



Republic of Lebanon - Council for Development and Reconstruction

Road and Employment Project (REP)

Environmental and Social Management Plan (ESMP)

LOT 6: Caza of Hermel  
Final  
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## Abbreviations and Acronyms

ATC	Automatic Traffic Counter
CDR	Council for Development and Reconstruction
CoC	Code of Conduct
CoM	Council of Ministers
DLIPS	Department of Labour Inspection, Prevention and Safety
EHS	Environment Health and Safety
ESMP	Environmental and Social Management Plan
EIA	Environmental Impact Assessment
EMoP	Environmental Monitoring Plan
ESMF	Environmental and Social Management Framework
EU	European Union
GBV	Gender Based Violence
GDP	Gross Domestic Product
GOL	Government of Lebanon
GRM	Grievance Redress Mechanism
IFC	International Finance Cooperation
IUCN	International Union for Conservation of Nature and Natural Resources
ILO	International Labour Organization
LULC	Land Use Land Cover Map
MoA	Ministry of Agriculture
MOE	Ministry of Environment
MoIM	Ministry of Interior and Municipalities
MoL	Ministry of Labour
MOPH	Ministry of Public Health
MOPWT	Ministry of Public Works and Transportation
MoSA	Ministry of Social Affairs
NGOs	Non-Governmental Organizations
OP	Operational Plan
OHS	Occupational Health and Safety
PAPs	Project Affected Persons
PAs	Protected Areas
PHS	Public Health and Safety
PIU	Project Implementation Unit
PM	Particulate Matter
REP	Roads and Employment Project
SAP	Safeguards Action Plan
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
UNESCO	United Nations Educational, Scientific and Cultural Organization
WB	World Bank
WBG	World Bank Group
WEF	World Economic Forum
WWTP	Waste Water Treatment Plant

## EXECUTIVE SUMMARY

### Introduction

Lebanon Roads and Employment Project (REP), funded by the World Bank (WB), aims to improve the roads conditions and traffic safety by rehabilitation of road networks in Lebanon, especially in rural lagging regions, and to create job opportunities for displaced Syrians and Lebanese citizens through the labor-intensive works of rehabilitation.

The project works will be executed on the main road network which is under the jurisdiction of the Ministry of Public Works and Transportation (MoPWT). In this context, the Lebanese Council for Development and Reconstruction (CDR) will implement Lebanon REP on behalf of the government/MoPWT.

Considering that the anticipated civil works will result in environmental and social impacts, an Environmental and Social Management Plan (ESMP) shall be prepared under the requirements of OP4.01 that classifies the project as Category B to limit potential implications. Accordingly, TEAM International developed in this report a specific ESMP for Hermel Caza.

The objective of the ESMP is to identify and assess the potential environmental and social impacts of REP and consult relevant stakeholders to prepare a management plan that includes mitigation measures for the expected social and environmental risks and a monitoring plan, as well as to define responsibilities in the operationalization of the ESMP.

### Project Description

The project covers classified roads in 25 Cazas throughout Lebanon with an expected total length of 835 km. Five of the proposed roads fall in Hermel Caza.

This ESMP is specific to five selected roads for rehabilitation in Hermel with a total length of 38.9 km:

**Hermel Road 4 (Hermel R4):** is located in Hermel and consists of two sections or alignments that have a combined length of 5.0 km.

**Hermel Road 6 (Hermel R6):** consists of a single alignment with a total length of 10.0 km. The road passes through Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail.

**Hermel Road 7a (Hermel R7a):** consists of a single alignment with a total length of 13.0 km. The road passes through Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail.

**Hermel Road 8 (Hermel R8):** located in Tall El-Far and consists of a single alignment with a total length of 1.9 km

**Hermel Road 9 (Hermel R9):** consists of two sections or alignments that have a combined length of 9.0 km

Section 1: Qasr – Fissane

Section 2: Fissane

Road upgrading activities are limited to maintenance, minor construction, as well as to traffic management and regulation. In the case of Hermel Caza, rehabilitation activities to be performed

vary between Hermel R4, Hermel R6, Hermel R7a, Hermel R8, and Hermel R9; depending on the current state of each surveyed road. In summary, activities to be performed in Hermel Caza include pavement works (complete reconstruction when needed and milling and overlay for roads that are in better condition); improvement and installation of drainage facilities, construction or rehabilitation of retaining walls, installation or rehabilitation of safety barriers, marking and signage, and fixing of lighting poles. Rehabilitation works will involve 175 workers and require a total of 18 months.

### **Legal Framework**

This ESMP was conducted in accordance with the World Bank safeguards and the Lebanese laws and regulations namely Law No. 444 (2002) about Environmental Protection.

Two World Bank safeguards policies apply to Lebanon Roads and Employment Project: OP 4.01 Environmental Assessment and OP 4.12 Involuntary Resettlement. Given that the planned project will mainly focus on the rehabilitation of roads, the work in these areas will be done under OP 4.01.

