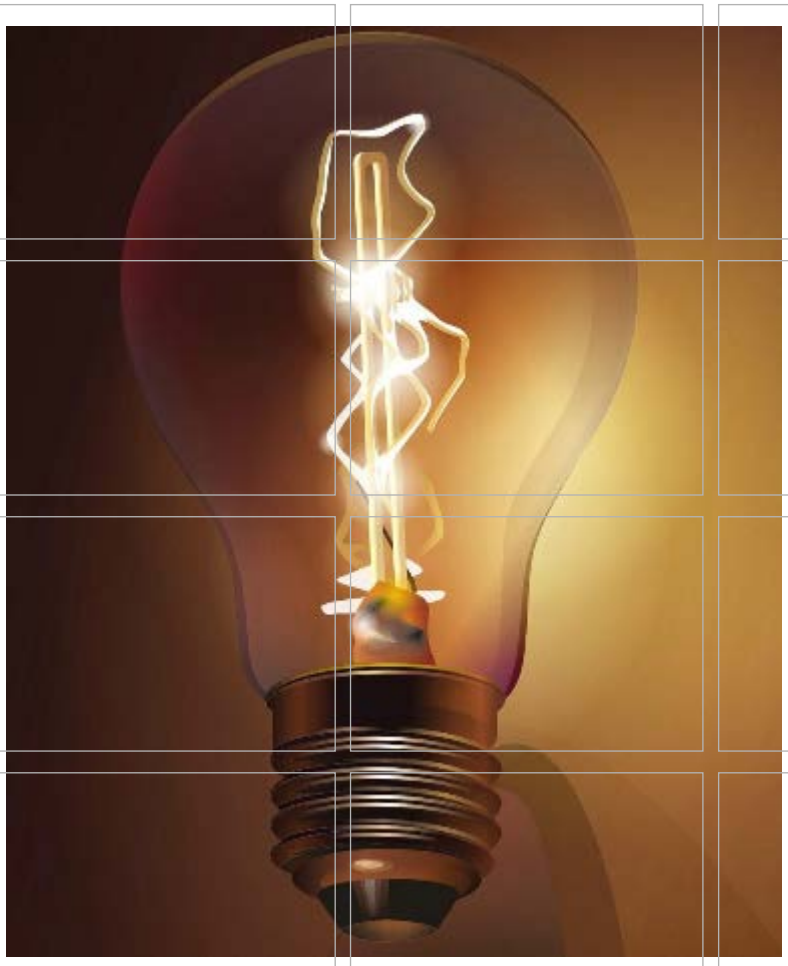

Cumulative Impact Assessment

Radiant and Eldosol Energy

Cumulative Impact Assessment for the Radiant and Eldosol Power Plant and associated Transmission Line (interconnector) in Kipchamo Village, Saroiyoi Sub Location, Kipchamo Location, Kesses Constituency, Uasin Gishu County

May 2016

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May 2016

Authors: Wanjiku Githinji and Callie Phillips

For and on behalf of
Environmental Resources Management

Approved by: Mike Everett

Signed: Mike Everett

Position: Partner

Date: 25th May 2016

Environmental Resources Management Limited
Incorporated in the United Kingdom with registration number 1014622
Registered Office: 2nd Floor, Exchequer Court, 33 St Mary Axe, London, EC3A 8AA

CONTENTS

1 INTRODUCTION

1.1 OVERVIEW

Radiant and *Eldosol Energy Limited* are proposing to construct and operate two 40 megawatts (MW) Solar Photovoltaic (PV) Power Plants and an associated Transmission Line (interconnector) in Kipchamo Village, Saroiyoi Sub Location, Kipchamo Location, Kesses Constituency, Uasin Gishu County.

As well as the Radiant and Eldosol Projects, a further 40 MW Solar Power Plant is being developed by *Alten Energy*, that will be located 1km east of the Radiant/Eldosol Sites. There is some certainty that all three developments will proceed to construction, as two (Radiant Energy and Alten Energy) have already been granted a licence by the Kenya National Environment Management Authority (NEMA) and one (Eldosol Energy) is still under review by the Authority. This means that a total of 120MW of power will be generated in the Kesses area.

ERM has prepared this Cumulative Impact Assessment (CIA) Report to assess the potential impacts of the three 40MW Projects and associated transmission lines which potentially will be constructed and operated in close proximity to each other as shown in *Annex A*.

1.2 PROJECT DESCRIPTION

The three Projects are summarised in *Table 1.1*

Table 1.1 Summary of the Alten, Eldosol and Radiant Projects

Summary Description	Alten Project	Eldosol Project	Radiant Project
Location	• Cheptiret/Kipchamo Block 6 (Plateau) Farm, Plateau Area, Kesses Division, Uasin Gishu County • 15 km from the main Eldoret-Nakuru Highway	• Kipchamo Village, Saroiyoi Sub Location, Kipchamo Location, Kesses Constituency, Uasin Gishu County • 13.5 kilometres to the South East of Eldoret Town	• Kipchamo Village, Saroiyoi Sub Location, Kipchamo Location, Kesses Constituency, Uasin Gishu County • 13.5 kilometres to the South East of Eldoret Town
Project coordinates	• 0º25′13" N (Latitude) • 35º22′53″E (Longitude)	**Northings** / **Eastings** 0°25'3.47"N 35°21'5.20"E 0°24'58.71"N 35°22'0.19"E 0°24'41.02"N 35°20'59.47"E 0°24'36.19"N 35°21'54.49"E	**Northings** / **Eastings** 0°25'26.03"N 35°21'6.37"E 0°25'20.83"N 35°22'5.72"E 0°25'3.47"N 35°21'5.20"E 0°24'58.71"N 35°22'0.19"E
Type of facility	• Installation and operation of solar panels with a projected output of 40 MW connected to the national grid	• Installation and operation of solar panels with a proposed output of 40 MW, as well as a transmission line, connected to the national grid via the existing 220kV Kenya Electricity Transmission Company Limited (KETRACO) Turkwel- Lessos transmission line traversing private land approximately 1 kilometre east of the Site	• Installation and operation of solar panels with a proposed output of 40 MW, as well as a transmission line, connected to the national grid via the existing 220kV KETRACO Turkwel- Lessos transmission line traversing private land approximately 1 kilometre east of the Site
Development Schedule	• 10-14 months from design to operation	• 36 months from pre-feasibility to operation	• 36 months from pre-feasibility to operation
Operation/life span	• At least 25 years	• At least 25 years	• At least 25 years
Project Area	• 630 acres	• 301 acres	• 300 acres
Access road	• Accessible via Plateau Road	• Accessible via Plateau Road	• Accessible via Plateau Road

