Rio Tinto Alcan

# Appendix 6-C

## Environmental Management Plan Outline - Threatened Fauna Species

# RED GOSHAWK (*Erythrotriorchis radiatus*)
# Environmental Management Plan Outline


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| **Habitat** | **High Suitability Habitat**<br>Comprises areas with woodland habitat mosaics associated with riparian, wetland, coastal woodland complexes, and vine forest edges, and includes a 1km buffer of adjacent woodland surrounding permanent or near permanent waterbodies to accommodate potential nesting sites.<br>**Moderate Suitability Habitat**<br>Mosaics of medium-tall open forest and woodland located adjacent to high suitability habitat and within foraging distance from potential nests located within high suitability habitat. |
| **EPBC Status** | Vulnerable |
| **Known Threats** | Note: known threats listed below are not all necessarily applicable to the SoE Project. Mitigation measures for relevant impacts on the Red Goshawk associated with the SoE Project are detailed separately in this table.<br><br>Habitat clearing is the major known threat to the Red Goshawk and has impacted on the density of individuals in the southern parts of its Queensland range. Other commonly identified threats to the species include:<br>▪ Human disturbance including illegal egg collection, disturbance by bird watchers and intentional killing of adults;<br>▪ Overgrazing, woody thickening of open woodlands, or other changes in land management which could reduce prey availability, and therefore reduce productivity;<br>▪ Logging of potential nest trees;<br>▪ Degradation of wetlands which provide seasonal foraging habitat;<br>▪ Altered fire regimes which have the potential to impact breeding sites and reduce prey availability, thus reducing productivity;<br>▪ The occurrence of a catastrophic event which may exaggerate the impact of existing threats; and,<br>▪ Possible genetic bottlenecks in the population.<br>The application of persistent organochlorine pesticides may have caused a historic reduction in the population. In 1989, Australia ceased widespread use of organochlorine pesticides and most affected species have now recovered. |
| **Likelihood of Occurrence in the SoE Project Area / Disturbance Areas** | **Mining Area**<br>**Possible:** the open forests of the mining area and adjacent habitats constitute potential foraging habitat for the Red Goshawk.Although no sightings of the Red Goshawk were made during the surveys. Darwin Stringybark woodlands within 1km of permanent water could be used for nesting. It is possible that nests of the species could occur within proposed mining areas.<br>**Infrastructure footprint**<br>**Possible:** no nests were located within the proposed dam site. However, the Dam C site contains potential foraging and nesting habitat.<br>**Balance of SoE Project area not disturbed**<br>**Possible:** the open forest, woodland, riparian, and wetland habitats that occur throughout the SoE Project area, present suitable nesting and feeding opportunities for the species. |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | **Potential Impact: Clearing and Loss of Habitat**<br>Disturbance of a small area of high suitability habitat during the construction of the proposed Dam C and infrastructure crossings of streams, and in proposed mining areas. Disturbance of some moderate suitability habitat through clearing of Darwin Stringybark open forest for mining and construction of the Port, Boyd infrastructure area and TSF.<br><br>***Avoidance Measures***<br>The following avoidance measures will reduce impacts of clearing and loss of habitat on the Red Goshawk:<br>▪ The SoE environmental buffer system (refer to details below) will avoid direct disturbance of the majority of high suitability habitat within the Project area. The SoE environmental buffer system shall exceed the requirement of the Coordinator General's approval conditions and comprise a methodology for determining set-back distances from sensitive vegetation, instead of from the banks of watercourses and wetlands. The sensitive vegetation to be buffered by Darwin Stringybark woodland shall comprise the following vegetation types: riparian, wetland, estuarine, vine forest and coastal vegetation on sand. RTA would work with Traditional Owners and the relevant WCCCC Sub-committee on establishment of environmental buffers as part of the CHEMP. The SoE environmental buffer system will maintain a network of undisturbed habitats and will be enhanced through the fire management program(refer details below) which will conserve fire sensitive flora and promote overall vegetation diversity and the feral pig control program (refer details below) which aims to reduce pig damage to riparian and wetland areas.<br>▪ Project planning for infrastructure shall minimise impact on vegetation that provides high suitability habitat for the Red Goshawk.<br><br><u>SoE Environmental Buffer System</u><br>The majority of high suitability habitat of the species within the Project area would be protected from mining by the environmental buffer system.<br>▪ Sensitive vegetation shall be buffered from mining by Darwin Stringybark woodland including the following vegetation types: riparian, wetland, estuarine, vine forest and coastal vegetation on sand.<br>▪ Typically, a buffer distance up to 200m shall be adopted for vine forest, wetlands, estuaries, coastal vegetation on sand and riparian vegetation along watercourses of stream order three and above.<br>▪ Narrower buffer distances to a minimum of about 100m may be adopted for riparian vegetation along watercourses of stream order one and two, or where significant ecological attributes are absent and physical characteristics are such that a narrower buffer will still provide edge effect protection and filtering of surface runoff flows from disturbed areas.<br>▪ As a minimum, the SoE environmental buffer system will cover approximately 8,356ha more than the regulatory buffer requirements set out in the Queensland Coordinator General's conditions of approval.<br>▪ Carry out surveys to confirm the boundaries of mapped sensitive vegetation types in the field prior to any clearing activities associated with mining operations. Surveys shall also assess the stream order of any watercourses and the presence or absence of significant ecological features such as springs, aquatic refugia and threatened flora and fauna in and around the sensitive vegetation types.<br>▪ Buffer distances shall be set based on the findings of the surveys and, where relevant, stream order.<br>▪ Establishment of the buffer distance and authorisation for clearing non-buffered areas shall be managed through a ground disturbance approval.<br>▪ A buffer mapping system shall be maintained to identify all buffer areas and distances.