ANNEX 12
TERRESTRIAL VERTEBRATE FAUNA REPORT



Prepared by JORGE MELLA A.

Licentiate in Biology

M.Sc. Terrestrial Ecology

Universidad de Chile

June 2009

CENTRO DE CEA ECOLOGIA APLICADA

CONTENTS

1 INTRODUCTION

This report presents the results of the Baseline survey of terrestrial fauna for the project "Electricity Transmission Lines S/S Maitenes – S/S Alfalfal & Alfalfal II Power Plant – S/S Alfalfal," which analyzes and assesses the different reptiles, amphibians, birds and mammals identified in the Project's area of influence.

2 OBJECTIVES

2.1 General Objective

Conduct a Baseline study of the Biotic Environment: Terrestrial Vertebrate Fauna

This study allowed an understanding of the current state of this specific biotic environment in the area of influence of the Project. The area of study is located in the Colorado River sector and in the Maipo Canyon, in the Metropolitan Region.

2.2 Specific Objectives

Characterize the terrestrial vertebrate fauna in the Project's area of influence.

To achieve this specific objective, the most conspicuous species were studied. This study allowed an understanding of the current state of the biotic environment in the area of study and its sensitivity to the activities planned in the Project. The characterization of the environment was based on the requirements of the Environmental Impact Assessment System, and as such:

- the taxa observed were identified
- the location of the taxa in relation to the Project was determined
- the distribution of the taxa (native-exotic, endemic, non-endemic) was determined
- the abundance of the taxa in each of the sites surveyed was determined
- the conservation status of the taxa encountered was determined

3 METHODOLOGY

The methodology used included the following components:

- General strategy of the study
- Sampling
- Analysis of the information

The components indicated above are described below.

3.1 General Strategy of the Study

The characterization of the environment was carried out by means of qualitative-quantitative sampling in different sectors that covered the entire area of influence of the Project. This type of sampling allowed a large area to be covered (qualitative sampling) and the largest amount of information possible to be collected (quantitative sampling).

The quantitative sampling unit consisted of sampling stations, which were defined on the basis of the accessibility and homogeneity of the sector studied. Qualitative sampling sought to describe the most conspicuous and representative elements of the site. In each sampling station, fieldwalking was carried out along routes of variable length, between approximately 300 and 600 meters.

3.2 Sampling

The Project area was searched and the most representative environments studied. In the sampling area the surveyors directly assessed the presence and abundance of terrestrial vertebrates, recorded their presence based on sightings or hearings, and from indirect indications (e.g. spoor, tracks, and nests).

The general methodology used was specific to each group:

- amphibians: transects were used (CONAMA, 1996) to conduct an exhaustive sampling along waterways and wet environments; trunks and stones were removed (where present).
- reptiles: an exhaustive search was conducted in the different environments identified in the Project's area of influence, with special attention paid to bushes, trees and rocks.
- birds: given the high visibility in the Project area, a complete scan of its area of influence was undertaken (CONAMA, 1996) and each individual bird observed or heard was recorded (to identify birds by their call, the surveyors used the keys provided by Egli (1998, 2002).
- mammals: indirect methods were used to identify mammals, such as identification of tracks and burrows and the analysis of spoor.

3.3 Analysis of the Information

For each one of the taxa identified, its conservation status was determined as per the Hunting Law, No. 19.473 (SAG, 2006), as well as its endemism. The specific conservation status considered was that defined for the central zone of Chile (regions IV to VII, SAG, 2006).

The species registered was compared in terms of its abundance and relative frequency.

To identify the species sighted in the field, the following bibliographic sources were used (where species from these animal groups were sighted):

- reptiles and amphibians: Cei (1962), Donoso-Barros (1966, 1970), Veloso & Navarro (1988), Núñez & Jaksic (1992), Veloso et al. (1995), Formas (1995), Mella (2005), Pincheira- Donoso & Núñez (2005).

- birds: Goodall et al. (1946, 1951), Cody (1970), Araya & Millie (1998), Araya et al. (1995), Araya & Bernal (1995), Rottmann (1995), Pearman (1995), de la Peña & Rumboll (1998), Egli & Aguirre (2000), Jaramillo (2005) y Martínez & González (2005).
- mammals: Osgood (1943), Mann (1978), Tamayo & Frassinetti (1980), Miller & Rottmann (1976), Campos (1986, 1996), Reise & Venegas (1987), Redford & Eisenberg (1992), Willson & Reeder (1993), Contreras & Yáñez (1995) y Muñoz-Pedreros & Yánez (2000).