Summary Description	Alten Project	Eldosol Project	Radiant Project
Number of vehicles	• 400 trucks (a month) for the delivery of panels • 20-30 trucks for the delivery of electrical equipment and components • 40-50 trucks for the prefabricated buildings • 140-150 trucks for the delivery of trackers • 20-30 trucks for earthworks	• Delivery of panels: approximately 400 trucks; • Delivery of electrical equipment and components: approximately 20-30 trucks; • Delivery of prefabricated buildings: potentially 40-50 trucks; • Delivery of mounting structures: approximately 140-150 trucks; and • Earthworks: approximately 20-30 trucks.	• Delivery of panels: approximately 400 trucks; • Delivery of electrical equipment and components: approximately 20-30 trucks; • Delivery of prefabricated buildings: potentially 40-50 trucks; • Delivery of mounting structures: approximately 140-150 trucks; and • Earthworks: approximately 20-30 trucks.
Non-hazardous waste anticipated	• Domestic waste, wooden pallets and cartons, scrap metal, concrete waste, paper and cardboard, grey water and food waste	• During construction, general wastes produced will include plastics, metal and wood shavings, ceramics, bricks, glass, cardboard, cement, paper, paints and sealants. Packaging material wastes will also be accumulated from unpacking of PV Array equipment.	• During construction, general wastes produced will include plastics, metal and wood shavings, ceramics, bricks, glass, cardboard, cement, paper, paints and sealants. Packaging material wastes will also be accumulated from unpacking of PV Array equipment.
Hazardous waste anticipated	• Batteries (large lead acid type), medical waste (from the first aid kit), oils rags and absorbents, used oil/oil filters, contaminated water and sewerage	• Batteries (large lead acid type), medical waste (from the first aid kit), oils rags and absorbents, used oil/oil filters, contaminated water and sewerage	• Batteries (large lead acid type), medical waste (from the first aid kit), oils rags and absorbents, used oil/oil filters, contaminated water and sewerage
Type of mounting system (fixed/tracking)	• TBC – data not provided in the ESIA Report	• Tracking system	• Tracking system
Grid connection	• TBC/on-going discussion with Kenya Power	• Transmission line, connected to the national grid via the existing 220kV Kenya Electricity Transmission Company Limited (KETRACO) Turkwel- Lessos transmission line traversing private land approximately 1 kilometre east of the Site	• Transmission line, connected to the national grid via the existing 220kV Kenya Electricity Transmission Company Limited (KETRACO) Turkwel- Lessos transmission line traversing private land approximately 1 kilometre east of the Site

Summary Description	Alten Project	Eldosol Project	Radiant Project
Land tenure	• Privately owned land • The Proponent has entered into a long-term lease agreement with the land owner	• Privately owned land • The Proponent has entered into sale agreement with the land owner	• Privately owned land • The Proponent has entered into sale agreement with the land owner
Current land use	• Agricultural	• Agricultural	• Agricultural
Quantities and origins of the source materials	• TBC - data not provided in the ESIA Report	• TBC - data not provided during the ESIA	• TBC - data not provided during the ESIA
Water requirements	• Not specified for the construction phase • Only 2 cleaning operations per year during the operational phase	• During construction, primary water use requirements will be for dust control and concrete foundations • During the operational phase PV panel cleaning will be carried out, using water and a mild, biodegradable and non-abrasive detergent. • A 40 MW facility requires approximately 200,000 litres of water (1.5 litres per m^2) for each cleaning, which will only be required in the event of a year with low rain	• During construction, primary water use requirements will be for dust control and concrete foundations • During the operational phase PV panel cleaning will be carried out, using water and a mild, biodegradable and non-abrasive detergent. • A 40 MW facility requires approximately 200,000 litres of water (1.5 litres per m^2) for each cleaning, which will only be required in the event of a year with low rain
Water sources	• TBC – data not provided in the ESIA Report	• TBC- a borehole, a well or abstracted from the Kipsinende River.	• TBC - a borehole, a well or abstracted from the Kipsinende River.
Employment	• During the construction phase activities, between 50 and 100 construction jobs will be created, with up to 400 during peak periods • About 10-15 permanent employees will be employed on a full-time basis during the operation phase. This number could go up to 30 workers at peak times	• Approximately 250 jobs during the construction period (including 210 junior staff and labourers and 40 high level staff) • 35 jobs during the operational phase	• Approximately 250 jobs during the construction period (including 210 junior staff and labourers and 40 high level staff) • 35 jobs during the operational phase

1.3 OBJECTIVES OF THE CIA

CIA is the process of analysing the potential impacts and risks of proposed development in the context of the potential effects of other human activities and natural environmental and social external drivers over time, and proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible. Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.