<br><br>***Mitigation and Enhancement Measures***<br><br><u>Pre -Disturbance Surveys</u><br>The impacts of loss of habitat will be reduced by undertaking pre-disturbance surveys:<br>▪ Pre-disturbance surveys for Red Goshawk nests shall be undertaken within parts of the mine and infrastructure areas located within 1km of permanent water supporting riparian gallery forest or Paperbark wetland; seasonally inundated coastal wetlands and seasonal water courses supporting riparian gallery forest; or an estuary.<br>▪ If a nest is identified, establish a 200m buffer around the nest and maintain the buffer to end of breeding season. |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | Fire Management Program<br>▪ Develop a program in cooperation with Traditional Owners and the relevant Western Cape Communities Coordinating Committee (WCCCC) sub-committee.<br>▪ The program shall aim to conserve fire-sensitive flora and vegetation communities and promote overall vegetation diversity by reducing fire intensity and frequency and promoting a regime of early to mid-dry season lower intensity burns with a lower frequency.<br>▪ Establish and maintain a network of fire breaks to facilitate effective control burns and provide opportunities for combating inappropriate fires.<br>▪ Control public access to the SoE Project area.<br><br>Weed Management Program<br>▪ Prior to the establishment of the mine access road, any vehicles travelling to the SoE Project area that are deemed to be at risk from weed contamination shall be washed down for weeds.<br>▪ Washdown facilities shall be provided at the Humbug barge terminal and all vehicles thoroughly washed before transfer to the Hey River barge/ferry terminal and mine access road.<br>▪ Runoff from wash-down facilities shall be treated before being released.<br>▪ Annual weed surveys shall be conducted post wet season, targeting:<br>  ▪ all operational areas (mining and infrastructure) and immediately adjacent ecosystems; and,<br>  ▪ site access roads.<br>▪ Periodic weed surveys shall be conducted at least every three years, targeting:<br>  ▪ habitats where key weed species are most likely to become established; and,<br>  ▪ areas within the mining lease where there is high recreational visitation (especially riparian and wetland areas).<br>▪ Detailed mapping of the above areas shall form the basis of the weed management program and guide annual weed surveys.<br>▪ Training courses shall be conducted regularly for relevant mine personnel, highlighting significant weed species and basic identification features for weeds likely to be encountered on the site, to ensure staff have been provided with enough information to accurately identify weed species.<br>▪ Protocols shall be established for easy reporting of weed occurrence by any personnel working on site and be of a format that encourages reporting.<br>▪ Results of weed surveys and any weed reporting shall be uploaded to the site GIS in a timely manner so that weed mapping is maintained as a live database.<br>▪ Any weed infestation areas shall have controlled access until appropriate treatment and suppression is complete and there is no risk of propagules being translocated.<br><br>Feral Pig Control Program<br>A feral pig control program shall be developed in consultation with EHP and shall be further refined and implemented in consultation with the Traditional Owners. The program, which will focus on reducing feral pig numbers, will reduce pig damage to riparian and wetlands areas within the management zone that support potential prey for the Red Goshawk. The feral pig control program in relation to Red Goshawk habitat would include the following:<br>▪ shooting of feral pigs (helicopter or ground based methods) shall occur in May, Specific details of control methods to be employed shall be subject to safety considerations and availability of equipment; and<br>▪ cover the coastal zone between Ina Creek and Winda Winda Creek and associated riparian hinterland areas.<br><br>Progressive Rehabilitation<br>The impacts of loss of habitat will be reduced by progressive rehabilitation which would limit the amount of habitat displaced at any one time. Most habitat would be rehabilitated at the end of mining:<br>▪ Develop and implement a rehabilitation strategy, including objectives and commitments described in the Western Cape Communities Coexistence Agreement (WCCCA) that would return the land to a post-mining land use that will be safe, stable, protects downstream water quality, and is self-sustaining.<br>▪ A Rehabilitation Management Plan for the SoE Project shall be prepared and submitted to EHP within three years of the commencement of bauxite mining. An interim |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | rehabilitation management plan shall be prepared and submitted to EHP for approval before 30 August 2013 which shall be reviewed and updated annually until the final Rehabilitation Management Plan is approved by EHP. The Rehabilitation Management Plan shall include the following:<br>▪ schematic representation of final land form inclusive of drainage features;<br>▪ slope and cover designs;<br>▪ drainage design;<br>▪ erosion controls proposed on reformed land;<br>▪ revegetation methods inclusive of plant species selection, re-profiling, soil handling (including stockpiling), soil ameliorants/amendments, surface preparation and method of propagation;<br>▪ materials balance including available topsoil and low permeability capping material;<br>▪ geotechnical, geochemical and hydrological studies;<br>▪ chemical, physical and biological properties of soil and water;<br>▪ agreed post mining land and/or infrastructure use with the landowner/holder and the administering authority;<br>▪ rehabilitation goal, rehabilitation objective, indicators (including indictors related to the measurement of performance of habitat for the Red Goshawk) and measurable completion criteria for each agreed post mining land use within each domain that enables determination of rehabilitation success;<br>▪ description of experimental design for monitoring of reference and rehabilitated areas inclusive of statistical design;<br>▪ a rehabilitation monitoring program based on a statistically sound, mutually agreed sampling design;<br>▪ research program and associated milestones; and,<br>▪ programs for maintenance of rehabilitation as required to achieve the nominated rehabilitation objective.<br>▪ Rehabilitation indicators shall be measured and monitored to track the performance of rehabilitation against rehabilitation objectives. A range of indicators shall be chosen for monitoring. These may be improved on in the future as site-specific research trials, the findings of on-going monitoring, and consultation outcomes become available.