



7.3.1 Removal of mine water from the project area

Table 13: Impact assessment of the removal of mine water from the project area

Impacts	Significance Score						Discussion	Possible mitigation measures
	Mag	D	SS	P	Total	Significance		
Impacts on water quality	SBM						Removal of mine water considered to be a positive impact on the water quality of the entire project area.	<p><b>Avoidance:</b> N/A. <b>Minimisation:</b> N/A. <b>Reduction:</b> N/A. <b>Rectification:</b> N/A. <b>Compensation:</b> N/A</p> <p>Monitor the water quality at abstraction points and downstream points along the Kromdraaispruit, Klipspruit, Brugspruit and Blesbokspruit. This must be done once every second month using Whole Effluent Toxicity (WET) testing. These tests can be performed by Golder Associates Research Laboratories.</p>
	8	4	3	5	75	High		
	SAM							
	8	4	3	5	75	High		
Impacts on habitat: Macro-channel and Riparian	SBM						Removal of the discharged mine water from the streams will revert the streams to their natural flow regimes and is considered to be a positive impact.	<p><b>Avoidance:</b> N/A. <b>Minimisation:</b> N/A. <b>Reduction:</b> N/A. <b>Rectification:</b> Implement rehabilitation where negative habitat impacts occur; Prevent exotic encroachment at the sites. <b>Compensation:</b> N/A</p> <p>Monitor the habitat at abstraction points and downstream points along the Kromdraaispruit, Klipspruit, Brugspruit and Blesbokspruit. The monitoring must take place once a year in the wet season between November and March. This study can be performed by a terrestrial ecologist from the Ecology Division from Golder Associates Africa.</p>
	6	4	3	5	65	Moderate		
	SAM							
	6	4	3	5	65	Moderate		
Impacts on habitat: In-stream habitat	SBM						Removal of the discharged mine water from the streams will revert the streams to their natural flow regimes and is considered to be a positive impact.	<p><b>Avoidance:</b> N/A. <b>Minimisation:</b> N/A. <b>Reduction:</b> N/A. <b>Rectification:</b> Implement rehabilitation where negative habitat impacts occur; Prevent exotic encroachment at the sites. <b>Compensation:</b> N/A</p> <p>Monitor the habitat at abstraction points and downstream points along the Kromdraaispruit, Klipspruit, Brugspruit and Blesbokspruit. The monitoring of the instream habitat must take place twice a year, once in the low flow season and once in the high flow season.</p>
	6	4	3	5	65	Moderate		
	SAM							
	6	4	3	5	65	Moderate		
Impacts on biota: Macroinvertebrates, Ichthyofauna	SBM						Increased water quality and increased natural habitats will result in a positive impact on the aquatic biota at the sites.	<p><b>Avoidance:</b> N/A. <b>Minimisation:</b> N/A. <b>Reduction:</b> N/A. <b>Rectification:</b> Implement rehabilitation where negative habitat impacts occur; Prevent exotic encroachment at the sites. <b>Compensation:</b> N/A</p> <p>Monitor the biotic integrity at abstraction points and downstream points along the Kromdraaispruit, Klipspruit, Brugspruit and Blesbokspruit must be done twice a year, once on the low flow season and once in the high flow season. These studies can be performed the aquatic team of the Ecology Division of Golder Associates.</p>
	6	4	2	4	48	Low		
	SAM							
	6	4	2	4	48	Low		