These sources were complemented in general by a review of the studies of Jaksic (1996), Lazo & Silva (1993) and Torres-Mura (1994).

4 RESULTS

4.1 Area of Study

The field visit was carried out in two campaigns: the first was conducted on March 11, 2008 and the second on November 24, 2008 (the latter taking into account the new route of the transmission lines). During those campaigns the surveyors walked the route of the transmission line and defined *in situ* a total of 9 sampling stations (5 in the first campaign, 4 in the second). The location and description of these is shown in Table 1 and Figure 1. In general, the stations are located near the watercourse of the Colorado River, in the upper river valley between the future Alfalfal II power plant (1530 m.a.s.l.) and the sector near the S/S Maitenes (1,087 m.a.s.l.). These are mountain environments that feature rocky terrain and Sclerophyllous scrubland of varying degrees of coverage (sparse to moderately dense), with and without cacti and puyales. The degree of human intervention is moderate to very high and consists basically of the existing substations, dwellings, roads, livestock and cultivated land.

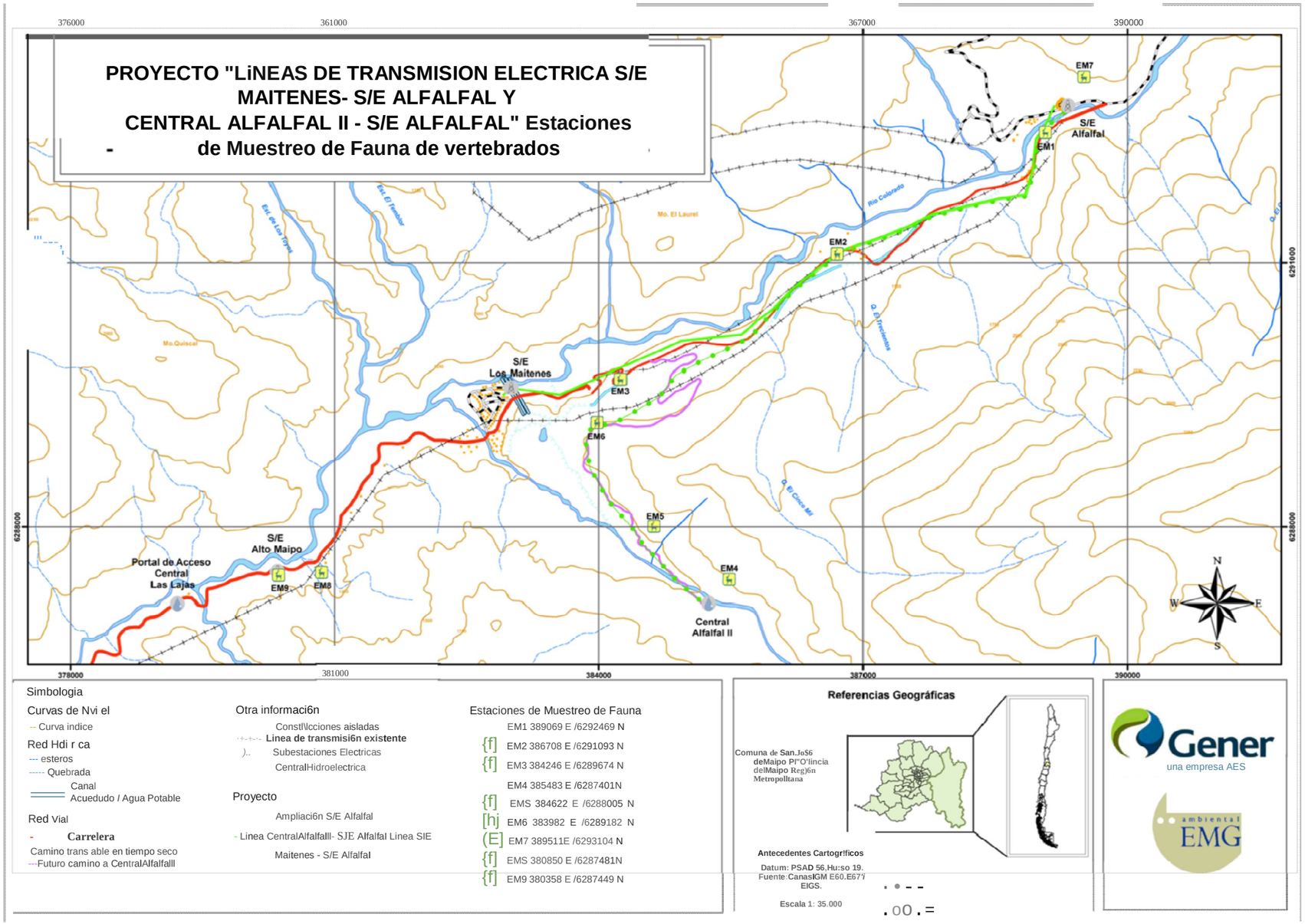
Table 1: Sampling Stations (EM) for vertebrate fauna