<br>▪ A rehabilitation monitoring program shall be developed to regularly assess the success of rehabilitation. The monitoring methodology would be likely to be similar to that currently used for operations north of the Embley River and include:<br>▪ monitoring in the first year after establishment at a scale of one 500m$^2$ transect plot per 10ha of rehabilitation; and,<br>▪ follow-up monitoring, for example 4, 8 and 12 years after establishment.<br>▪ Performance against rehabilitation indicators shall be used to inform an adaptive management approach.<br><br>**Potential Impact: Effect on Movement/Breeding/Feeding Patterns**<br>Impacts to breeding and feeding during construction would be negligible given the limited extent of high suitability habitat removed. Fragmentation of high suitability habitat, which will occur during the operational phase, is not anticipated to affect movement or foraging patterns within high suitability habitat. Movement and foraging patterns of individuals within moderate suitability habitat may be affected during the operational phase but this is not anticipated to lead to an overall adverse effect on the local population of the species. There is a low possibility that nests could be disturbed during clearing for mining and could result in loss of eggs or chicks and disruption to the adults' breeding season, which would represent a moderate impact. The effect of nest disturbance on a breeding pair is regarded as a temporary minor impact that will not permanently affect their subsequent breeding effort.<br><br>***Mitigation and Enhancement Measures***<br><u>Pre-disturbance Surveys</u> (refer details above)<br>The potential disruption of active nests during construction and operation shall be mitigated by pre-disturbance surveys for Red Goshawk nests in potential nesting habitat within the mine plan. Any active nests would be buffered until the end of the breeding season. |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | **Potential Impact: Fragmentation of Habitat**<br>The fragmentation of habitat caused by clearing for construction would not affect this highly mobile species. Clearing of high suitability habitat during the operational phase would not substantially fragment high suitability habitat. The more extensive areas of moderate suitability habitat that occur within mining areas would be fragmented by operational clearing.<br><br>***Mitigation and Enhancement Measures***<br>Progressive Rehabilitation (refer details above)<br>The impacts of fragmentation of habitat by operational clearing will be reduced by the sequential re-establishment of habitat on rehabilitation areas. Sequential re-establishment of habitat on rehabilitation areas would facilitate re-colonisation of prey fauna within the rehabilitated mine areas which will reinstate potential foraging habitat in these areas.<br>The over-water surface are of Dam C, which may be retained at the end of the Project life will continue to provide high/moderate foraging opportunities for the Red Goshawk.<br><br>**Potential Impact: Introduction of Weeds and Pests, and, Altered Fire Regime**<br>Construction and operational activities are unlikely to lead to the introduction of any invasive fauna that could affect the Red Goshawk. Construction and mining activities could lead to the introduction and spread of fire promoting weeds. If introduced and allowed to proliferate, these weeds could lead to an increase in fire intensities which could adversely affect the abundance of mammal prey species and potential Red Goshawk nesting trees.<br><br>***Mitigation and Enhancement Measures***<br>Weed and Fire Management Programs (refer details above) - The impacts of introduction of weeds that may intensify fire impacts on foraging and nesting opportunities shall be mitigated by the weed and fire management programs.<br><br>**Potential Negligible Impacts**<br>*Edge Effects* – Edge effects are anticipated to be negligible given the small amount of high suitability habitat displaced and the negligible noise, light and air quality impacts.<br>*Road Kill* – It is not anticipated that the Red Goshawk would be at substantial risk of collision with vehicles during the construction or operational phases because of the relatively low number of vehicle movements, and the preference for the species to hunt within treed habitats.<br>*Altered Light Regime* – The Red Goshawk is primarily a diurnal predator so foraging will not be expected to be affected by artificial lighting. No nests of the species were located within infrastructure areas so breeding effort is unlikely to be affected by construction related lighting. Incident light from mining and infrastructure areas is likely to be attenuated within a short distance within the treed habitats where the species prefers to roost.<br>*Noise* – Anticipated increases in noise during the construction and operational phases are relatively minor and localised.<br>*Water Quality* – There are no impacts to water quality anticipated that would indirectly impact the Red Goshawk through modification of habitat.<br>*Air Quality* – Increases in air emissions during the construction and operational phases would be relatively minor and localised.<br>*Altered Hydrological Regime* – There is no significant change anticipated to wetland or riparian habitats that would be utilised by the Red Goshawk.<br><br>**General Mitigation and Enhancement Measures**<br>Specific mitigation measures are not required for the negligible impacts; however, proposed mitigation and enhancement measures described above will reduce any potential for impact to the species. |
| **Rehabilitation** | ▪ A Rehabilitation Management Plan shall be implemented as outlined above. |

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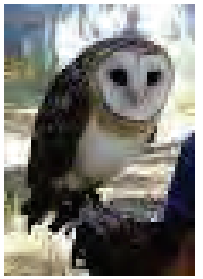
| **Collection of Baseline Data** | ▪ Baseline data on the Red Goshawk was collected during surveys for the SoE Project (RTA 2013).<br>▪ Data on the occurrence of nesting activities shall be collected as part of pre clearance surveys. |
| **Monitoring and Inspection** | ▪ Any nests found are to be monitored until the end of the breeding season.<br>▪ Monitoring and inspection of vegetation buffer, fire management program and rehabilitation.<br>▪ Annual and periodic weed surveys. |
| **Incident Management** | ▪ Incidents to be reported and managed in accordance with the RTA's certified ISO14001 Environmental Management System and incident management system. |
| **Performance Reporting** | ▪ Surveys and monitoring are conducted in accordance with this Management Plan.<br>▪ Zero incidents relating to Red Goshawks. |
| **Auditing** | ▪ Auditing of this plan including the effectiveness of mitigation measures and monitoring shall be conducted n accordance with the RTA's certified ISO14001 Environmental Management System. |

RTA (2013). *Environmental Impact Statement*. Rio Tinto Alcan.



