, 4WW and Eastern Range additional pits							
27W_53	0.01	0	1,000	1,000	2,000	3,000	3,000
27W_54	0.03	1,000	1,000	3,000	5,000	8,000	6,000
27W_55	0.01	0	0	1,000	2,000	2,000	2,000
27W_56	0.14	4,000	6,000	12,000	24,000	34,000	27,000
20W_57	0.13	4,000	5,000	12,000	23,000	33,000	26,000
14-16W_58	0.08	2,000	3,000	7,000	15,000	21,000	16,000
14-16W_59	0.13	3,000	5,000	11,000	22,000	31,000	24,000
4EE_1	3.39	92,000	141,000	300,000	594,000	849,000	660,000
4EE_2	0.34	9,000	14,000	30,000	59,000	85,000	66,000
4EE_3	0.43	12,000	18,000	38,000	75,000	107,000	83,000
ER_1	0.14	4,000	6,000	13,000	25,000	36,000	28,000
ER_2	0.15	4,000	6,000	13,000	26,000	38,000	29,000
ER_3	0.03	1,000	1,000	3,000	5,000	8,000	6,000
ER_4	0.05	1,000	2,000	4,000	8,000	11,000	8,000
ER_5	0.03	1,000	1,000	3,000	5,000	7,000	5,000