7.3.2 Pipeline construction

Table 14: Impact assessment of the pipeline construction

Impacts	Significance Score						Discussion	Possible mitigation measures
	Mag	D	SS	P	Total	Significance		
Impacts on water quality	SBM						If sediments and contaminants enter the in-stream environment from construction activities around the pipeline and water crossings, a decrease in water quality will occur and will impact on the aquatic biota. Accidental spills, leaks and contamination of sites from pipeline will impact the water quality and the aquatic biota.	<p><b>Avoidance:</b> N/A. <b>Minimisation:</b> Construct pipeline during the dry season; Implement low impact construction techniques; Where possible, keep construction activities out of the wetland buffer zone; Limit movement of construction vehicles within wetlands; Monitor the water quality upstream and downstream of the pipeline during the construction phase. <b>Reduction:</b> Clean up and rehabilitate any accidental spillages or impacts to the aquatic and wetland ecosystems; Devise and implement a relocation plan if rare and sensitive species are identified during construction; Contain spills to avoid degrading macro-habitats and vegetation downstream; Implement dust suppression on dirt roads during construction to avoid excessive dust formation. <b>Rectification:</b> Implement rehabilitation where construction site impacts occur; Prevent pipeline spillages and, should any occur, clean up and rehabilitate immediately; Where wetland soils have been compacted, labourers on foot should loosen soils with light weight tools. <b>Compensation:</b> N/A</p>
	6	2	2	4	40	Low		
	SAM							
	4	2	1	2	14	Low		
Impacts on habitat: Macro-channel and Riparian	SBM						Removal of vegetation and changes to the channel banks and habitats will result in macro-channel instability and will impact the in-stream habitats around the pipeline crossing sites. Bank erosion, exotic vegetation encroachment and bank undercutting can occur. Trenches and river diversions at watercourse crossings are considered to be the greatest impact in terms of the habitat.	<p><b>Avoidance:</b> N/A. <b>Minimisation:</b> Place relevant sections of the pipeline below the groundwater flow component of the streams and wetlands; Construct pipeline / watercourse crossings during the dry season; Construct pipeline / watercourse crossings in stages so as to limit the impact to the sites. Implement low impact construction techniques; Where possible, keep construction activities out of the wetland buffer zone; Limit movement of construction vehicles within wetlands; Restrict vehicles to service roads; Put construction practices in place to avoid dumping on or damage to the wetlands; Monitor the habitat both upstream and downstream of the pipeline / watercourse crossing sites. <b>Reduction:</b> Clean up and rehabilitate any accidental spillages or impacts to the aquatic and wetland ecosystems; Devise and implement a relocation plan if rare and sensitive species are identified during construction; Contain spills to avoid degrading in-stream habitats downstream; Implement dust suppression on dirt roads during construction to avoid excessive dust formation; Maintain service roads to avoid erosion and excessive dust formation. <b>Rectification:</b> Implement rehabilitation where construction site impacts occur; Prevent pipeline spillages and, should any occur, clean up and rehabilitate immediately. <b>Compensation:</b> N/A</p>
	8	3	2	4	52	Moderate		
	SAM							
	6	2	2	4	40	Low		
Impacts on habitat: In-stream habitat	SBM						Increase or decrease in channel widths, removal or modification of substrates and changes in flow will impact the site and the aquatic biota. Increased sedimentation will also occur. Trenches and river diversions at watercourse crossings are considered to be the greatest impact in terms of the habitat.	<p><b>Avoidance:</b> N/A. <b>Minimisation:</b> Place relevant sections of the pipeline below the groundwater flow component of the streams and wetlands; Construct pipeline / watercourse crossings during the dry season; Construct pipeline / watercourse crossings in stages so as to limit the impact to the sites. Implement low impact construction techniques; Where possible, keep construction activities out of the wetland buffer zone; Limit movement of construction vehicles within wetlands; Restrict vehicles to service roads; Put construction practices in place to avoid dumping on or damage to the wetlands; Monitor the habitat both upstream and downstream of the pipeline / watercourse crossing sites. <b>Reduction:</b> Clean up and rehabilitate any accidental spillages or impacts to the aquatic and wetland ecosystems; Devise and implement a relocation plan if rare and sensitive species are identified during construction; Contain spills to avoid degrading water quality downstream; Implement dust suppression on dirt roads during construction to avoid excessive dust formation; Maintain service roads to avoid erosion and excessive dust formation. <b>Rectification:</b> Implement rehabilitation where construction site impacts occur; Prevent pipeline spillages and, should any occur, clean up and</p>
	6	2	2	4	40	Low		
	SAM							