# MASKED OWL (*Tyto novaehollandiae kimberli*)
# Environmental Management Plan Outline

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| **Habitat** | **High Suitability Habitat**<br>Areas of tall closed forest, open forest, woodland, mangrove edges, with or without open grassy areas, with persistent abundant small-medium sized ground mammals and large hollow bearing trees.<br>Note: There is no high suitability habitat within the Project area due to the low availability of mammal prey.<br>**Moderate Suitability Habitat**<br>Medium to tall open forest and woodland with mangrove edge or vine forest or *Melaleuca* wetland habitat present, with moderately abundant or seasonally fluctuating small mammal population, with or without large tree hollows. |
| **EPBC Status** | Vulnerable |
| **Known Threats** | Note: known threats listed below are not all necessarily applicable to the SoE Project. Mitigation measures for relevant impacts on the Masked Owl associated with the SoE Project are detailed separately in this table.<br>Key threats to the Masked Owl across its distribution include pervasive threats comprising altered fire regimes, invasion by weeds, and grazing by livestock (and feral stock). Effects of these threats appear to have resulted in declines in small mammal prey populations and possibly reduction in availability of tree hollows which reduce habitat suitability for the species. Competition with arboreal mammals for tree hollows has also been advocated as a potential threat to the species. Land clearing threatens the species by reduction in available habitat. |
| **Likelihood of Occurrence in the SoE Project Area/ Disturbance Areas** | **Mining Area**<br>**Unlikely:** suitable habitat areas (riparian, wetland and vine forest habitats) and peripheral habitat (Darwin Stringybark open forest habitat adjacent to the moderate suitability habitat areas), are not located within the proposed mining area.<br>**Infrastructure footprint**<br>**Possible:** sections of tall closed forest on major drainages along Norman Creek and the Ward River provide potentially suitable habitat. The Dam C footprint contains some suitable habitat, however, this area is not regarded as especially significant for foraging or breeding. The prevalence of the species may be significantly limited by the apparent paucity of small mammal populations within the SoE Project area.<br>**Balance of SoE Project area not disturbed**<br>**Possible:** the majority of key habitat resources for the species within the SoE Project area are located in areas not to be disturbed, however, the prevalence of the species may be significantly limited by the apparent paucity of small mammal populations. |
| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | **Potential Impact - Clearing and Loss of Habitat**<br>Disturbance of moderate suitability habitat from construction of Dam C and infrastructure crossings of streams. Only 5ha of moderate suitability habitat is to be cleared during the operations phase, which is not anticipated to impact any potential individuals that may be located in the area. |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | ***Avoidance Measures***<br>The following avoidance measures will reduce impacts from clearing and loss of habitat on the Masked Owl:<br>▪ All other areas of moderate suitability habitat for the species within the Project area shall be protected from mining by the SoE environmental buffer system (refer to details below). The SoE Environmental buffer system shall exceed the requirement of the Queensland Coordinator General's approval conditions and comprise a methodology for determining set-back distances from sensitive vegetation, instead of from the banks of watercourses and wetlands. The sensitive vegetation to be buffered by Darwin Stringybark woodland shall comprise the following vegetation types: riparian, wetland, estuarine, vine forest and coastal vegetation on sand. RTA shall work with Traditional Owners and the relevant WCCCC Sub-committee on establishment of environmental buffers as part of the CHEMP. The SoE environmental buffer system will maintain a network of undisturbed habitats and will be enhanced through the fire management program (refer details below) which aims to conserve fire sensitive flora and promote overall vegetation diversity and the feral pig control program (refer details below) which will reduce pig damage to riparian and wetland areas.<br>▪ Project planning for infrastructure shall minimise impacts on the Masked Owl by siting facilities in areas with less sensitive habitat.<br><br><u>SoE Environmental Buffer System</u><br>▪ The SoE environmental buffer system will benefit the Masked Owl by avoiding direct disturbance of the riparian and vine forest habitats where favoured small mammal prey are most abundant. The SoE environmental buffer system will also prevent disturbance of surrounding woodland up to 200m from the boundary of sensitive vegetation (including riparian and vine forest) providing additional undisturbed areas for roosting and nesting.<br>▪ All of the potential habitat for the species within the Project area would be protected from mining by the environmental buffer system.<br>▪ Sensitive vegetation buffered from mining by Darwin Stringybark woodland including the following vegetation types: riparian, wetland, estuarine, vine forest and coastal vegetation on sand.<br>▪ A buffer distance up to 200m shall be adopted for vine forest, wetlands, estuaries, coastal vegetation on sand and riparian vegetation along watercourses of stream order three and above.<br>▪ Narrower buffer distances to a minimum of about 100m may be adopted for riparian vegetation along watercourses of stream order one and two, or where significant ecological attributes are absent and physical characteristics are such that a narrower buffer will still provide edge effect protection and filtering of surface runoff flows from disturbed areas.<br>▪ As a minimum, the SoE environmental buffer system will cover approximately 8,356ha more than the regulatory buffer requirements set out in the Queensland Coordinator General's conditions of approval. Carry out surveys to confirm the boundaries of mapped sensitive vegetation types in the field prior to any clearing activities associated with mining operations. Surveys shall also assess the stream order of any watercourses and the presence or absence of significant ecological features such as springs, aquatic refugia and threatened flora and fauna in and around the sensitive vegetation types.<br>▪ Buffer distances shall be set based on the findings of the surveys and, where relevant, stream order.<br>▪ Establishment of the buffer distance and authorisation for clearing non-buffered areas shall be managed through a ground disturbance approval.<br>▪ A buffer mapping system shall be maintained to identify all buffer areas and distances.<br><br>***Mitigation and Enhancement Measures***<br><br><u>Fire Management Program</u><br>The existing condition of moderate suitability habitat will be enhanced with the implementation of a favourable fire regime under a fire management program:<br>▪ Develop a program in cooperation with Traditional Owners and the relevant Western Cape Communities Coordinating Committee (WCCCC) sub-committee.<br>▪ The program shall aim to conserve fire-sensitive flora and vegetation communities and promote overall vegetation diversity by reducing fire intensity and frequency |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | and promoting a regime of early to mid-dry season lower intensity burns with a lower frequency.