IFC Performance Standard 1, *Assessment and Management of Environmental and Social Risks and Impacts*, recognizes that in some instances, private sector developers need to consider cumulative effects in their identification and management of environmental and social impacts and risks. Similarly, Performance Standard Guidance Note 1 (GN1), in paragraph GN38, states, *"in situations where multiple projects occur in, or are planned for, the same geographic area...it may also be appropriate for the client to conduct a CIA as part of the risks and impacts identification process."*

The main objectives of this CIA study are to:

- assess the potential impacts and risks of the proposed PV Solar developments over time.
- verify that the proposed development's cumulative social and environmental impacts and risks will not negatively impact on communities or the environment..
- confirm that the proposed development's value and feasibility are not limited by cumulative social and environmental effects.
- ensure that the concerns of affected communities about the cumulative impacts of a proposed development are identified, documented, and addressed.

1.4 CUMULATIVE IMPACT APPROACH

This CIA has been prepared as per the ERM Cumulative Impact Assessment Standard which addresses the evaluation of cumulative impacts and is based on current international practice and guidance, specifically:

- International Finance Corporation (IFC), 2013, Good Practice Handbook Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets.
- European Union (EU), 1999, Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.

- Canadian Environmental Assessment Agency, 2012, Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act.

- National Environmental Policy Act (NEPA) Council on Environmental Quality (CEQ), 1997, Considering Cumulative Effects under the National Environmental Policy Act.

The ERM study team evaluated cumulative impacts of the proposed PV Solar projects using the following steps:

- Defined the geographic and temporal scope of cumulative impact analysis, based on the potential area within which impacts of the proposed projects could combine.

- Identified the valuable environmental components likely to be significantly affected by the three projects.

- Evaluated the effects of the proposed projects with foreseeable future projects and conditions likely to occur within the projects' geographical area of influence.

- Designed appropriate mitigation measures for each identified impact, including appropriate monitoring and evaluation mechanisms.

In conducting these steps, the ERM team paid full attention and observance to the relevant legal and regulatory requirements.

ERM has assessed a worst case scenario in which all three Projects are implemented at the same time.

2 CUMULATIVE IMPACT ASSESSMENT

2.1 INTRODUCTION

Cumulative impacts can only occur where, following the implementation of mitigation, significant residual impacts are predicted by the ESIA process. The residual impact significance for the three projects during construction and operation are summarised in *Table 2.1.* It should be noted that in reviewing the proposed projects, ERM has determined that the mitigation measures are fit for purpose and supports the residual impact ratings proposed.

Table 2.1 Summary of Residual Impacts for the Three Projects

Impact	Alten Project	Eldosol Project	Radiant Project
Loss of topsoil, soil compaction and erosion	Construction – Minor Negative Operation – Negligible	Construction – Minor Negative Operation – Negligible	Construction – Minor Negative Operation – Negligible
Impact on Hydrology and Hydrogeology	Construction – Minor Negative Operation – Minor Negative	Construction – Minor Negative Operation – Minor Negative	Construction – Minor Negative Operation – Minor Negative
Habitat Loss	Construction – Minor Negative Operation –Negligible	Construction - Negligible Operation- Minor Positive	Construction - Negligible Operation- Minor Positive
Impacts on Avifauna (disturbance and mortality)	Construction – Minor Negative Operation – Minor Negative	Construction – Moderate – Minor Negative Operation- Negligible	Construction – Moderate – Minor Negative Operation- Negligible
Local Air Quality	Construction – Minor Operation –Minor	Construction - Negligible Operation – Scoped out	Construction - Negligible Operation – Scoped out
Waste and Effluent	Construction – Minor Negative Operation – Negligible	Construction – Minor Negative Operation – Minor Negative	Construction – Minor Negative Operation – Minor Negative
Loss of Livelihoods	Construction – Minor Negative Operation – Minor Negative	Construction – Minor Negative Operation – Minor Negative	Construction – Minor Negative Operation – Minor Negative
Direct Employment and Training	Construction – Moderate Positive Operation – Minor Positive	Construction – Moderate Positive Operation – Minor Positive	Construction – Moderate Positive Operation – Minor Positive
Procurement and Indirect Employment	Construction– Moderate Positive Operation – Minor Positive	Construction– Moderate Positive Operation – Minor Positive	Construction– Moderate Positive Operation – Minor Positive
Induced Economic Benefits	Construction– Moderate Positive Operation – Minor Positive	Construction– Moderate Positive Operation – Minor Positive	Construction– Moderate Positive Operation – Minor Positive
Increased Revenue Generation	Construction– Moderate Positive Operation – Minor Positive	Construction– Moderate Positive Operation – Minor Positive	Construction– Moderate Positive Operation – Minor Positive
Increased Social Disturbance	Construction – Minor Negative Operation – Negligible	Construction – Negligible Operation - Negligible	Construction – Negligible Operation - Negligible
Impact on Disease Transmission	Construction – Minor Negative Operation – Minor Negative	Construction – Minor Negative Operation – Minor Negative	Construction – Minor Negative Operation – Minor Negative
Traffic Impacts	Construction – Minor Negative Operation – Negligible	Construction – Minor Negative Operation – Negligible	Construction – Minor Negative Operation – Negligible
Workers Management and Rights	Construction – Minor Negative Operation – Minor Negative	Construction- Negligible Operation - Negligible	Construction- Negligible Operation - Negligible
Health and Safety	Construction – Minor Negative Operation – Negligible	Construction - Minor Negative Operation - Negligible	Construction - Minor Negative Operation - Negligible

Impact	Alten Project	Eldosol Project	Radiant Project
Visual Impacts	Construction – Minor Negative Operation – Negligible	Construction – Negligible Operation – Minor-Moderate Negative	Construction – Negligible Operation – Minor-Moderate Negative
Fauna	Construction- Negligible Operation – Negligible	Scoped out	Scoped out
Noise	Construction – Minor Negative Operation – Minor Negative	Construction – Minor Negative Operation – Negligible	Construction – Minor Negative Operation – Negligible

Based on the significance of the residual impacts during construction and operation the following impacts have been considered in this assessment:

- Noise;
- Traffic and Transport;
- Soils, Surface and Groundwater;
- Avifauna;
- Employment and Procurement; and
- Community Health and Safety.