EM	UTM Coordinates (PSAD56)	Reference Name	Brief characterization
EM1	389069 E / 6292469 N / 1333 m	Downriver of the S/S Alfalfal (near Torre 44 of the S/S Maitenes – S/S Alfalfal Line)	River and canal banks, rocky areas, base of mountains. Moderate to high human intervention (roads, canal, and substation). Sparse Sclerophyllous
EM2	386708 E / 6291093 N/ 1293 m	Near Tower 36 of the S/S Maitenes – S/S Alfalfal Line	Base of the mountain, sparse Sclerophyllous scrubland, cactus, rocks, moderate human intervention.
EM3	384246 E / 6289674 N/ 1287 m	Before the S/S Maitenes (near Tower 9 of the Alfalfal II Plant – S/S Alfalfal line)	Mountain, rocky land, sparse Sclerophyllous scrubland and puyales, slopes, moderate human intervention.
EM4	385483 E / 6287401 N / 1530 m	Alfalfal II Plant– lower La Totorilla sector (near the future Alfalfal II Plant)	Ravine terraces, Sclerophyllous forest (quillay – bollén), rocky sectors.
EM5	384622 E / 6288005 N / 1442 m	Alfalfal II Plant– water intake sector, northern, south-facing slope (between Tower 2 and Tower 7. Alfalfal II Plant – S/S Alfalfal)	Rocky slope, ravine, sparse Sclerophyllous scrubland, slope beside the Aucayes Stream.

EM	UTM Coordinates (PSAD56)	Reference Name	Brief characterization
EM6	383982 E / 6289182 N / 1453 m	Alfalfal Plant– the foot of El Yoque hill (near Gener's auxiliary tank; near Tower 7 of the Alfalfal II Plant– S/S Alfalfal line)	Sclerophyllous scrubland, predominantly tralhuén and manzanilla pastures. Also quillay, bollén and rocks.
EM7	389511 E / 6293104 N	S/S Alfalfal –Power plant building and parking area	Very high human intervention. Sector inside the S/S. Parking with grass and isolated trees of introduced species.
EM8	380850 E / 6287481 N / 1114 m	West of the S/S Maitenes, near the future S/S Alto Maipo.	Mountain, sparse Sclerophyllous scrubland, high human intervention (aggregates, road, houses).
EM9	380358 E / 6287449 N / 1087 m	Near the future S/S Alto Maipo, near Route G-345	Riverside meseta, moderately dense Sclerophyllous scrubland, moderate human intervention (livestock)

Source: CEA Ltda.

Figure 1: Location of the Sampling Stations for Vertebrate Fauna



Source: EMG Ambiental S.A

4.2 Vertebrate Fauna

In the area of study at least 27 species were observed, 20 of which were birds, 5 reptiles, and 2 mammals. No amphibians were observed (although they may be present, see section 6). Table 2 summarizes the species observed in the entire Project area. Seven of these species (25.9%), the 5 lizards, the condor and one mammal (zorro culpeo) are in one of the 5 conservation categories defined by SAG (2006). Five species in all are classified as vulnerable, including 4 lizards (*Liolaemus lemniscatus*, *L. nigroviridis*, *L. monticola* and *L tenuis*) and the condor (*Vultur gryphus*), while one, the zorro culpeo (*Pseudalopex culapaeus*) is considered insufficiently known, and one (*Liolaemus fuscus*) is catalogued as out of danger (Table 2).
In terms of criteria for protection (SAG, 2006), 22 species (81.5%) present one or more of these criteria. Thus, 17 species are considered beneficial for agriculture and livestock activity (B), 16 species are considered beneficial for maintaining the balance of natural ecosystems (E) and 5 species are deemed to have limited population densities (S, details in Table 2).

In regard to origin, of the 27 species observed, 6 are endemic to Chile, including 4 reptile and 2 bird species (*L. nigroviridis*, *L. monticola*, *L.fuscus*, *L. tenuis*, *Pteroptochos megapodius* and *Mimus thenca*), 19 are native species, and 2 are introduced species (Table 2).