<br>▪ Establish and maintain a network of fire breaks to facilitate effective control burns and provide opportunities for combating inappropriate fires.<br>▪ Control public access to the SoE Project area.<br><br><u>Pre -Disturbance Surveys</u><br>The impacts of loss of a small area of moderate suitability habitat will be mitigated by undertaking pre-disturbance surveys:<br>▪ Dusk stag-watching and call-playback surveys shall be carried out for this species, concurrent with the Red Goshawk pre-clearing nest surveys.<br>▪ Areas supporting large hollow trees in the productive (non-plateau) habitats shall be targeted. Survey records and pertinent ecological records shall be documented. Surveys shall be conducted prior to undertaking any significant disturbance to land located within 200m of permanent water supporting riparian gallery forest of paperbark wetland, seasonally inundated paperbark wetlands, seasonal watercourses supporting riparian gallery forest or an estuary.<br>▪ If any active Masked Owl nests are found within mining areas within the 1km limit, a 200m buffer around the nesting tree shall be excised from the mining plan until the end of the breeding season.<br><br><u>Progressive Rehabilitation</u><br>▪ The impacts of loss of a small area of moderate suitability habitat will be reduced by the sequential re-establishment of habitat on rehabilitation areas. Sequential re-establishment of habitat on rehabilitation areas will facilitate re-colonisation of prey fauna within the rehabilitated mine areas which will reinstate potential foraging habitat in these areas. In addition, given the high densities of small rodents that are likely to occur in the young mine rehabilitation, it is considered likely that the Masked Owl, if present, could potentially utilise mine rehabilitated areas in preference to open Darwin Stringybark forest and early rehabilitation areas could be utilised as seasonal hunting areas by the species.<br>▪ Surveys of rehabilitation areas north of the Embley River have found that compared to adjacent Darwin Stringybark forest, young rehabilitation areas support higher densities of small mammal prey suitable for the Masked Owl.<br>▪ Develop and implement a rehabilitation strategy, including objectives and commitments described in the Western Cape Communities Coexistence Agreement (WCCCA) that would return the land to a post-mining land use that will be safe, stable, protects downstream water quality, and is self-sustaining.<br>▪ A Rehabilitation Management Plan for the SoE Project shall be prepared and submitted to EHP within three years of the commencement of bauxite mining. An interim rehabilitation management plan shall be prepared and submitted to EHP for approval before 30 August 2013 which shall be reviewed and updated annually until the final Rehabilitation Management Plan is approved by EHP. The Rehabilitation Management Plan shall include the following:<br>  ▪ Schematic representation of final land form inclusive of drainage features;<br>  ▪ Slope and cover designs;<br>  ▪ Drainage design;<br>  ▪ Erosion controls proposed on reformed land;<br>  ▪ Revegetation methods inclusive of plant species selection, re-profiling, soil handling (including stockpiling), soil ameliorants/amendments, surface preparation and method of propagation;<br>  ▪ Materials balance including available topsoil and low permeability capping material;<br>  ▪ Geotechnical, geochemical and hydrological studies;<br>  ▪ Chemical, physical and biological properties of soil and water;<br>  ▪ Agreed post mining land and/or infrastructure use with the landowner/holder and the administering authority;<br>  ▪ Rehabilitation goal, rehabilitation objective, indicators (including indicators related to the measurement of performance of habitat for the Masked Owl) and measurable completion criteria for each agreed post mining land use within each domain that enables determination of rehabilitation success; |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | ▪ Description of experimental design for monitoring of reference and rehabilitated areas inclusive of statistical design;<br>▪ A rehabilitation monitoring program based on a statistically sound, mutually agreed sampling design;<br>▪ Research program and associated milestones; and,<br>▪ Programs for maintenance of rehabilitation as required to achieve the nominated rehabilitation objective.<br>▪ Rehabilitation indicators shall be measured and monitored to track the performance of rehabilitation against rehabilitation objectives. A range of indicators shall be chosen for monitoring. These may be improved on in the future as site-specific research trials, the findings of on-going monitoring, and consultation outcomes become available.<br>▪ A rehabilitation monitoring program shall be developed to regularly assess the success of rehabilitation. The monitoring methodology would be likely to be similar to that currently used for operations north of the Embley River and include:<br>▪ Monitoring in the first year after establishment at a scale of one 500m2 transect plot per 10ha of rehabilitation; and<br>▪ Follow-up monitoring, for example 4, 8 and 12 years after establishment.<br>▪ Performance against rehabilitation indicators shall be used to inform an adaptive management approach.<br>▪ The 326ha of moderate suitability habitat which will be disturbed is located within the footprint of Dam C and road crossings. This infrastructure may be retained at the end of the life of the Project (subject to consultation with Traditional Owners and other stakeholders). These areas are still likely to provide foraging habitat; however, the impact assessment carried out for the EIS (RTA 2013) assumed that this area would be lower value for the Masked Owl than the pre-clearance vegetation.<br><br>**Potential Impact: Introduction of Weeds, and, Altered Fire Regime**<br>Construction activities could lead to the introduction and spread of fire promoting weeds. Operational activity at Dam C and use of access roads could also lead to the introduction and spread of fire promoting weeds. If introduced and allowed to proliferate these weeds could lead to an increase in fire intensities that could adversely affect the abundance of mammal prey species and potential Masked Owl nesting trees.<br><br>***Mitigation and Enhancement Measures***<br>The impacts of introduction of weeds that may intensify fire impacts on foraging and nesting opportunities would be mitigated by the weed and fire management programs.<br><br><u>Weed Management Program</u><br>▪ The weed management program will benefit the Masked Owl by controlling the potential establishment of fire promoting weeds during construction and operational phases that could lead to adverse fire effects on habitat features utilised by the species including the availability of trees with hollows and persistent mammal populations.<br>▪ Prior to the establishment of the mine access road, any vehicles travelling to the SoE Project area that are deemed to be at risk from weed contamination shall be washed down for weeds.<br>▪ Washdown facilities shall be provided at the Humbug barge terminal and all vehicles thoroughly washed before transfer to the Hey River barge/ferry terminal and mine access road.<br>▪ Runoff from wash-down facilities shall be treated before being released.