The following impacts have been scoped out as they are predicted to have negligible or minor impacts and as such cumulative impacts are not predicted to occur:

- Air Quality;
- Habitat Loss;
- Social Disturbance;
- Worker Management and Rights; and
- Visual Impacts.

In addition, impacts associated with worker health and safety has been excluded as these will be managed individually by the Project.

Finally, as Kenya Power will only allow the existing transmission line for Turkwell to Lessos to be cut once and only require one substation to be constructed in the area the potential for impacts associated with land take for the transmission lines and sub-stations is limited.

2.2 NOISE

2.2.1 Potential Cumulative Impacts

A summary of the projected noise impacts from the projects is shown in *Table* 2.2.

Table 2.2 Summary of Cumulative Noise Impacts

Summary	Construction	Operation
Project aspect/activity	Heavy equipment use during earthworks/ground preparation. Project Transport	Noise from Plant operation, supervision and maintenance activities.
Impact type	Cumulative Negative	Cumulative Negative
Receptors	Construction workers, neighbouring residents. Avifauna	Neighbouring residents, on-site personnel Avifauna

Construction Phase Impacts

Noise impacts are related to the source of the noise (e.g. vehicles, construction equipment, workers and project facility components), the proximity to the noise receptor (e.g., humans and wildlife), and the times of day at which noise-producing activities are taking place.

The three projects (Eldosol, Radiant and Alten) are within 2km of each other, and surrounded by settlements as well as some sensitive avifauna. As such, continuous use of heavy equipment use (e.g. rollers, bulldozers, diesel engines, vehicular traffic) during the construction period is likely to be the primary source of noise in the sites. In some instances, the noise levels from some equipment operation could exceed the limits set by the *Environmental Management And Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations,2009*, but would be intermittent and extend for only a limited time.

Nature: Continuous heavy construction equipment use during the construction period is likely to be the primary source of **negative cumulative** noise impact on avifauna, construction workers and residents in the nearby communities.

Impact Magnitude – Medium

- **Extent:** It is anticipated that the potential risk of noise levels impacts will occur at the local level.
- **Duration:** The impacts identified are expected to be **short-term** as they will mostly occur for short periods, and last for the duration of the construction phase.
- **Intensity:** The intensity will be **medium** given the continuous nature of heavy equipment use routines in similar construction activities and additional noise from similar activities in all three projects.

Likelihood – It is **likely** that this impact will occur during the construction phase.

Impact significance (pre-mitigation) – moderate negative.

Degree of Confidence: The degree of confidence is **medium**.

Construction Phase Mitigation Measures

- The three projects should to the extent possible, schedule noisy activities to occur at the same time, since, generally, less-frequent noisy activities would be less annoying.

- To the extent feasible, all projects should agree transport routes which will route heavy truck traffic supporting construction activities away from residences and other sensitive receptors.

- The projects should ensure that there is an integrated approach to stakeholder engagement such that cumulative issues can be addressed in an integrated manner.

Operation Phase Impacts

During the operational phase of the three projects there are likely to be very limited noise sources and therefore the potential for impacts from the individual projects is considered to negligible or minor as such cumulative noise impacts are not expected.

2.2.2 *Residual Cumulative Noise Impacts*

If the above stipulated mitigation measures are implemented, the residual impact significance will be reduced to *Minor* negative cumulative impacts for construction, while impacts are considered *Negligible* for the operational phase.

Table 2.3 Pre- and Post- Mitigation Significance: Noise

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Construction	**Moderate NEGATIVE**	**Minor NEGATIVE**
Operation	**Negligible**	**Negligible**

2.3 *TRAFFIC AND TRANSPORT*

A summary of the projected transportation impacts from the projects is shown in *Table 2.4.*

Table 2.4 Summary of Cumulative Transportation Impacts

Summary	Construction	Operation
Project aspect/activity	Temporary but significant increase in the use of local roads by construction traffic (delivery of PV components and construction equipment, delivery of concrete, construction personnel commuting to and from Site).	Movement of workers (limited) Movement of equipment for maintenance
Impact type	Cumulative Negative	Cumulative Negative
Receptors	• Neighbouring residents; and • Other road users.	• Neighbouring residents; and • Other road users.

2.3.1 *Potential Cumulative Impacts*

Construction Phase Impacts

Assuming that all the Projects transport goods and materials by road there will be increased vehicle movements in the area as trucks will be required to transport materials and equipment such as PV panels and frames to the site.

The increase in traffic could create noise, dust and safety (including injury or even death due to accidents) impacts for other road users and people living or working within close proximity to the roads on the selected transport route.

Traffic movements also have the potential to result in damage to property or livestock.

Nature: Increase in the use of local roadways and access roads by construction traffic (for delivery of PV components and construction equipment, delivery of concrete, construction personnel commuting to and from the three sites) will likely result in **negative cumulative** impacts on members of the nearby communities, other road users and is likely to lead to **positive cumulative** impacts to the local community.

Impact Magnitude – Medium

- **Extent:** It is projected that construction traffic impacts will be significant at the local level.
- **Duration:** The impacts identified are expected to be **short-term** as they will only occur during construction.
- **Intensity:** The intensity will be **medium** given the small width and type of roads (earth) in comparison to the expected high traffic associated with the three projects.

Likelihood – It is **likely** that this impact will occur during the construction phase.