Table 2 Vertebrate Species Registered in the Area of Study of the Project "Electricity Transmission Lines S/S Maitenes - S/S Alfalfal and Alfalfal II Power Plant – S/S Alfalfal," Metropolitan Region.

Species	Common name	Protection Criteria SAG 2006	Origin
REPTILES (6 species)			
Liolaemus lemniscatus	Lagartija lemniscata	S, E, Vulnerable	Native
Liolaemus nigroviridis	Lagarto negroverdoso	S, E, Vulnerable	Endemic
Liolaemus monticola	Lagartija de monte	S, E, Vulnerable	Endemic
Liolaemus fuscus	Lagartija oscura	B, E, Out of danger	Endemic
Liolaemus tenuis	Lagartija esbelta	S, E, Vulnerable	Endemic
BIRDS (20 species)			
Vultur gryphus	Cóndor	B, E, Vulnerable	Native
Elanus leucurus	Bailarín	B, E	Native
Milvago chimango	Tiuque	B, E	Native
Sephanoides sephaniodes	Picaflor chico	B, E	Native
Vanellus chilensis	Queltehue	B, E	Native
Picoides lignarius	Carpinterito	B, S	Native
Callipepla californica	Codorniz	Not applicable	Introduced
Pteroptochos megapodius	Turca	B	Endemic
Asthenes humilis	Canastero	B	Native
Leptasthenura aegithaloides	Tijeral	B	Native

Species	Common Name	Protection criteria SAG 2006	Origin
Turdus falcklandii	Zorzal	No information	Native
Troglodytes aedon	Chercán	B, E	Native
Pygochelidon cyanoleuca	Golondrina dorso negro	B, E	Native
Tachycineta leucopyga	Golondrina chilena	B, E	Native
Mimus thenca	Tenca	B	Endemic
Elaenia albiceps	Fío-fio	B, E	Native
Anairetes parulus	Cachudito	B, E	Native
Curaeus curaeus	Tordo	No information	Native
Diuca Diuca	Diuca	No information	Native
Zonotrichia capensis	Chincol	B	Native
MAMMALS (2 species)			
Pseudalopex culpaeus	Zorro culpeo	E, Insufficiently known	Native
Oryctolagus cuniculus	Conejo	Not applicable	Introduced

Abbreviations for Protection Criteria: E= Beneficial for maintaining the balance of natural ecosystems; B= Beneficial for Agriculture and Livestock Activity; S = Limited population density.

Source: CEA Ltda.

4.3 Frequency and Relative Abundance of Species

In this sampling, 5 species of lizard were recorded, with 64 individuals in all, in 7 of the 9 sampling stations (77.8% frequency). The predominant species was the "lagartija lemniscata" (*Liolaemus lemniscatus*), with 24 individuals (37.5%) in 4 stations, followed by the "lagartija de monte" (*L. monticola*), with 21 individuals (32.8%) recorded at 6 stations. The other species were the "lagartija oscura" (*L. fuscus*), with 12.5% in 4 stations, the "lagartija esbelta" (*L. tenuis*), with 15.6% in 4 stations, and the "lagartija negroverdosa" (*L. nigroviridis*) with just one individual registered at a single station (see Table 3).

In the sampling, 56 individuals from 20 bird species were also recorded, the most abundant of which was the "tordo", with 9 individuals (16.1%), followed by the "turca" (10.7%) and the "diuca" (8.9%;); individuals of the other species were not abundant (between 1 and 4 individuals; see Table 3).

Of the mammals observed, spoor evidence of the fox, zorro culpeo was found at one station and hare spoor at 4 stations (see Table 3).

The richness of species per sampling station ranged from 2 to 12 species (see Table 3).

Table 3 Results of the census of vertebrates conducted in the sector studied

Common Name	Sampling Stations									Abundance	
	EM1	EM2	EM3	EM4	EM5	EM6	EM7	EM8	EM10	N	%
REPTILES											
Lagartija lemniscata		12		1	2			9		24	37.5
Lagarto negroverdoso	1									1	1.6