OP 4.12 was triggered by this project and a Resettlement Policy Framework' was accordingly prepared and disclosed on the CDR website: <https://www.cdr.gov.lb/CDR/media/CDR/StudiesandReports/Roads%20and%20Employment/RPF.pdf>. However, in the case of Hermel, the design of roads under study did not implicate land acquisition since no involuntary resettlement or land acquisition will take place. In other words, the project will be implemented primarily within the existing "right of way" there will be no displaced persons by the project activities (this includes local and Syrian refugees).

### **Consultation**

Consulting with the main stakeholders and ensuring they agree on sensitive issues improves the chances that the project will not be subject to last-minute dispute.

This ESMP was publicly consulted where a public participation meeting was arranged for Hermel Caza. The public meeting was held at the Union of Hermel Municipalities on Thursday February 27.

The number of attendees was 16 of which 2 were women. During the meeting, attendees were informed about the project objectives, the identified natural, economic, and social resources of importance in the area, the project's possible environmental and social risks, the planned mitigation measures and Grievance Redress Mechanism (GRM).

First, local authorities were not satisfied about the selection of roads within the scope of REP. According to them, there are roads that are in greater need for rehabilitation. They asked about the selection process as they were not consulted at the beginning of the project. In this context, the consultant explained that the Government prioritized roads in Hermel Caza based on municipalities' official requests beside several technical criteria.

The second main concern was the coordination with relevant authorities, especially with respect to public works (i.e. wastewater and water infrastructure, etc.). The head of municipalities were worried whether there would be coordination among ministries and infrastructural institutions

before the project implementation to avoid re-excavations of roads and further disturbances and pressures. In this context, the public was informed that CDR will ensure that a full coordination among municipalities and authorities prior to project execution.

Further, technical concerns were revealed during the meeting including whether the scope of work encompasses installing new drainage systems when needed and rehabilitating existing wastewater channels that are in bad conditions. In this context, the consultant explained that, when needed, proper drainage systems will be installed, however, wastewater channels are not included in the project scope.

Finally, only two women were present at the meeting and they shared the same concerns as the rest of attendees (road selection, coordination between relevant authorities, and works included within the project's scope). As for NGOs Consultation, this ESMP has targeted them according to their position in Lebanon. They consist of two levels as follows: (1) Local: they are specific to each Caza. Their mission is to address different concerns and issues among the local society including social, economic, gender equality, environment, poverty, women empowerment, etc. and (2) International: They are covering the whole country and their consultation will be applied to all the ESMPs of the REP. When the crisis in Syria erupted in early 2011, numerous International NGOs responded to the humanitarian crisis and worked directly with the Syrian in Lebanon by providing aid and responding to their critical situation.

The local NGOs that were invited are Kafa, Himaya, and Lost, all of which cover the Hermel area. As for international NGOs, ACTED, ANERA, and DRC were invited. Out of all invited NGOs, Lost attended the meeting and suggested to offer guidelines and training for workers once project implementation begins. The consultant suggested that they communicate with CDR in this respect.

### **Baseline Assessment**

The environmental and social assessment recorded the existing conditions within the project area including physical, biological, and socioeconomic conditions prior the project implementation and operation. Baseline data and field surveys were conducted to describe the status of the following environmental receptors: air quality, water quality, soil quality, geological conditions, climate and meteorology, natural habitats and biodiversity, land-use/land-cover, acoustic environment, cultural resources, and socio-economic conditions (employment opportunities, labor influx, social tensions, labor induced Sexual Exploitation and Abuse (SEA) Sexual Harassment (SH), occupational health and safety).

The geology of the studied roads was investigated for outcropping formations, subsurface stratigraphy, structure (faults, folds, seismic, etc.), hydrogeology (groundwater and sea water intrusions) and hydrology (surface water). Assessments showed that all Hermel roads are considered highly sensitive in terms of surface and groundwater vulnerability. In terms of the subsurface, the roads are situated on karstified formations that allow the infiltration of any liquid spilled on the surface due to their high permeability characteristics. This can lead to increased likelihood of groundwater contamination. In terms of surface water quality, the roads cross or are in close proximity to Al Assi Perennial River and other secondary rivers (El Sharbine and El Fissane).

Air quality is also an essential component in assessing social wellbeing and health status of a community. The study relied on UNDP/MoE project "Air quality assessment in an East

Mediterranean country: the case of Lebanon” and showed that the levels of CO, SO<sub>2</sub>, O<sub>3</sub>, NO<sub>2</sub>, and PM<sub>10</sub> are within the national limit values (Decision 52/1 dated 1996) confirming that the studied areas for the five roads do not include major air polluting activities.

Regarding natural habitats and biodiversity, given the nature of the project, the direct influence area concerns existing roads. Consequently, a rapid biological assessment has been carried out to draw the ecological profile of the adjacent areas to the concerned roads. The field investigation did not aim for an exhaustive inventory of the biodiversity of the project area but a general overview of present species (mainly flora) and habitats. The assessment showed that the studied roads are mainly bordered by grasslands and degraded grasslands, woodlot (riparian formations along the river), agricultural, artificial and unproductive (unproductive soils) areas. In this context, the area does not provide an important habitat for a large variety of flora and fauna (i.e. the studied area is impacted by human activities).