Impact Significance (pre-mitigation) – Moderate negative.

Degree of Confidence: The degree of confidence is **medium**.

Construction Phase Mitigation Measures

- Develop an integrated traffic management plan for use of main public roads, particularly for oversized vehicles that may affect other traffic movements in the area. This should include agreed measures such as speed limits, traffic routes, waiting areas, timing of movements etc to avoid / minimise congestion.

- Compensation rates for damage to community property or livestock should also be agreed to avoid communities playing developers off against each other.

- Limit traffic to roads indicated specifically for the projects. Limit use of unimproved roads to emergency use only.

Operation Phase Impacts

Low-significance transportation impacts are expected from the three projects. Low volumes of pick-up trucks and personal vehicles are expected for routine maintenance and monitoring at each of the sites, as such cumulative impacts are not expected.

2.3.2 *Residual Cumulative Traffic and Transport Impacts*

If the above stipulated mitigation measures are implemented, the residual impact significance will be reduced to *Minor* negative for construction, while impacts are considered *Negligible* for the operational phase.

Table 2.5 Pre- and Post- Mitigation Significance: Transportation

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Construction	**Moderate NEGATIVE**	**Minor NEGATIVE**
Operation	**Negligible**	**Negligible**

2.4 *SOILS, SURFACE AND GROUNDWATER*

A summary of the projected soils, surface and groundwater impacts from the projects is shown in *Table 2.8*.

Table 2.6 Summary of Cumulative Soils, Surface and Groundwater Impacts

Summary	Construction	Operation
Project aspect/activity	Surface disturbance, heavy equipment traffic, and changes to surface runoff patterns could cause soil erosion, soil nutrient loss and slope instability.	Soil erosion caused by storm water or surface water runoff may occur during the operational phase as a result of additional impervious surfaces onsite and fixed equipment.
Impact type	Cumulative negative	Cumulative negative
Receptors	Construction workers, neighbouring residents, other passers-by.	Neighbouring residents, on-site personnel, passers-by.

2.4.1 *Potential Cumulative Impacts*

Construction Phase Impacts

Surface disturbance, heavy equipment traffic, and changes to surface runoff patterns due to preparation of the sites for the establishment of PV arrays, onsite access roads, temporary laydown area and buildings could cause soil erosion, soil nutrient losses and reduced water quality in nearby surface water bodies. Altering drainage patterns could also accelerate erosion and create slope instability.

Nature: Surface disturbance, heavy equipment traffic, and changes to surface runoff patterns could result in **cumulative negative** impacts on the soils and affect the residents in the nearby communities, others within the locality.

Impact Magnitude – Medium

- **Extent:** It is projected that impacts will be significant at the local level.
- **Duration:** The impacts identified are expected to be **short-term** as they will only occur during the construction period.
- **Intensity:** The intensity will be **medium** due to the likely big acreage to be cleared for the PV Solar projects in the locality.

Likelihood – It is **likely** that this impact will occur during the operation phase.

Impact Significance (pre-mitigation) – Moderate negative.

Degree of Confidence: The degree of confidence is **medium**.

Construction Phase Mitigation Measures

The stipulated mitigation measures for the Projects to avoid disturbance to soils are as per their respective mitigation measures. With regards to surface and groundwater, the sources of water for the Projects must first be identified.

Operation Phase Impacts

Soil erosion caused by storm water or surface water runoff may occur during the operational phase as a result of additional impervious surfaces onsite, such as the gravel compacted roads, the laydown and storage areas used for the construction phase, and the panels themselves, resulting in increased runoff.

Obstructions such as poles supporting the PV structures, building foundations and compacted gravel tracks on the Site may concentrate water flows into catchment areas feeding surrounding drainage lines. Surface water flows diverted along tracks and infilled trenches could also result in in the formation of eroded gullies or dongas.

It is also important to note that all Sites have very gentle gradients and will be covered with vegetation, both between and under the panels. Therefore, there should be negligible impact on rainwater infiltration.

Nature: Soil erosion caused by storm water or surface water runoff may occur during the operational phase as a result of additional impervious surfaces onsite and fixed equipment may result in **cumulative negative** impacts on the soils and affect the residents in the nearby communities, others within the locality.

Impact Magnitude – Low

- **Extent:** It is projected that impacts will be significant at the local level.
- **Duration:** The impacts identified are expected to be **long-term** as they will occur throughout the operation period.
- **Intensity:** The intensity will be **low** since the activities at this stage will be mostly limited to already affected surfaces.

Likelihood – It is **likely** that this impact will occur during the operation phase.

Impact Significance (pre-mitigation) – Minor negative.

Degree of Confidence: The degree of confidence is **medium**.

Operation Phase Mitigation measures

- Laydown or infrastructure assembly areas not required during the operational phase of the PV power facility to be re-vegetated with indigenous vegetation to prevent erosion immediately after these areas are no longer required for construction.

- Bi-annual monitoring of erosion in the vicinity of roads, PV arrays and other hard-standing surfaces will be conducted before and after the rainy season to ensure erosion sites can be identified early and remedied.

2.4.2 *Residual Cumulative Soil, Surface and Ground Water Impacts*

Assuming the stipulated construction mitigation measures are implemented, the residual impact significances for the construction phases in each of the Projects were reduced from *Moderate* to *Negligible* negative. Assuming a worst case scenario that all three Projects were constructed at the same time the mitigation proposed by all three Projects with the mitigation proposed the potential for disturbance to soils, surface and groundwater will be minimal but it is recognised that the area disturbed will be greater. As such, the cumulative impacts are expected to be *Minor Negative* and additional mitigation is not proposed.

If the suggested operation phase mitigation and monitoring remedies are observed, the cumulative impacts are expected to be *Minor Negative*.