Common Name	Sampling Stations									Abundance	
	EM1	EM2	EM3	EM4	EM5	EM6	EM7	EM8	EM10	N	%
Lagartija de monte	7	8	2	1				2	1	21	32.8
Lagartija oscura	1	3	1						3	8	12.5
Lagartija esbelta				1	1			7	1	10	15.6
Subtotal Reptiles	9	23	3	3	3	0	0	18	5	64	100
BIRDS											
Cóndor						1				1	1.8
Bailarín						1				1	1.8
Tiuque		1								1	1.8
Picaflor chico	2	2								4	7.1
Queltehue							2			2	3.6
Carpinterito								1		1	1.8
Codorniz								2		2	3.6
Turca					2	2		1	1	6	10.7
Canastero								1		1	1.8
Tijeral		1								1	1.8
Chercán	1			2	1					4	7.1
Golondrina dorso negro			4							4	7.1
Golondrina chilena					1					1	1.8
Zorzal								1		1	1.8
Chercán								2		2	3.6
Tenca			2			1		1	1	5	8.9
Fío-fío					1					1	1.8
Cachudito	1	1								2	3.6
Tordo			5			1	3			9	16.1
Diuca					2			3		5	8.9
Chincol					2					2	3.6
Subtotal birds	4	5	11	2	9	6	5	12	2	56	100
MAMMALS											
Zorro culpeo						X				-	-
Conejo			X			X		X	X	-	-
TOTAL SPECIES	**6**	**7**	**6**	**4**	**8**	**7**	**2**	**12**	**6**	**28**	**-**

Note: 1. Total abundance (N) and relative abundance (%). The order of species follows that of Table 2. Note 2. The X indicates indirect presence (spoor, tracks).

Source: CEA Ltda.

5 IDENTIFICATION AND ASSESSMENT OF IMPACTS

Owing to the characteristics of the Project and the terrestrial vertebrate fauna identified in the Project location, impacts have been identified for both the construction phase and the operational phase of the Project. The analysis and summary of those impacts is presented in the sections below.

5.1 Construction Phase

5.1.1 Analysis of environmental impact

To identify and assess impacts, the geographic zone analyzed was the same as that used in the analysis of the Flora and Vegetation component.

In the area of study at least 27 species were sighted, 20 of which were birds, 5 reptiles and 2 mammals. No amphibians were registered (although they may be present). Seven of these species (25.9% of the total), including 5 lizards, the condor and one mammal (zorro culpeo or culpeo fox) are currently classified in one of 5 conservation classes defined by SAG (2006). Of these, 5 species are classified as vulnerable, including 4 lizards (*Liolaemus lemniscatus*, *L. nigroviridis*, *L. monticola* y *L tenuis*) and the condor (*Vultur gryphus*), while one species, the culpeo fox (*Pseudalopex culapaeus*) is considered insufficiently known, and one other species (*Liolaemus fuscus*) is classified as out of danger.

5.1.2 Summary of environmental impact

Given the attributes of the fauna present in the area of influence of the Project, the impact identified will occur mainly during the construction phase. The identification and assessment of that impact is presented in the table below.

Table 4 Impact Assessment for the Fauna Component, Construction Phase

ENVIRONMENT: Biotic		COMPONENT: Terrestrial vertebrate fauna					
ACTIVITIES	IMPACT	LOCATION	ASSESSMENT				
			Ca	Re	Te	Ti	Mg
▪ Transportation of personnel and supplies to and from the work sites and transport of waste to treatment areas. ▪ Operation of trucks, equipment and machines ▪ Clearing of sites and construction of structures. ▪ Earth moving ▪ Construction of foundations ▪ Dumps ▪ Assembly of structures and substation equipment	IF1:Alteration of habitat quality	Area in which towers are installed	-	Irr	Per	Dir	Ba

ASSESSMENT CRIERTIA: Ca= Character [Positive (+), Negative (-)]; Re= Reversibility [Reversible (Rev), Recoverable (Rec), Unrecoverable (Irr)]; Te= Timeframe [Temporary (Te), Permanent (Per)]; Ti=Type [Direct (Dir), Indirect (Ind), Synergistic (Sin), Cumulative (Acu)]; Mg= Magnitude [High (Al), Medium (Me), Low (Ba)].

Source: Prepared by the authors.

IFT1: Alteration of habitat quality

Given the results presented and the characteristics of the Project, it is concluded that the activities that will be carried out during the construction stage will have a *low* magnitude impact on the vertebrate fauna that are directly affected, as the area that is actually altered will not exceed 0.9 ha in total; the impact will be *unrecoverable* as these areas will not return to their natural state; and it will be *permanent*. The assessed group with the highest risk corresponds to reptiles, all of which are considered threatened and have low mobility.