Despite the importance of Semi-arid Mediterranean grasslands, these systems are generally degraded due to land use changes. In other words, land-use intensification due to grazing and cropland conversion have certainly affected grassland productivity in the area. Finally, rivers and groundwater that support the delivery of crucial ecosystem services need special attention during the rehabilitation phase. Segments of ecological significance consist of woodlots (namely for Hermel R9) and riparian habitats when roads encounter winter drainage channels (all Hermel roads) and intersect with rivers (El Assi River and Hermel R4 section 1 intersect, Hermel R7a intersects with Sharbin River and Hermel R9 crosses Wadi El Fissane).

Finally, a socio-economic assessment was conducted in the project area to map the demographic, social, and economic baseline conditions at the level of Hermel Caza. A set of social indicators were investigated including Hermel’s demographic profile (age and gender distribution), employment and livelihood, the availability of public and private education and health institutions, the global level of education (educational attainment) and standards of public health, access to public utility and community services, land use patterns, archeology and cultural heritage, and impacts of the Syrian crisis. The assessment allowed drawing conclusions regarding the project’s potential impacts on the socioeconomic conditions of the study area. In specific, Hermel R4 section 2 and some segments of Hermel R4 section 1 and R7a are surrounded by residential agglomerations, commercial areas and other nearby sensitive receptors (such as school) at a distance of 10 m. Further, Hermel R6, R8 and some segments of Hermel R4 section 1, R7a and R9 section 1 are surrounded by agricultural areas and fallow lands. Finally, Hermel R9 (sections 1 and 2) is bordered by wooded lands and grasslands.

### **Impacts Evaluation**

The purpose of this section is to identify and quantify all potential impacts, both adverse and beneficial, of the project on the existing environment during both rehabilitation and operational phases. The assessment studied the impacts of the proposed project on air quality, water quality, soil quality, acoustic environment, visual intrusion, land-use/land- cover and socio-economic impacts.

Regarding the operation phase, the assessment entails the “**Defects Liability Period**” during which the Contractor is responsible for maintenance activities.

Given that the project aims to upgrade existing roads, the environmental impacts are expected to include dust raised during rehabilitation, increase in noise pollution derived from rehabilitation

machinery, degradation of water quality, disruption to traffic movement, potential damage to existing utilities, and disturbance of local biodiversity. During the rehabilitation phase, impacts on air and water quality have been evaluated as direct and irreversible. The rehabilitation phase requires the use of many heavy machinery and equipment which are usually associated with impacts on air quality. Dust and odor emissions are expected to be high during this phase. Moreover, potential impacts on water quality from rehabilitation activities are aligned with accidental spillages and contaminated storm water runoff.

Finally, in addition to the expected temporary disturbance of the natural ecosystems (noise pollution and potential soil and water contamination), direct destruction of vegetation and population might occur if waste (excavated materials) was discharged directly into the roadside shrub-lands and riparian ecosystems. However, given that the concerned roads generally involve paths that are already under anthropogenic influences, the potential impacts of the project on the local biodiversity are expected to be limited due to potential illegal dumping and discharge of wastes into streams and rivers (if the contractor did not follow the set waste management plan by this ESMP), and dust accumulation on nearby vegetation and agricultural lands (involves all Hermel roads).

Potential social risks related to the project include (1) labor influx (in case the contractor doesn't recruit labor from the surrounding community) and potential risk of labor induced SH towards female workers and SEA towards women in the surrounding community; (2) Potential risk of child labor; (3) Poor labor conditions; (4) Social tensions and dissatisfaction with job allocation; (5) Risk of under-participation or underemployment of women; (6) Nuisance and traffic disturbance; and (7) Temporary obstruction of access routes to sensitive receptors which is expected to be high specifically for Hermel R4 section 2 and some segments of Hermel R4 section 1 and R7a that are mostly surrounded by residential agglomerations, commercial areas and other nearby sensitive receptors at a distance of 10 m.

Whereas, the potential positive impacts of the project are to create direct and indirect short-term jobs for Lebanese and Syrians living in the surrounding community and enhance the economic development and livelihood opportunities.

In addition, the project may positively impact the commercial shops mainly surrounding Hermel R4 S1 (between stations 1+900 – 4+600) and Hermel R4 S2 by the rehabilitation activities as workers will buy goods from local shops. However, it is to be noted that this a temporary potential positive impact during rehabilitation works and not all shops may necessarily benefit from this. It is important to mention, the community surrounding the roads will not experience economic displacement, for instance, loss of assets or loss of income sources or means of livelihood.

Once roads are rehabilitated, the project is expected to improve drainage systems (less runoff water), road safety conditions, reduce traffic congestion, and ultimately enhance livelihood opportunities. On the other hand, the main expected environmental impacts on water and soil could result in from maintenance activities (if needed) during the “**Defects Liability Period**” (during which the Contractor is responsible for maintenance activities), if activities were not managed properly.