Table 2.7 Pre- and Post- Mitigation Significance: soils, surface and groundwater Impacts

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Construction	**Moderate NEGATIVE**	**Minor NEGATIVE**

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Operation	**Minor NEGATIVE**	**Negligible**

2.5 *AVIFAUNA*

A summary of the projected impacts on avifauna from the three projects is shown in *Table 2.10*

Table 2.8 Summary of Cumulative Avifauna Impacts

Summary	Construction	Operation
Project aspect/activity	Displacement or exclusion of threatened, rare, endemic or range restricted species, specifically the Grey Crowned Crane.	Avian electrocutions, nuisance.
Impact type	Cumulative negative	Cumulative negative
Receptors	Avifauna	Avifauna.

Construction Phase Impacts

The most significant potential impact identified on avifauna by the solar PV facilities was related to the displacement or exclusion of threatened, rare, endemic or range restricted species, specifically the Grey Crowned Crane, which was observed on all three site locations, during construction.

Nature: Displacement or exclusion of threatened, rare, endemic or range restricted species, specifically the Grey Crowned Crane may result in **cumulative negative** impacts on the bird species within the locality.

Impact Magnitude – Low

- **Extent:** It is projected that avifauna impacts will be significant at the local level.
- **Duration:** The impacts identified are expected to be **temporary** as they will occur occasionally during the early part of the construction period.
- **Intensity:** The intensity will be **medium** since the birds may move to other locations after loss of habitat within the locality.

Likelihood – It is **likely** that this impact will occur during the operation phase.

Impact Significance (pre-mitigation) – Moderate negative.

Degree of Confidence: The degree of confidence is **medium**.

Construction Phase Mitigation Measures

The stipulated mitigation measures for the Projects to avoid disturbance to avifauna are as per their respective mitigation measures.

Operation Phase Impacts

Other bird species are attracted to the PV arrays, using the erected structures as prominent perches, sheltered roost sites or even nesting sites, and possibly foraging around the infrastructure in response to changes in the distribution of preferred foods (plants growing under the arrays, other animals attracted to the PV power facility). Such scenarios might be associated with fouling of critical components of the solar infrastructure, bringing local bird populations into conflict with the facility operators.

Avian electrocutions may also occur when a bird perches (or attempts to perch) on an electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components.

Nature: Avian electrocutions and nuisance from birds may result in **cumulative negative** to the bird species within the locality.

Impact Magnitude – Low

- **Extent:** It is projected that avifauna impacts will be significant at the local level.
- **Duration:** The impacts identified are expected to be **long-term** as they will occur throughout the operation period.
- **Intensity:** The intensity will be **low** since there is likely to be few birds within the project site.

Likelihood – It is **unlikely** that this impact will occur during the operation phase.

Impact Significance (pre-mitigation) – Negligible.

Degree of Confidence: The degree of confidence is **medium**.

Operation Phase Mitigation Measures

- During the operational phases, personnel will receive environmental education so as to ensure that that no hunting or killing of avifauna occurs at any stage during the Project.

- The Proponent will develop and implement a disciplinary procedure for staff caught conducting such activities.

- Any electrocution and collision events that occur should be recorded, including the species affected and the date. This can be done, for example,

by Site Security during their regular patrol. The Staff can be provided with an environmental checklist that details what to look out for.

Provided that the above mentioned mitigation measures are applied wherever possible post-construction, each development should have a limited impact on avifauna.

2.5.2 *Residual Cumulative Impacts*

The residual significance ratings for the construction phase for all three ESIAs was *Minor Negative*. The operational phase residual significance rating for disturbance to avifauna, as well as avifaunal mortality was *Negligible* in all three ESIAs. Assuming that all three Projects are constructed and operated at the same time and the described mitigation is implemented the cumulative impact of the Projects are unlikely to change from the individual ratings as the likelihood of incidents will remain unchanged.

Table 2.9 Pre- and Post- Mitigation Significance: Avifauna

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Construction	**Minor NEGATIVE**	**Negligible**
Operation	**Negligible**	**Negligible**

2.6 *SOCIO-ECONOMIC IMPACTS*

A summary of the projected socio-economic impacts from the projects is shown in *Table 2.11.*

Table 2.10 Summary of Cumulative Socio-economic Impacts

Summary	Construction	Operation
Project aspect/activity	Employment and Procurement opportunities Presence of an external workforce including transport drivers..	Limited employment and procurement opportunities
Impact type	Cumulative positive and negative	Cumulative positive
Receptors	Local communities.	Local communities.

The following sections describe the potential socio-economic cumulative impacts that may occur.

2.6.1 *Employment and Procurement*

Potential Cumulative Impacts

Benefits to the local, regional and national economy through employment and procurement of services were already identified as part of the ESIA. The development of three projects in the area is likely to support the enhancement of these benefits. Should the projects be constructed sequentially there is the possibility for those who have gained skills working for contractors, sub-contractors or suppliers on one project to transfer these skills and find employment on subsequent projects.

However, potential cumulative negative impacts could occur, if the projects are constructed concurrently including:

- Competition for workers during the construction phase if the projects are developed at/around the same time.

- Variances in salary structures for employees within the three projects during construction and operation if these are not harmonised prior to employment. This could lead to ongoing dissatisfaction with discrepancies in pay between various roles and worker types.

- Variances in procurement practices that lead to discrepancies in pay between contractors and for good and services that could result in risks to project implementation.

Nature: Employment and procurement locally will provide positive benefits to communities but there is potential for dissatisfaction if there are discrepancies in pay and conditions.

Impact Magnitude – Low

- **Extent:** It is projected that employment and procurement impacts will be significant at the local level.
- **Duration:** The impacts identified are expected to be **short-term** as they will occur throughout the construction period.
- **Intensity:** The intensity will be **low** due to the number of people likely to find employment and the associated benefits in an area with limited employment opportunities..