Based on the information provided above, this impact has been assessed as MINOR NEGATIVE. However, in order to mitigate the loss of areas directly affected, environmental management measures will be carried out, which are detailed in section 3 of Chapter 6.

5.2 Operational Phase

5.2.1 Analysis of environmental impact

In the area of study, at least 27 species were sighted, 20 of which are birds, 5 reptiles and 2 mammals. No amphibians were registered (although they may be present). Of the birds identified, one of these, the condor (*Vultur gryphus*), is currently in a conservation category and considered vulnerable.

5.2.2 Summary of Environmental Impact

Given the attributes of the Fauna component present in the area of direct influence of the Project, one impact has been identified for the operational phase. The assessment of this impact is presented in the table below.

Table 5 Impact Assessment Matrix for the Fauna Component, Operational Phase

ENVIRONMENT: Biotic		COMPONENT: Fauna					
ACTIVITIES	IMPACT	LOCATION	ASSESSMENT				
			Ca	Re	Te	Ti	Mg
▪ Existence of new lines	IF2: Probable collisions of birds with new lines	Mainly in river crossings	-	Irr	Per	Dir	Ba

ASSESSMENT CRIERTIA: Ca= Character [Positive (+), Negative (-)]; Re= Reversibility [Reversible (Rev), Recoverable (Rec), Unrecoverable (Irr)]; Te= Timeframe [Temporary (Te), Permanent (Per)]; Ti=Type [Direct (Dir), Indirect (Ind), Synergistic (Sin), Cumulative (Acu)]; Mg= Magnitude [High (Al), Medium (Me), Low (Ba)].

Source: Prepared by the authors.

IF2: Probable collisions of birds with new transmission lines

Based on the characteristics of the Project and the baseline study conducted, it can be affirmed that the impact of its operation on the vertebrate fauna in the sector will be of *low* magnitude. This impact will affect birds specifically, as there is a possibility that these animals may collide with the new transmission lines.

It is important to mention that the risk of the birds being electrocuted by 45 kV or higher transmission lines is unlikely, given the separation between the conductors.

As a result, this impact has been assessed as MINOR NEGATIVE.

6 PLANNED MITIGATION, RESTORATION AND/OR COMPENSATION MEASURES

Some of the environmental management measures applicable to this study are outlined below. Most of them have been suggested in the Manual on "Mitigation Measures for Environmental Impacts on Wild Fauna" (*Medidas de Mitigación de Impactos Ambientales en Fauna Silvestre*, SAG, 2004, digital library).

Mitigation Measures for Impact IF1:

- Rescue individual reptiles and micromammals in order to relocate them in nearby areas outside of the area of direct influence of the Project.
- Teach Project workers (through pamphlets and talks) about fauna protection measures and restrictions on tracking, displacement and/or hunting of fauna. Keep an up to date record of training activities and of training participants in each work camp and work site.

- Disseminate environmental protection actions pledged under the Project by installing signage on roadways with images of the species present in the zone that are in a conservation class, and with information on the hunting ban and on the species' biological importance. Locate these signs in areas where tourists and other visitors congregate.

The application of some of these mitigation and compensation measures should be sufficient for maintaining the diversity of fauna in the sector studied.

7 ENVIRONMENTAL FOLLOW UP PLAN

In order to verify compliance with these mitigation measures for impact IF1, the Follow Up Plan outlined below is proposed.

Table 6 Environmental Follow Up Program, Fauna Component, Construction Phase

Parameter	Description
Impact/parameter to be monitored	IF1: Alteration of habitat quality. Status of species rescued and relocated.
Control point	Relocation sites
Method	Visual inspection
Frequency of monitoring	At month 1, 2 and 3 once the rescue and relocation plan has been carried out for the species. After the third monitoring action, the measure will be evaluated jointly with the authority. A report will be sent to SAG indicating the result of each monitoring activity.
Enforcement authority	SAG, Metropolitan Region

Source: Prepared by the authors.

8 CONCLUSION

Based on the results obtained, in the area of study, the diversity of terrestrial vertebrate fauna was moderate and consisted of at least 27 taxa of terrestrial vertebrates (20 birds, 5 reptiles and 2 mammals), seven of which (25.9%) are in a conservation category (the 5 species of lizards, the condor and the culpeo fox).

Other species that could possibly be registered include:

- Amphibians: It is possible that amphibians could be found in areas near the streams, including the frogs "sapito de cuatro ojos" (*Pleurodema thaul*) and "sapo de rulo" (*Bufo chilensis*), both of which are considered threatened.
- Reptiles: Reptiles are the most potentially sensitive fauna group (all species are threatened) in the Project area. Other species that may be present include lizards such as *Liolaemus nitidus* and snakes such as *Tachymenis chilensis* and *Philodryas chamissonis*. There have even been sightings of snakes around the S/S Alfalfal.