### **Development of the ESMP**



A proper management plan was provided for specific concerns regarding the roads in Hermel, as shown in the conducted environmental and social assessment. The plan includes measures and equipment to control exhaust emissions, dust and odor emissions, and soil manipulation activities during the rehabilitation phase. Moreover, proper measures and guidelines on the control of accidental spills of construction material were provided to prevent soil contamination. Any accidental spillage of wastewater onto open ground can easily infiltrate the karstic limestone and is highly likely to pollute water present in the subsurface. Moreover, any discharge of wastewater into the winter channels will mainly lead to adverse impacts to the “Assi River”.

Regarding biodiversity, recommendations are provided to guide the project contractor in reducing the negative impacts on natural habitats and biodiversity. Mitigation actions suggested in this ESMP include recommendations regarding rehabilitation work and solid waste management in order to avoid degrading the sites or disturbing the local fauna. Although the concerned roads are mainly under anthropogenic influences, contractors must be careful during the rehabilitation work so that the direct impacts (direct destruction) on ecosystems and associated fauna would be minimal. Waste management plan must be adopted to avoid soil and water contamination that could have irreversible impacts on biodiversity. In other words, waste and rehabilitation wastes should not be dumped into the natural habitat (e.g. streams and water channels encountered in Hermel Caza along the studied roads).

The social risks of this project can be mitigated through periodic monitoring of labor conditions, specific required clauses within contracts that aim to protect workers, and the Code of Conduct (CoC) for Gender Based Violence (GBV) issues. This ESMP guides the contractor (1) to preferably hire local workers, (2) not to hire individuals below the legal working age in accordance with the labor law of Lebanon, and (3) to ensure proper compliance and implementation of the CoC. Similarly, close coordination with the affected municipalities and schools is recommended in relation to road obstruction issues. In addition, a robust GRM must be clearly communicated to all project-affected persons before and during project implementation.

As for the diversions and detours, exact locations and distances of detours will be set by the site engineer, later during the rehabilitation phase. Accordingly, general precautionary measures are recommended to be considered when selecting the detour. It is important to note that the project will not use or rent land for the purpose of diversions.

Further, the ESMP generated key project indicators to monitor project implementation success. It is designed to guarantee effectiveness in the measurement of major project outcomes and outputs based on measurable indicators. The risk of environmental and social impacts can be monitored (e.g. monitoring of solid waste disposal and wastewater discharge, monitoring of underage labor, and monitoring of worker behaviors during the rehabilitation work.). Project monitoring will be undertaken by the implementing agency (CDR) to ensure the project is being implemented in line with the proposed objectives and is on track to achieve expected results. Project progress reports will be prepared by CDR and submitted to the WB for review.

Finally, a multi-layer GRM was established for the concerned roads in Hermel Caza. GRM will ensure that any complaint is identified and handled properly and within specified timeline.

## **Conclusion**

Assessments showed that the proposed project has potential implications, both adverse and beneficial, on the concerned environmental and social issues. In this context, the contractor shall be committed to putting in place several measures to mitigate the negative environmental, safety, health, and social impacts associated with the development cycle of the project, adhering to WB social and environmental standards and policies.

## ملخص تنفيذي

### مقدمة

يهدف مشروع الطرق والعمالة في لبنان الممول من البنك الدولي إلى تحسين أحوال الطرق والسلامة المرورية من خلال إعادة تأهيل شبكة الطرق في لبنان، وخاصة في المناطق الريفية النائية، كما ويهدف إلى خلق فرص عمل للمواطنين اللبنانيين والنازحين السوريين من خلال مشاركة العمالة في أعمال إعادة التأهيل.

سيتم تنفيذ أعمال المشروع ضمن شبكة الطرق الرئيسية الخاضعة لسلطة وزارة الأشغال العامة والنقل. في هذا السياق، سينفذ مجلس الإنماء والإعمار المشروع بالنيابة عن الحكومة / وزارة الأشغال العام والنقل.

تجدر الإشارة إلى أن الأعمال المتوقعة قد تؤدي إلى آثار بيئية واجتماعية سلبية مرافقة لأعمال التنفيذ، وعليه يجب إعداد خطة إدارة بيئية واجتماعية وفقاً لمتطلبات سياسة العمليات في البنك الدولي رقم (OP4.01)، والتي تصنف المشروع على أنه الفئة B وذلك من أجل الحد من التداعيات الممكن حدوثها وتخفيف الآثار السلبية وتطوير الآثار الإيجابية. وبناءً على ذلك، طورت شركة TEAM International في هذا التقرير خطة إدارة بيئية واجتماعية مخصصة لتأهيل الطرقات ضمن قضاء الهرمل.

إن الهدف من خطة الإدارة البيئية والاجتماعية هو تحديد وتقييم التأثيرات البيئية والاجتماعية المحتملة للمشروع والتباحث مع الأطراف المعنية لإعداد خطة إدارة تتضمن تدابير وسبل التخفيف من المخاطر الاجتماعية والبيئية المتوقعة، كما وتطوير خطة رصد ومراقبة، بالإضافة إلى تحديد المسؤوليات في تفعيل خطة الإدارة البيئية والاجتماعية.