Likelihood – It is **likely** that this impact will occur during the construction phase.

Impact Significance (pre-mitigation) – Minor negative.

Degree of Confidence: The degree of confidence is **medium**.

Mitigation Measures

- In order to avoid these impacts the Projects should development of an integrated Employment and Procurement Plan or at least agreement on

key principles such as wages, hours of work etc to ensure alignment between the Radiant/Eldosol Projects and the Alten Project.

- All three projects should purchase supplies from the local communities as much as possible to enhance their economic capacities.

In this way the cumulative impacts outlined above can be avoided.

Operation Phase

Impacts are not expected during the operations phase as the size of the workforce and level of procurement will be limited. Furthermore, many of the positions will be skilled roles; as such employees will be in a better position to negotiate working conditions.

Residual Impact

The residual significance ratings for the construction phase of all three ESIAs is *Positive*. The negative impacts are associated with discrepancies in pay and condition leading to dissatisfaction

Table 2.11 Pre- and Post- Mitigation Significance: Employment and Procurement

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Construction	**Minor NEGATIVE**	**Negligible**
Operation	**Positive**	**Positive**

2.6.2 Community Health and Safety

Potential Cumulative Impacts

The construction of the three Projects either at the same time or overlapping could result in changes in community health. Of particular concern are community-worker interactions related to transport workers and the presence of an external construction workforce.

Nature: The presence of a construction workforce and truck drivers has the potential to increase the spread of diseases and contribute to decreased health and safety during construction.

Impact Magnitude – Medium

- **Extent:** It is projected that community health and safety impacts will be significant at the local level.
- **Duration:** The impacts identified are expected to be **short-term** as they will occur throughout the construction period.

Intensity: The intensity will be **medium** since those affected may have long term ill health with restrictions on economic activities etc.
Likelihood – It is **likely** that this impact will occur during the construction phase.

Impact Significance (pre-mitigation) – Moderate.

Degree of Confidence: The degree of confidence is **Medium**.

Mitigation measures

- The three project proponents should develop and implement an HIV/AIDS/malaria policy and information document for all employed workers.

- The three project proponents should develop and implement consistent Worker Codes of Conduct for all project personnel which guides community-worker interactions and forbids illegal activities.

- All Projects should forbid truck drivers stopping at the roadside in Ngeria Junction or other communities in the Project area.

- The Community Relations teams of the projects should work together to ensure consistent messages are shared about project activities, responses to grievances and other activities being undertaken. This will avoid confusion and communities playing the developers off against each other.

Operation Impacts

Impacts are not expected during the operations phase as the size of the workforce and level of procurement will be limited. Furthermore, many of the positions will be skilled roles; as such employees will be in a better position to negotiate working conditions.

Residual Impact

As a result of these measures and due to the predicted size and duration of the construction activities.

Table 2.12 Pre- and Post- Mitigation Significance: Employment and Procurement

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Construction	**Moderate NEGATIVE**	**Minor NEGATIVE**
Operation	**Minor NEGATIVE**	**Minor NEGATIVE**

Cumulative impacts will result should all three Projects be developed. However, these are mainly related to the construction activities of the Projects, notably:

- increased traffic movements,
- the presence of three external construction workforces including transport personnel, and
- the potential for discrepancies in employment and procurement practices.

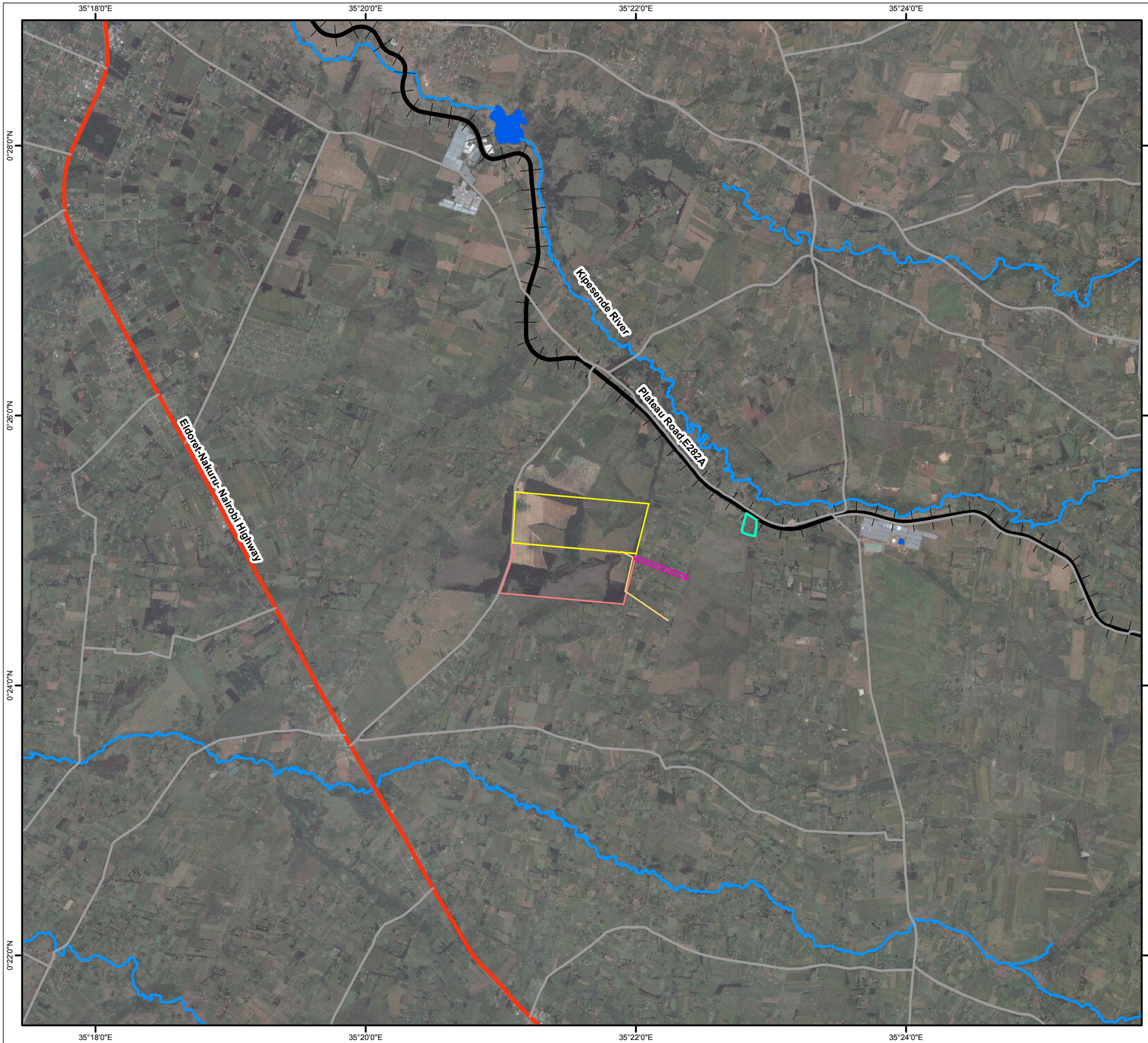
Once operational, the potential for cumulative impact is minimised reflecting the limited number of workers at the site and that vehicles movements will only be required for this workforce and maintenance activities.