Impacts	Significance Score						Discussion	Possible mitigation measures
	Mag	D	SS	P	Total	Significance		
	4	2	2	4	32	Low		rehabilitate immediately; Where wetland soils have been compacted, labourers on foot should loosen soils with light weight tools. <b>Compensation:</b> N/A
Impacts on biota: Macroinvertebrates, Ichthyofauna	<b>SBM</b>							<p>Aquatic biota will be impacted during the Construction Phase due to the amount of disturbance and activity at the site. This is however temporary and should recover during the operational phase.</p> <p><b>Avoidance:</b> N/A. <b>Minimisation:</b> Place relevant sections of the pipeline below the groundwater flow component of the streams and wetlands; Construct pipeline / watercourse crossings during the dry season; Construct pipeline / watercourse crossings in stages so as to limit the impact to the sites. Implement low impact construction techniques; Where possible, keep construction activities out of the wetland buffer zone; Limit movement of construction vehicles within wetlands; Restrict vehicles to service roads; Put construction practices in place to avoid dumping on or damage to the wetlands; Monitor the biotic integrity both upstream and downstream of the pipeline / watercourse crossing sites. <b>Reduction:</b> Clean up and rehabilitate any accidental spillages or impacts to the aquatic and wetland ecosystems; Devise and implement a relocation plan if rare and sensitive species are identified during construction; Contain spills to avoid degrading water quality and habitat downstream; Implement dust suppression on dirt roads during construction to avoid excessive dust formation; Maintain service roads to avoid erosion and excessive dust formation. <b>Rectification:</b> Implement rehabilitation where construction site impacts occur; Prevent pipeline spillages and, should any occur, clean up and rehabilitate immediately. <b>Compensation:</b> N/A</p>
	6	2	2	4	40	Low		
	<b>SAM</b>							
	4	2	2	4	32	Low		