### وصف المشروع

يشمل المشروع الطرق المصنفة في ٢٥ قضاء في جميع أنحاء لبنان بطول إجمالي يصل إلى حوالي ٨٣٥ كم تقريباً، بحيث يوجد طريقتين مقترحة في قضاء الهرمل.

تم تطوير خطة الإدارة البيئية والاجتماعية مخصصة لأعمال التأهيل ضمن هذه الطريق في قضاء الهرمل بطول إجمالي يصل إلى حوالي ٣٨,٩ كم تقريباً، مقسمة على الشكل التالي:

- طريق الهرمل المسمى (R4): يوجد في منطقة الهرمل ويتكون من قسمين ويمتد بطول إجمالي يبلغ ٥ كم.
- طريق الهرمل المسمى (R6): يمتد الطريق من قسم واحد بطول إجمالي يبلغ 10 كم، بحيث يمر عبر الهرمل والشواغير ومزرعة بيت التثيم وحوش بيت إسماعيل.
- طريق الهرمل المسمى (R7a): يمتد الطريق من قسم واحد بطول إجمالي يبلغ ١٣ كم، بحيث يمر عبر الهرمل والمنصورية وبوداي وناصرية وحوش بيت إسماعيل.
- طريق الهرمل المسمى (R8): يوجد في منطقة الفار ويتكون من قسم واحد ويمتد بطول إجمالي يبلغ ١,٩ كم.
- طريق الهرمل المسمى (R9): يتكون الطريق من قسمين ويمتد بطول إجمالي يبلغ ٩ كم، وهو عبارة عن الأقسام التالية:
  - القسم الأول يمر في القصر والفيسان.
  - القسم الثاني يوجد ضمن الفيسان.

تقتصر أنشطة تطوير الطرق على الصيانة والإنشاءات الصغيرة وكذلك إدارة وتنظيم حركة المرور. في حالة قضاء الهرمل تتنوع نشاطات إعادة التأهيل بين طرقات الهرمل R4 والهرمل R6 والهرمل R7a والهرمل R8 والهرمل R9 على الوضع الحالي لكل طريق تم مسحه. باختصار ، الأنشطة التي يتعين القيام بها في قضاء الهرمل تشمل أعمال الرصف (إعادة بناء كاملة عند الحاجة وطحن وتراكب للطرق في حالة أفضل) ؛ تحسين وتركيب مرافق الصرف الصحي ، وبناء أو إعادة تأهيل الجدران الاستنادية ، وتركيب أو إعادة تأهيل حواجز الأمان ، ووضع العلامات واللافتات ، وتثبيت أعمدة الإنارة. ستشمل أعمال إعادة التأهيل ١٧٥ عاملاً وتتطلب ١٨ شهراً.

### الإطار القانوني

تم إجراء خطة الإدارة البيئية والاجتماعية هذه وفقاً لإجراءات وسياسات البنك الدولي والقوانين واللوائح اللبنانية وهي القانون رقم ٤٤٤ (٢٠٠٢) بشأن حماية البيئة.

تتطبق ثلاث سياسات وقائية للبنك الدولي على مشروع الطرق والتوظيف في لبنان وهي التالية:

- (١) OP 4.01 التقييم البيئي
- (٢) OP 4.11 الموارد الثقافية المادية
- (٣) OP 4.12 إعادة التوطين غير الطوعي.

تم تفعيل OP 4.12 بواسطة هذا المشروع وتم إعداد إطار سياسة إعادة التوطين وفقاً لذلك وتم الكشف عنه على موقع مجلس الإنماء والإعمار:

20Employment/RP/20and/https://www.cdr.gov.lb/CDR/media/CDR/StudiesandReports/Roads.F.pdf

ومع ذلك ، فإنه في حالة هرمل ، فإن تصميم الطرق قيد الدراسة لا ينطوي على الاستحواذ على الأراضي ولن تتم إعادة توطين قسري أو حيازة أرض. بمعنى آخر، سيتم تنفيذ المشروع في المقام الأول ضمن "حق المرور" الحالي ولن يكون هناك أي نزاحين بسبب أنشطة المشروع (وهذا يشمل اللاجئين المحليين والسوريين).

### اجتماعات المشاركة العامة

إن الهدف الرئيسي للتشاور مع أصحاب العلاقة المعنيين هو التأكد من مدى موافقتهم على القضايا الحساسة لأجل تحسين فرص عدم تعرض للمشروع وخلق نزاعات تؤدي لتوقفة و/أو إلغائه.