- Birds: Several other species, both non passeriformes (partridges, owls, diurnal raptors) and passeriformes (blckbirds, finches, 'dormilonas', and others), although most bird species are not considered threatened.
- Mammals: In the area of study (especially in rocky and scrubland areas) micromammals may be observed such as 'yacas' (*Thylamys elegans*) and rodents (Degú, Chinchilla, Ratón de pelo largo, Ratoncito oliváceo, Lauchón orejudo, and others).

Given the results of this report, it is concluded that the Project should have a low impact on vertebrate fauna in the area during the construction phase. The assessed group with the highest risk corresponds to reptiles, all of which are considered threatened and have low mobility.

9 BIBLIOGRAPHY

Araya B, M. Bernal, R. Schlatter & M. Sallaberry. 1995. Lista patrón de las aves de Chile. Tercera Edición. Ed. Universitaria, Santiago.

Araya B. & G. Millie. 1986, 1996. Guía de campo de las aves de Chile. Ed. Universitaria, Santiago.

Araya B. & M. Bernal. 1995. Aves. In: Simonetti JA, MTK Arroyo, AE Spotorno & E Lozada (eds). Diversidad Biológica de Chile. CONICYT, Santiago, Chile. 350-360.

Campos H. 1986, 1996. Mamíferos terrestres de Chile. Marisa Cuneo Ediciones, Corporación Nacional Forestal, Santiago.

Cei. 1962. Batracios de Chile. Ediciones de la Universidad de Chile, Santiago.

Cody M. 1970. Chilean bird distribution. Ecology 51 (3): 455-464.

CONAMA. 1996. Metodologías Para la Caracterización de la Calidad Ambiental. Comisión Nacional del Medio Ambiente. 242 pp.

Contreras L.C & J.L Yañez. 1995. Mamíferos. In: Simonetti JA, MTK Arroyo, AE Spotorno & E Lozada (eds). Diversidad Biológica de Chile. CONICYT, Santiago, Chile. 336-349.

Contreras L.C. 2000. Biogeografía de Mamíferos Terrestres de Chile, en: Muñoz-Pedreros & Yáñez (eds.) Mamíferos de Chile. CEA Ediciones, Valdivia: 241-249.

De la Peña M.R. & M. Rumboll. 1998. Birds of Southern South America and Antarctica. Collins illustrated checklist. HarperColllins Publishers, London. 304 pp.

Díaz N. y J. Valencia. 1985. Larval morphology and phenetic relationships of the Chilean Alsodes, Telmatobius, Caudiverbera and Insuetophrynus (Anura:Leptodactylidae). Copeia 1985 (1): 175-181.

Donoso-Barros R. 1966. Reptiles de Chile. Ediciones de la Universidad de Chile, Santiago.

Donoso-Barros R. 1970. Catálogo Herpetológico Chileno. Boletín Museo Nacional de Historia Natural, Chile 31: 50-124.

Egli G. 1998. Voces de la Fauna Chilena. (Compact Disc).

Egli G. 2002. Voces de aves chilenas (Compact Disc).

Egli G & J Aguirre 2000. Aves de Santiago. UNORCH, Santiago. 130 pp.

Formas J.R. 1995. Anfibios. En: Simonetti JA, MTK Arroyo, AE Spotorno & E Lozada (eds). Diversidad Biológica de Chile. CONICYT, Santiago, Chile. 314-325.

Glade A.A. (ED). 1993. Libro Rojo de los Vertebrados Terrestres de Chile. Corporación Nacional Forestal, Santiago.

Jaksic F.M. 1996. Ecologia de los Vertebrados de Chile. Ediciones Universidad Católica de Chile, Santiago, 262 pp.

Jaramillo A, 2005. Aves de Chile. Lynx Ediciones, Barcelona, 240 pp.

Johnson A.W. & J.D. Goodall. 1965. The Birds of Chile and Adjacent Regions of Argentina, Bolivia, and Perú. Platt eds., Buenos Aires, Argentina.

Lazo I. & E. Silva. 1993. Diagnóstico de la ornitología en Chile y recopilación de la literatura científica publicada desde 1970 a 1992. Revista Chilena de Historia Natural 66: 103-118.