<br>▪ Annual weed surveys shall be conducted post wet season, targeting:<br>▪ All operational areas (mining and infrastructure) and immediately adjacent ecosystems; and, |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | ▪ Site access roads.<br>▪ Periodic weed surveys shall be conducted at least every three years, targeting:<br>▪ Habitats where key weed species are most likely to become established; and,<br>▪ Areas within the mining lease where there is high recreational visitation (especially riparian and wetland areas).<br>▪ Detailed mapping of the above areas shall form the basis of the weed management program and guide annual weed surveys.<br>▪ Training courses shall be conducted regularly for relevant mine personnel, highlighting significant weed species and basic identification features for weeds likely to be encountered on the site, to ensure staff have been provided with enough information to accurately identify weed species.<br>▪ Protocols shall be established for easy reporting of weed occurrence by any personnel working on site and be of a format that encourages reporting.<br>▪ Results of weed surveys and any weed reporting shall be uploaded to the site GIS in a timely manner so that weed mapping is maintained as a live database.<br>▪ Any weed infestation areas shall have controlled access until appropriate treatment and suppression is complete and there is no risk of propagules being translocated.<br><br><u>Fire Management Program</u> (refer to detail above)<br><br>**Potential Negligible Impacts**<br>*Edge Effects* – Edge effects are anticipated to be negligible given that no high suitability habitat would be displaced during the construction or operational phases and the negligible noise, light and air quality impacts.<br>*Fragmentation of Habitat* – Minor fragmentation of habitat caused by clearing for construction would have negligible effect on this highly mobile species.<br>Effect on Movement/Breeding/Feeding Patterns – Construction of Dam C will disrupt the riparian corridor along the middle branch of Norman Creek and may force Masked Owls to make minor adjustments to movement patterns in this area. Clearing of 5ha of moderate suitability habitat during the operations phase is not anticipated to impact any potential individuals that may be located in the area.<br>*Road Kill* – It is not anticipated that the Masked Owl will be at substantial risk of collision with vehicles during the construction or operational phases because of the relatively low number of night-time vehicle movements, the minimal amount of moderate suitability habitat for the species located in construction areas, and the anticipated low density of the species if present.<br>Altered Light Regime – Overall lighting impacts on the Masked Owl during construction and operational phases are expected to be negligible.<br>*Noise* – Anticipated increases in noise during the construction phase are relatively minor and localised. During the operational phase there may be some intermittent local impacts on foraging individuals at access road crossings of riparian habitats.<br>*Water Quality* – There are no impacts to water quality anticipated that would indirectly impact the Masked Owl through modification of habitat.<br>*Air Quality* – Anticipated increases in air emissions are relatively minor and localised compared to existing conditions.<br>*Altered Hydrological Regime* – There is no significant change anticipated to wetland or riparian habitats that would be utilised by the Masked Owl.<br><br>**General Mitigation and Enhancement Measures**<br>Specific mitigation measures are not required for the negligible impacts, however, the general mitigation and enhancement measures identified above will reduce any potential for impact on the species. |

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| **Rehabilitation** | A Rehabilitation Management Plan shall be implemented as outlined above. |
| **Collection of Baseline Data** | ▪ Baseline data on the Masked Owl was collected during surveys for the SoE Project (RTA 2013).<br>▪ Data on the occurrence of nesting activities shall be collected as part of pre clearance surveys. |
| **Monitoring and Inspection** | ▪ Any active Masked Owl nesting site identified within the mining path shall be monitored until the nesting cycle has been completed, after which clearing activities can resume.<br>▪ Monitoring and inspection of vegetation buffer, fire and weed management programs and rehabilitation. |
| **Incident Management** | ▪ Incidents to be reported and managed in accordance with the RTA's certified ISO14001 Environmental Management System and incident management system. |
| **Performance Reporting** | ▪ Surveys and monitoring are conducted in accordance with this Management Plan.<br>▪ Zero incidents relating to Masked Owls. |
| **Auditing** | ▪ Auditing of this plan including the effectiveness of mitigation measures and monitoring shall be conducted in accordance with the RTA's certified ISO14001 Environmental Management System. |

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# NORTHERN QUOLL (*Dasyurus hallucatus*)
# Environmental Management Plan Outline

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| **Habitat** | **High Suitability Habitat**<br>Areas of high topographic variability with rocky denning and foraging habitats and close to waterways. May include a range of vegetation types but commonly woodland. Note: high suitability habitat does not occur within the Project area.<br>**Moderate Suitability Habitat**<br>Areas (especially woodlands) with low - high topographic relief, no rocky denning habitat, but containing alternative denning habitat such as hollow logs and trees. |
| **EPBC Status** | Endangered |
| **Known Threats** | Note: known threats listed below are not all necessarily applicable to the SoE Project. Mitigation measures for relevant impacts on the Northern Quoll associated with the SoE Project are detailed separately in this table.<br>Overall threats identified for the Northern Quoll include:<br>▪ lethal toxic ingestion caused by Cane Toads;<br>▪ removal, degradation and fragmentation of habitat as a result of development actions and agricultural activities leading to population isolation;<br>▪ inappropriate fire regimes;<br>▪ invasion of habitat by weeds;<br>▪ predation and or competition associated with feral animals (cats, dogs);<br>▪ enhanced exposure to the effects of disease in isolated populations; and,<br>▪ hunting or extermination.<br>The following threats are listed as key threatening processes for the species under the EPBC Act:<br>▪ lethal toxic ingestion caused by Cane Toads;<br>▪ the invasion of northern Australia by Gamba Grass (Andropogon gayanus) and other introduced grasses; and,<br>▪ predation by the Feral Cat (*Felis catus*) and European Red Fox (*Vulpes vulpes*). |
| **Likelihood of Occurrence in the SoE Project Area/ Disturbance Areas** | **Mining Area**<br>**Unlikely:** this species has declined on Cape York following the spread of Cane Toads to the area. A paucity of favoured rocky habitat and continued exposure to modification and suppression by fire may see limited persistence of the species in suitable habitat within the Project area. Whilst the species may once have utilised Darwin Stringybark woodland it is most likely that patches of vine forest and riparian forest habitat currently provide the most likely habitat for the species within the Project area.<br><br>**Infrastructure footprint**<br>**Possible:** minor areas of suitable riparian habitats are located within the footprint of the water supply dam, although targeted searches did not locate the species in these areas. The habitat areas within the proposed dam footprint are not regarded as especially significant for foraging or breeding. |