تمت مشاركة خطة الإدارة البيئية والاجتماعية هذه علناً بحيث تم ترتيب اجتماع للمشاركة العامة في قضاء الهرمل. وعقد اجتماع المشاركة العامة في بلدية هرمل يوم الخميس ٢٧ شباط ٢٠٢٠ وبلغ عدد الحاضرين ١٦ من بينهم ٢ نساء. خلال الاجتماع تم إبلاغ الحضور بأهداف المشروع ، والموارد الطبيعية والاقتصادية والاجتماعية المحددة ذات الأهمية في المنطقة ، والمخاطر البيئية والاجتماعية المحتملة للمشروع ، وتدابير التخفيف المخطط لها وآلية معالجة المظالم (GRM).

أولاً ، لم تكن السلطات المحلية راضية عن اختيار الطرق ضمن نطاق REP. وبحسب رأيهم ، هناك طرق بحاجة أكبر إلى إعادة التأهيل. سألوا عن عملية الاختيار حيث لم يتم استشارتهم في بداية المشروع. وفي هذا السياق أوضح الإستشاري إلى أن الحكومة أعطت الأولوية للطرق في قضاء الهرمل بناء على طلبات البلديات الرسمية إلى جانب عدة معايير فنية.

إما الموضوع الرئيسي الثاني فهو التنسيق مع السلطات ذات الصلة ، لا سيما فيما يتعلق بالأشغال العامة (مثل البنية التحتية للمياه العادمة والمياه ، إلخ). أعرب رئيس البلديات عن قلقه من وجود تنسيق بين الوزارات ومؤسسات العامة قبل تنفيذ المشروع لتجنب إعادة حفر الطرق والمزيد من الاضطرابات والضغوط. في هذا السياق ، تم إبلاغ الجمهور بأن مجلس الإنماء والإعمار سيضمن التنسيق الكامل بين البلديات والسلطات قبل تنفيذ المشروع.

كما وتم الكشف عن المخاوف الفنية خلال الاجتماع بما في ذلك ما إذا كان نطاق العمل الذي يشمل تركيب أنظمة صرف جديدة عند الحاجة وإعادة تأهيل قنوات الصرف الصحي الحالية التي هي في ظروف سيئة. وفي هذا السياق ، أوضح المستشار أنه سيتم عند الحاجة تركيب أنظمة صرف مناسبة ، والبرغم من أن قنوات الصرف الصحي ليست مدرجة في نطاق المشروع.

أخيراً ، كانت امرأتان فقط حاضرتان في الاجتماع وتقاسمتا نفس الاهتمامات مع بقية الحاضرين (اختيار الطريق ، والتنسيق بين السلطات ذات الصلة ، والأعمال المدرجة في نطاق المشروع). أما بالنسبة لاستشارات المنظمات غير الحكومية ، فقد استهدفتهم خطة الإدارة البيئية والاجتماعية بحسب موقعهم في لبنان. وهي تتكون من مستويين على النحو التالي:

- (١) محلي: خاص بكل قضاء. مهمتهم هي معالجة الاهتمامات والقضايا المختلفة بين المجتمع المحلي بما في ذلك الاجتماعية ، والاقتصادية ، والمساواة بين الجنسين ، والبيئة ، والفقر ، وتمكين المرأة ، وما إلى ذلك.
- (٢) دولي: يغطي لبنان بأكمله وسيتم تطبيق استشاراتهم على جميع خطط الإدارة البيئية والاجتماعية الخاصة بالتقرير. عندما اندلعت الأزمة في سوريا في أوائل عام ٢٠١١ ، استجابت العديد من المنظمات غير الحكومية الدولية للأزمة الإنسانية وعملت مباشرة مع السوريين في لبنان من خلال تقديم المساعدة والاستجابة لحالتهم الحرجة.

تشمل المنظمات غير الحكومية المحلية التي تمت دعوتها هي "كفى" و "حماية" و "لوس" ، وجميعها تغطي منطقة الهرمل. أما بالنسبة للمنظمات غير الحكومية الدولية ، فقد تمت دعوة ACTED و ANERA و DRC. من بين جميع المنظمات غير الحكومية المدعوة ، حضر Lost الاجتماع واقترح تقديم إرشادات وتدريب للعمال بمجرد بدء تنفيذ المشروع. واقترح المستشار أن يتواصلوا مع مجلس الإنماء والإعمار في هذا الصدد.

## وصف البيئة المحيطة بالمشروع

تمت دراسة البيئة الفيزيائية والكيميائية والبيولوجية والاجتماعية والاقتصادية ضمن منطقة المشروع في الوضع الحالي وقبل تنفيذ المشروع. إذ قام فريق العمل بجمع البيانات الأساسية وإجراء المسح الميداني للعناصر البيئية التالية: جودة الهواء وجودة المياه وجودة التربة والظروف الجيولوجية ووضع المناخ والأرصاء الجوية والموائل الطبيعية والتنوع البيولوجي واستخدام الأراضي / الغطاء الأرضي ونسبة الضوضاء والموارد الثقافية والظروف الاجتماعية الاقتصادية (فرص العمل وتوفير اليد العاملة والمشاكل الاجتماعية والاستغلال و/أو الانتهاك الجنسيين الناجمين عن العمل والتحرش الجنسي والصحة والسلامة المهنية).