Mann G. 1978. Los Pequeños Mamíferos de Chile. Gayana, Zoología 40. Universidad de Concepción.

Martínez D. & G. González. 2005. Las aves de Chile. Nueva Guía de campo. Ediciones del Naturalista, Santiago. 620. pp.

Mella J. 2005. Guía de campo de reptiles de Chile: Zona Central. Ediciones del Centro de Ecología Aplicada, Santiago, 165 pp.

Miller S.D. & J. Rottmann. 1976. Guía de reconocimiento de mamíferos chilenos. Editorial Gabriela Mistral, Santiago.

Muñoz-Pedreros A. & J. Yañez, Eds. 2000. Mamíferos de Chile. CEA Ediciones, Valdivia. 464 pp.

Muñoz M, H Nuñez & J Yáñez (eds. 1996) Libro Rojo de los sitios prioritarios para la conservación de la Diversidad Biológica de Chile. Corporación Nacional Forestal, Santiago.

Núñez H. & F. Jaksic. 1992. Lista comentada de los reptiles terrestres de Chile continental. Boletín Museo Nacional de Historia Natural 43: 63-91.

Osgood W.H. 1943. The Mammals of Chile. Field Museum of Natural History, Zoological series 30: 1-268.

Pearman M. 1995. The Essential Guide to Birding in Chile. Worldwide Publications, England. 95 pp.

Pincheira-Donoso D. & H. Núñez. 2005. Las especies chilenas del género Liolaemus Wiegmann, 1834 (Iguania: Tropiduridae: Liolaeminae). Taxonomía, Sistemática y Evolución. Publicación Ocasional del Museo Nacional de Historia Natural, Chile Nº 59: 7-486.

Redford K.H. & J.F. Eisenberg. 1992. Mammals of the Neotropics. Volume 2: The Southern Cone. Chile, Argentina, Uruguay And Paraguay. University of Chicago Press, Chicago. 430 pp.

Reise D. & W. Venegas. 1987. Catalogo de registros, localidades y biotopos del trabajo de investigación acerca de los pequeños mamíferos de Chile y Argentina. Gayana, Zoología 51:103-130.

Rottmann J. 1995. Guía de Identificación de Aves de Ambientes Acuáticos. Unión de Ornitólogos de Chile. 80 pp.

SAG. 2006. La Ley de caza y su reglamento, División de Protección de los Recursos Naturales Renovables. 98 pp.

Spotorno A.E, H. Cofre, G. Manriquez, Y. Vilina, P.A. Marquet & L. Walker. 1998. Una nueva especie de Loxodontomys, otro mamífero filotino de los Andes de Chile central. Revista Chilena de Historia Natural 71: 359-373.

Tamayo M. & D. Frassinetti. 1980. Catálogo de los mamíferos fósiles y vivientes de Chile. Boletín del Museo Nacional de Historia Natural 37: 323-399.

Torres-Mura J.C. 1994. Fauna terrestre de Chile. In Perfil Ambiental de Chile. Comisión Nacional del Medio Ambiente, Santiago.

Veloso A, J.C. Ortiz, J. Navarro, H. Núñez, P. Espejo & M.A. Labra. 1995. Reptiles, in: Simonetti JA, MTK Arroyo, A Spotorno & E Lozada (eds). Diversidad Biológica de Chile. CONICYT, Santiago, Chile: 326 - 335.

Veloso A. & J. Navarro. 1988. Lista sistemática y distribución geográfica de anfibios y reptiles de Chile. Bolletino del Museo Regionale di Scienze Naturali 6: 481-539.

Wilson D.E & D.M. Reeder (Eds.). 1993. Mammal Species of the World: Taxonomic And Geographic Reference. Smithsonian Institution Press, Washington D.C.

APPENDIX
PHOTOGRAPHC RECORD

Figure 2: Sampling Stations: EM2 (upper left) EM3 (upper right), EM5 (lower left) and EM7 (lower right), with sparse Sclerophyllous scrubland and high degree of human intervention (in the last case).

Source: CEA Ltda.

Figure 3: "Lagartija de monte" (*Liolaemus monticola*), one of the most abundant species in the area of study

Source: CEA Ltda.

Figure 4: "Lagartija lemniscata" (*Liolaemus lemniscatus*), another species that is abundant in the area of study

Source: CEA Ltda.

Figure 5: Adult "Lagartija oscura" (*Liolaemus fuscus*)

Source: CEA Ltda.

Figure 6: Male "Lagartija esbelta" (*Liolaemus tenuis*)

Source: CEA Ltda.