The cumulative impacts are also limited due to the existing land uses and ownership and that Kenya Power require that the existing power line is only cut once and only one new sub-station is constructed which will occur within the footprint of the Radiant/Eldosol Project.

There is however a need for the three developers to work together to develop measures related to traffic and transport to avoid congestion and minimise accidents, employment and procurement and their approach to worker-community interactions. This will minimise dissatisfaction with the Projects and reputational risks.

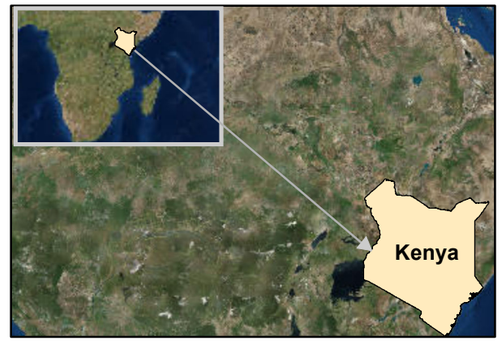
Annex A

Location of the Eldosol, Radiant and Alten Power Plants



Legend

- Power Evacuation Route 1
- Power Evacuation Route 2
- Eldoret-Nakuru-Nairobi Highway
- Road Network
- Railwaytrack
- River
- Radiant Energy
- Eldosol Energy
- Additional Solar Energy Power Plant
- Waterbodies



Scale:

0 0.75 1.5 3

Kilometers

N

TITLE:

Solar Power Plants in the Area

CLIENT:

Eldosol and Radiant Energy Ltd

DATE: July 2015	CHECKED: RC	PROJECT: 0275855
DRAWN: AT	APPROVED: TM	SCALE: 1 : 50,000

DRAWING: Solar Power Plants in the Area

REV: 0

ERM

Fourth Floor, Asyst Park
GN-37/1, Sector-V
Salt Lake City
Kolkata-7000 091, India

Projection: Geographic, Datum: WGS 84
Image Source: ESRI World Imagery

SIZE: A3

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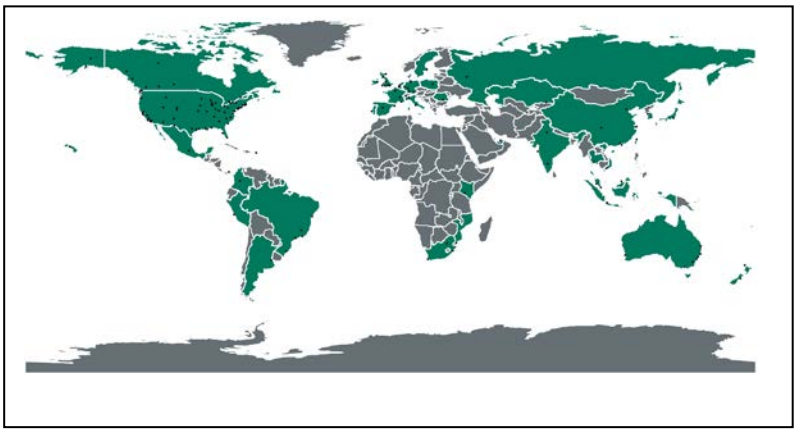

ERM's Nairobi Office
4th Floor, Landmark Office Suites
Laiboni Centre, Lenana Road, Kilimani
PO Box 100798-00101
Nairobi, Kenya
T: +254 20 493 8113/4
M: +254 71 265 0516

ERM's Cape Town Office
2nd Floor Great Westerford
240 Main Road,
Rondebosch, 7700
Cape Town, South Africa
T:+27 (0) 21 681 5400
F:+27 (0) 21 686 0736

ERM's Durban Office
Unit 6, St Helier Office Park,
Cnr St Helier & Forbes Drive
Gillitts, 3610
Durban, South Africa
T:+27 (0) 31 767 2080
F:+27 (0) 31 764 3643

ERM's Johannesburg Office
Building 32, The Woodlands Office Park,
Woodlands Drive,
Woodmead, 2148
Johannesburg, South Africa
T:+27 (0) 11 798 4300
F:+27 (0) 11 804 2289

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