أظهرت الدراسة أن الوضع الجيولوجي ضمن الطرق المقترحة لناحية الطبقات الصخرية المتكشفة والطبقات الجوفية والتكوينات التكتونية (فوالق ، طيات ، الوضع الزلزالي ، إلخ) ، الهيدروجيولوجيا (المياه الجوفية ومياه البحر) والهيدرولوجيا (المياه السطحية والأنهر). أظهرت التقييمات أن جميع طرق الهرمل تعتبر شديدة الحساسية من حيث التعرض للمياه السطحية والجوفية. من حيث السطح تحت السطحي ، تقع الطرق على تكوينات كارسيتية تسمح بتسرب أي سائل متسرب على السطح بسبب خصائصها عالية النفاذية. هذا يمكن أن يؤدي إلى زيادة احتمالية تلوث المياه الجوفية من حيث جودة المياه السطحية ، وتتقاطع الطرق أو تقع بالقرب من نهر العاصي والأنهار الثانوية الأخرى (الشربين والفيسان).

تعد جودة الهواء أيضاً عنصراً أساسياً في تقييم الرفاهية الاجتماعية والحالة الصحية للمجتمع. وقد اعتمدت الدراسة على مشروع برنامج الأمم المتحدة الإنمائي / وزارة البيئة "تقييم جودة الهواء في بلد شرق البحر الأبيض المتوسط: حالة لبنان" وأظهرت أن مستويات ثاني أكسيد الكربون وثاني أكسيد الكبريت وثاني أكسيد الكبريت وأكسيد النيتروجين وأكسيد النيتروجين و PM10 تقع ضمن قيم الحدود الوطنية (القرار ١/٥٢ بتاريخ ١٩٩٦ م) مؤكداً أن المناطق المدروسة للطرق الأربعة لا تحتوي على أنشطة ملوثة للهواء.

فيما يتعلق بالموائل الطبيعية والتنوع البيولوجي، ونظراً لطبيعة المشروع، فإن منطقة التأثير المباشر تتعلق بالطرق الحالية. وبالتالي ، تم إجراء تقييم بيولوجي سريع لرسم الصورة البيئية للمناطق المجاورة للطرق المعنية لتقييم الموائل والأنواع المعرضة لخطر إضافي من المشروع المقترح. لم يهدف البحث الميداني إلى إجراء جرد شامل للتنوع البيولوجي لمنطقة المشروع ولكن يهدف إلى نظرة عامة على الأنواع الحالية (النباتات بشكل أساسي) والموائل. وتبين بأن طرق الهرمل تشمل على مسار خاضع بالفعل لتأثيرات بشرية، إذ يحد الطريق أساساً المستوطنات البشرية والمدرجات الزراعية والأراضي البور والأراضي العشبية المتدهورة.

على الرغم من أهمية الأراضي العشبية في البحر الأبيض المتوسط شبه القاحلة ، فإن هذه الأنظمة تتدهور بشكل عام بسبب التغييرات في استخدام الأراضي. وبعبارة أخرى ، فإن تكتيف استخدام الأراضي بسبب الرعي وتحويل الأراضي الزراعية قد أثر بالتأكيد على إنتاجية الأراضي العشبية في المنطقة. أخيراً ، تحتاج الأنهار والمياه الجوفية التي تدعم تقديم خدمات النظم البيئية الحيوية إلى اهتمام خاص أثناء مرحلة إعادة التأهيل. الأجزاء ذات الأهمية البيئية تتكون من مناطق مشجرة (خاصة بالهرمل R9) و موائل على ضفاف النهر عندما تواجه الطرق قنوات تصريف شتوية (جميع طرق الهرمل) وتتقاطع مع الأنهار (يتقاطع نهر العاصي مع الهرمل قسم ١ ، ويتقاطع الهرمل R7a مع نهر شربين والهرمل R9 يعبر وادي الفسان).

أخيراً ، تم إجراء تقييم اجتماعي اقتصادي في منطقة المشروع لرسم خريطة للظروف الأساسية الديموغرافية والاجتماعية والاقتصادية على مستوى قضاء الهرمل. وتم التحقيق في مجموعة من المؤشرات الاجتماعية بما في ذلك التوظيف وسبل العيش في الهرمل وتوافر مؤسسات التعليم والصحة العامة والخاصة والوصول إلى المرافق العامة والخدمات المجتمعية وأنماط استخدام الأراضي وتأثيرات الأزمة السورية.

سمح التقييم باستخلاص النتائج فيما يتعلق بالتأثيرات المحتملة للمشروع على الظروف الاجتماعية والاقتصادية لمنطقة الدراسة. بشكل خاص ، الهرمل R4 القسم ٢ وبعض قطاعات الهرمل R4 قسم ١ و R7a محاطة بتجمعات سكنية ومناطق تجارية ومستقبلات حساسة أخرى قريبة (مثل المدرسة) على مسافة ١٠ أمتار. علاوة على ذلك ، فإن الهرمل R6 و R8 وبعض

قطاعات الهرمل R4 قسم ١ و R7a و R9 محاطة بمناطق زراعية وأراضي بور. وأخيراً ، فإن الهرمل R9 (القسمان ١ و ٢) تحدها الأراضي الحرجية والمراعي.