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| **Likelihood of Occurrence in the SoE Project Area/ Disturbance Areas** | **Balance of SoE Project area not disturbed**<br>**Possible:** although the optimal habitat for the species, rocky outcrops and other rocky habitat, is not available within the Project area, the Northern Quoll may occur in vine forest and riparian gallery forest. Suitable habitat for the species includes the riparian communities of Norman Creek, and the vine forest patches in the Hey Point area, which are not within proposed mining areas. All vine forest areas, and most riparian habitats within the Project area, are located in areas not to be disturbed. |
| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | **Potential Impact: Clearing and Loss of Habitat**<br>Disturbance of a small area of moderate suitability habitat during the construction of the proposed Dam C and infrastructure crossings of riparian habitats.<br><br>***Avoidance Measures***<br>The following avoidance measures will reduce impacts of clearing and loss of habitat on the Northern Quoll:<br>▪ All remaining areas of potential habitat of the orthern Quoll shall be protected from mining within the SoE environmental buffer system (see below for further details). The SoE environmental buffer system shall exceed the requirement of the Coordinator General's approval conditions and comprise a methodology for determining set-back distances from sensitive vegetation, rather than banks of watercourses and wetlands. The sensitive vegetation to be buffered by Darwin Stringybark woodland shall comprise the following vegetation types: riparian, wetland, estuarine, vine forest and coastal vegetation on sand. RTA would work with Traditional Owners and the relevant WCCCC Sub-committee on establishment of environmental buffers as part of the CHEMP. The SoE environmental buffer system will maintain a network of undisturbed habitats and will be enhanced through the fire management program (refer detils below) which aims to conserve fire sensitive flora and promote overall vegetation diversity and the feral pig control program (refer details below) which will reduce pig damage to riparian and wetland areas.<br>▪ Project planning for infrastructure shall minimise impacts on the Northern Quoll by siting facilities in areas with less sensitive habitat.<br><br><u>SoE Environmental Buffer System</u><br>▪ All of the moderate suitability habitat for the species within the Project area would be protected from mining by the environmental buffer system.<br>▪ Sensitive vegetation shall be buffered from mining by Darwin Stringybark woodland including the following vegetation types: riparian, wetland, estuarine, vine forest and coastal vegetation on sand.<br>▪ Typically, a buffer distance up to 200m shall be adopted for vine forest, wetlands, estuaries, coastal vegetation on sand and riparian vegetation along watercourses of stream order three and above.<br>▪ Narrower buffer distances to a minimum of about 100m may be adopted for riparian vegetation along watercourses of stream order one and two, or where significant ecological attributes are absent and physical characteristics are such that a narrower buffer will still provide edge effect protection and filtering of surface runoff flows from disturbed areas.<br>▪ As a minimum, the SoE environmental buffer system will cover approximately 8,356ha more than the regulatory buffer requirements set out in the Queensland Coordinator General's conditions of approval.<br>▪ Carry out surveys to confirm the boundaries of mapped sensitive vegetation types in the field prior to any clearing activities associated with mining operations. Surveys shall also assess the stream order of any watercourses and the presence or absence of significant ecological features such as springs, aquatic refugia and threatened flora and fauna in and around the sensitive vegetation types.<br>▪ Buffer distances shall be set based on the findings of the surveys and, where relevant, stream order.<br>▪ Establishment of the buffer distance and authorisation for clearing non-buffered areas shall be managed through a ground disturbance approval.<br>▪ A buffer mapping system shall be maintained to identify all buffer areas and distances. |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | ***Mitigation and Enhancement Measures***<br><br>Fire Management Program<br>The vegetation in the SoE environmental buffers will be enhanced by the implementation of a favourable fire regime under a fire management program.<br>▪ Develop a program in cooperation with Traditional Owners and the relevant Western Cape Communities Coordinating Committee (WCCCC) sub-committee.<br>▪ The program shall aim to conserve fire-sensitive flora and vegetation communities (including potential habitat of the Northern Quoll) and promote overall vegetation diversity by reducing fire intensity and frequency and promoting a regime of early to mid-dry season lower intensity burns with a lower frequency.<br>▪ Establish and maintain of a network of fire breaks to facilitate effective control burns and provide opportunities for combating inappropriate fires.<br>▪ Control public access to the SoE Project area.<br><br>Weed Management Program<br>▪ Prior to the establishment of the mine access road, any vehicles travelling to the SoE Project area that are deemed to be at risk from weed contamination shall be washed down for weeds.<br>▪ Washdown facilities shall be provided at the Humbug barge terminal and all vehicles thoroughly washed before transfer to the Hey River barge/ferry terminal and mine access road.<br>▪ Runoff from wash-down facilities shall be treated before being released.<br>▪ Annual weed surveys shall be conducted post wet season, targeting:<br>  ▪ all operational areas (mining and infrastructure) and immediately adjacent ecosystems; and,<br>  ▪ site access roads.<br>▪ Periodic weed surveys shall be conducted at least every three years, targeting:<br>  ▪ habitats where key weed species are most likely to become established; and,<br>  ▪ areas within the mining lease where there is high recreational visitation (especially riparian and wetland areas).<br>▪ Detailed mapping of the above areas shall form the basis of the weed management program and guide annual weed surveys.<br>▪ Training courses shall be conducted regularly for relevant mine personnel, highlighting significant weed species and basic identification features for weeds likely to be encountered on the site, to ensure staff have been provided with enough information to accurately identify weed species.<br>▪ Protocols shall be established for easy reporting of weed occurrence by any personnel working on site and be of a format that encourages reporting.<br>▪ Results of weed surveys and any weed reporting shall be uploaded to the site GIS in a timely manner so that weed mapping is maintained as a live database.<br>▪ Any weed infestation areas shall have controlled access until appropriate treatment and suppression is complete and there is no risk of propagules being translocated.