7.3.3 Pipeline layout and operation

Table 15: Impact assessment of the pipeline construction

Impacts	Significance Score						Discussion	Possible mitigation measures
	Mag	D	SS	P	Total	Significance		
Impacts on water quality	SBM						Placement of the pipeline near existing roads and servitudes or at degraded sites will reduce the impact to the aquatic ecosystems. Accidental spills, leaks and contamination of sites from pipeline will impact the water quality and the aquatic biota.	<p><b>Avoidance:</b> At Site 1, the pipeline should be re-routed to follow the upstream road servitude to the northeast. At Site 3, the pipeline should be re-routed to cross the stream at the upstream road servitude 100 m to the east. At Site 4, along the Brugspruit, the pipeline should be re-routed to follow the upstream road servitude (R104) to the south. At Site 5, the pipeline should be re-routed to follow the upstream road servitude (R104) to the south. <b>Minimisation:</b> At sites 1, 3, 4 and 5, construct the pipeline as close to the existing upstream road servitudes as possible; Monitor the water quality upstream and downstream of the pipeline during the operation phase. <b>Reduction:</b> Clean up and rehabilitate any accidental spillages or impacts to the aquatic and wetland ecosystems; Monitor the pipeline for leaks and spills on a regular basis during the operational phase; Repair damaged pipes immediately to avoid excessive spills; Contain spills to avoid degrading water quality downstream; Maintain service roads to avoid erosion and excessive dust formation. <b>Rectification:</b> Implement rehabilitation where construction site impacts occur; Prevent pipeline spillages and, should any occur, clean up and rehabilitate immediately; Prevent exotic vegetation encroachment. <b>Compensation:</b> N/A</p>
	6	4	2	4	48	Low		
	SAM							
	6	3	2	3	33	Low		
Impacts on habitat: Macro-channel and Riparian	SBM						Removal of vegetation and changes to the channel banks and habitats will result in macro-channel instability and will impact the in-stream habitats around the pipeline crossing sites. Bank erosion, exotic vegetation and bank undercutting can occur. During operation erosion from discharges, spill or leaks as well as from increased activity around the sites (vehicles / workers) will disturb and modify the vegetation and channel habitats.	<p><b>Avoidance:</b> At Site 1, the pipeline should be re-routed to follow the upstream road servitude to the northeast. At Site 3, the pipeline should be re-routed to cross the stream at the upstream road servitude 100 m to the east. At Site 4, along the Brugspruit, the pipeline should be re-routed to follow the upstream road servitude (R104) to the south. At Site 5, the pipeline should be re-routed to follow the upstream road servitude (R104) to the south. <b>Minimisation:</b> Place relevant sections of the pipeline below the groundwater flow component of the streams and wetlands; At sites 1, 3, 4 and 5, construct the pipeline as close to the existing upstream road servitudes as possible; Where possible, keep all maintenance and monitoring activities out of the wetland buffer zone; Limit movement of vehicles within wetlands; Restrict vehicles to service roads; Prevent dumping on or damage to the wetlands; Monitor the habitat both upstream and downstream of the pipeline / watercourse crossing sites. <b>Reduction:</b> Clean up and rehabilitate any accidental spillages or impacts to the aquatic and wetland ecosystems; Monitor the pipeline for leaks and spills on a regular basis during the operational phase; Repair damaged pipes immediately to avoid excessive spills; Contain spills to avoid degrading water quality downstream; Maintain service roads to avoid erosion and excessive dust formation. <b>Rectification:</b> Implement rehabilitation where site impacts occur; Prevent pipeline spillages and, should any occur, clean up and rehabilitate immediately. <b>Compensation:</b> N/A</p>
	8	4	2	4	56	Moderate		
	SAM							
	4	2	2	3	24	Low		
Impacts on habitat: In-stream habitat	SBM						Increase or decrease in channel widths, removal or modification of substrates and changes in flow will impact the site and the aquatic biota. Accidental spills, leaks or discharges will erode banks and in-stream habitats.	<p><b>Avoidance:</b> At Site 1, the pipeline should be re-routed to follow the upstream road servitude to the northeast. At Site 3, the pipeline should be re-routed to cross the stream at the upstream road servitude 100 m to the east. At Site 4, along the Brugspruit, the pipeline should be re-routed to follow the upstream road servitude (R104) to the south. At Site 5, the pipeline should be re-routed to follow the upstream road servitude (R104) to the south. <b>Minimisation:</b> Place relevant sections of the pipeline below the groundwater flow component of the streams and wetlands; At sites 1, 3, 4 and 5, construct the pipeline as close to the existing upstream road servitudes as possible; Where possible, keep all maintenance and monitoring activities out of the wetland buffer zone; Limit movement of vehicles within wetlands; Restrict vehicles to service roads; Prevent dumping on or damage to the wetlands; Monitor the habitat both upstream and downstream of the pipeline / watercourse crossing</p>
	8	4	2	4	56	Moderate		



Impacts	Significance Score						Discussion	Possible mitigation measures
	Mag	D	SS	P	Total	Significance		
Impacts on biota: Macroinvertebrates, Ichthyofauna	<b>SAM</b>						Water quality impacts and in-stream habitats disturbance activities at the site may impact on the aquatic biota.	sites. <b>Reduction:</b> Clean up and rehabilitate any accidental spillages or impacts to the aquatic and wetland ecosystems; Monitor the pipeline for leaks and spills on a regular basis during the operational phase; Repair damaged pipes immediately to avoid excessive spills; Contain spills to avoid degrading water quality downstream; Maintain service roads to avoid erosion and excessive dust formation. <b>Rectification:</b> Implement rehabilitation where site impacts occur; Prevent pipeline spillages and, should any occur, clean up and rehabilitate immediately. <b>Compensation:</b> N/A
	4	2	2	3	<b>24</b>	Low		
	<b>SBM</b>							
	6	4	2	4	<b>48</b>	Low		
	<b>SAM</b>							
	4	2	2	3	<b>24</b>	Low		





Figure 1: Map showing location of aquatic biomonitoring sites.