<br><br>Installation of Dry Culvert Cells<br>Dry culvert cells shall be installed at constructed access road crossings of Winda Winda Creek and the southern branch of Norman Creek (upstream of Dam C, the northern crossing on the Norman Creek Access Road) to maintain habitat continuity along the riparian corridor, apart from during periodic high flow events. These will minimise exporure of the Northern Quoll to vehicle traffic.<br><br>Progressive Rehabilitation<br>Progressive rehabilitation of mining areas will re-establish potential foraging areas for the Northern Quoll on disturbed areas, given the ability of the Northern quoll to vary dietary intake to suit prey availability. Rehabilitated areas in close proximity to undisturbed suitable habitat areas would be most likely to be utilised by the species. |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | ▪ Develop and implement a rehabilitation strategy, including objectives and commitments described in the Western Cape Communities Coexistence Agreement (WCCCA) that would return the land to a post-mining land use that will be safe, stable, protects downstream water quality, and is self-sustaining.<br>▪ A Rehabilitation Management Plan for the SoE Project shall be prepared and submitted to EHP within three years of the commencement of bauxite mining. An interim rehabilitation management plan shall be prepared and submitted to EHP for approval before 30 August 2013 which shall be reviewed and updated annually until the final Rehabilitation Management Plan is approved by EHP. The Rehabilitation Management Plan shall include the following:<br>▪ schematic representation of final land form inclusive of drainage features;<br>▪ slope and cover designs;<br>▪ drainage design;<br>▪ erosion controls proposed on reformed land;<br>▪ revegetation methods inclusive of plant species selection, re-profiling, soil handling (including stockpiling), soil ameliorants/amendments, surface preparation and method of propagation;<br>▪ materials balance including available topsoil and low permeability capping material;<br>▪ geotechnical, geochemical and hydrological studies;<br>▪ chemical, physical and biological properties of soil and water;<br>▪ agreed post mining land and/or infrastructure use with the landowner/holder and the administering authority;<br>▪ rehabilitation goal, rehabilitation objective, indicators and measurable completion criteria for each agreed post mining land use within each domain that enables determination of rehabilitation success;<br>▪ description of experimental design for monitoring of reference and rehabilitated areas inclusive of statistical design;<br>▪ a rehabilitation monitoring program based on a statistically sound, mutually agreed sampling design;<br>▪ research program and associated milestones; and,<br>▪ programs for maintenance of rehabilitation as required to achieve the nominated rehabilitation objective.<br>▪ Rehabilitation indicators shall be measured and monitored to track the performance of rehabilitation against rehabilitation objectives. A range of indicators shall be chosen for monitoring. These may be improved on in the future as site-specific research trials, the findings of on-going monitoring, and consultation outcomes become available.<br>▪ A rehabilitation monitoring program shall be developed to regularly assess the success of rehabilitation. The monitoring methodology would be likely to be similar to that currently used for operations north of the Embley River and include:<br>▪ monitoring in the first year after establishment at a scale of one 500m2 transect plot per 10ha of rehabilitation; and,<br>▪ follow-up monitoring, for example 4, 8 and 12 years after establishment.<br>▪ Performance against rehabilitation indicators shall be used to inform an adaptive management approach.<br><br>**Potential Negligible Impacts**<br>*Edge Effects* – Edge effects are anticipated to be negligible given that no high suitability habitat will be displaced during the construction or operational phases and the negligible noise, light and air quality impacts.<br>*Fragmentation of Habitat* – Minor fragmentation of habitat caused by clearing for construction will have negligible effect on this highly mobile species.<br>*Effect on Movement/Breeding/Feeding Patterns* – Construction of Dam C will disrupt the riparian corridor along the middle branch of Norman Creek and may force Northern Quolls to make minor adjustments to movement patterns in this area.<br>*Road Kill* – It is anticipated that the Northern Quoll will be at negligible risk of collision with vehicles during construction because of the minimal amount of moderate suitability habitat for the species located in construction areas and the low volume of vehicle movements. There is minimal potential for vehicles and Northern Quoll to intersect during the operational phase.<br>*Altered Light Regime* – Overall lighting impacts on the Northern Quoll during construction and operational phases are expected to be negligible. |

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| **SoE Project Potential Impacts and associated Avoidance, Mitigation or Enhancement Measures** | *Noise* – Any impact from noise emissions during construction and operational phases will be negligible.<br>*Water Quality* – There are no impacts to water quality anticipated that willindirectly impact the Northern Quoll through modification of habitat.<br>*Air Quality* – Anticipated increases in air emissions during construction and operational phases are relatively minor and localised compared to existing conditions.<br>Introduction of Weeds – It is unlikely that fire promoting weeds will become established in the fire resistant moderate suitability habitats (vine forest, riparian gallery forest) that are likely to be favoured by the species.<br>*Altered Hydrological Regime* – There is no significant change anticipated to wetland or riparian habitats that would be utilised by the Northern Quoll.<br>*Altered Fire Regime* – Construction and operational activities are not expected to significantly impact on the current fire regime.<br><br>***General Mitigation and Enhancement Measures***<br>Specific mitigation measures are not required for the negligible impacts, however, the following general mitigation measure will further reduce any potential for impact on the species.<br>The fire management program will facilitate enhancement of habitat of the species by mitigating existing impacts of the current uncontrolled fire regime. Prescriptions for fire frequency, timing and intensity under such a program would be able to deliver improvements in the condition and biodiversity values of woodland habitats within the Project area. |
| **Rehabilitation** | ▪ A Rehabilitation Management Plan shall be implemented as outlined above. |
| **Collection of Baseline Data** | ▪ Baseline data on the Northern Quoll was collected during surveys for the SoE Project (RTA 2013). |
| **Monitoring and Inspection** | ▪ Monitoring and inspection of vegetation buffer, fire and weed management programs and rehabilitation.<br>▪ Annual and periodic weed surveys. |
| **Incident Management** | ▪ Incidents to be reported and managed in accordance with the RTA's certified ISO14001 Environmental Management System and incident management system. |
| **Performance Reporting** | ▪ Surveys and monitoring are conducted in accordance with this Management Plan.<br>▪ Zero incidents relating to Northern Quolls. |
| **Auditing** | ▪ Auditing of this plan including the effectiveness of mitigation measures and monitoring shall be conducted n accordance with the RTA's certified ISO14001 Environmental Management System. |

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