### وصف الآثار المحتملة للمشروع

إن الهدف من هذا القسم هو تحديد وتقدير جميع الآثار المحتملة، السلبية والإيجابية للمشروع على الوضع البيئي خلال مرحلتي إعادة التأهيل والتشغيل. ولذلك تم دراسة تقييم آثار المشروع المقترح على جودة الهواء وجودة المياه وجودة التربة وجودة الهواء ونسبة الضوضاء والتلوث النظري واستخدام الأراضي / الغطاء الأرضي والآثار الاجتماعية والاقتصادية.

فيما يتعلق بمرحلة التشغيل ، يستلزم التقييم "فترة الضمان" التي يتحمل خلالها المقاول مسؤولية أنشطة الصيانة.

كون المشروع يهدف بشكل أساسي إلى تحديث الطرق القائمة، فمن المتوقع أن تشمل الآثار البيئية الغبار الناتج أثناء أعمال إعادة التأهيل وزيادة التلوث الضوضائي الناتج عن آلات البناء وتدهور جودة المياه وتعطيل حركة المرور والحركة السياحية والأضرار المحتملة للمرافق القائمة واضطراب التنوع البيولوجي.

وعليه فإنه تم تقييم الآثار خلال مرحلة إعادة التأهيل على جودة الهواء والمياه على أنها مباشرة ولا رجعة فيها. تتطلب مرحلة إعادة التأهيل استخدام العديد من الآلات والمعدات الثقيلة التي ترتبط عادةً بالتأثيرات على جودة الهواء. من المتوقع أن تكون انبعاثات الغبار والروائح عالية خلال هذه المرحلة. أما الآثار المحتملة على جودة المياه من أنشطة إعادة التأهيل فهي مرتبطة بحدوث تسرب ملوثات عرضية وعند جريان المياه السطحية.

أخيراً ، بالإضافة إلى الاضطراب المؤقت المتوقع للنظم البيئية الطبيعية (التلوث الضوضائي والتلوث المحتمل للتربة والمياه) ، قد يحدث تدمير مباشر للنباتات والسكان إذا تم تصريف النفايات (المواد المحفورة) مباشرة في أراضي الجنبات على جانب الطريق والنظم الإيكولوجية النهرية . ومع ذلك ، نظرًا لأن الطرق المعنية تشتمل عمومًا على مسارات تخضع بالفعل لتأثيرات بشرية ، فمن المتوقع أن تكون الآثار المحتملة للمشروع على التنوع البيولوجي المحلي محدودة بسبب الإغراق غير القانوني المحتمل وتصريف النفايات في الجداول والأنهار (إذا قام المقاول بذلك. عدم اتباع خطة إدارة النفايات المحددة في خطة الإدارة البيئية والاجتماعية هذه) ، وتراكم الغبار على الغطاء النباتي والأراضي الزراعية المجاورة (يشمل جميع طرق الهرمل).

تشمل المخاطر الاجتماعية المحتملة المتعلقة بالمشروع:

(١) تدفق اليد العاملة (في حالة عدم توظيف المقاول للعمالة من المجتمع المحيط بها) والمخاطر المحتملة تجاه العاملات من النساء في المجتمع المحيط (بسبب قرب السكان والمدارس من الطرق المراد إصلاحها) ؛ (٢) الخطر المحتمل لعمل الأطفال ؛ (٣) ظروف العمل السيئة ؛ (٤) عدم الرضا عن تخصيص الوظائف ؛ (٥) خطر نقص مشاركة المرأة أو قلة تقدير دور النساء ؛ (٦) الإزعاج بشكل عام واضطراب المرور ، (٧) عرقلة مؤقتة لطرق الوصول إلى المستقبلات الحساسة والتي من المتوقع أن تكون عالية بشكل خاص لقسم الهرمل R4 قسم ٢ وبعض أجزاء الهرمل R4 قسم ١ و R7a التي تحيط بها في الغالب تجمعات سكنية ومناطق تجارية ومستقبلات حساسة أخرى قريبة في مسافة ١٠ م.

أما من الناحية الإيجابية فإنه من المتوقع أن تتمثل في خلق وظائف قصيرة الأجل مباشرة وغير مباشرة للبنانيين والسوريين الذين يعيشون في المجتمع المحيط وتعزيز التنمية الاقتصادية وفرص كسب العيش. بالإضافة إلى ذلك ، قد يؤثر المشروع بشكل إيجابي على المحلات التجارية المحيطة بالهرمل R4 S1 (بين المحطات ١ + ٤٩٠٠ + ٦٠٠) والهرمل R4 S2 من خلال أنشطة إعادة التأهيل حيث سيشتري العمال البضائع من المتاجر المحلية. ومع ذلك ، تجدر الإشارة إلى أن هذا له أثر إيجابي مؤقت محتمل أثناء أعمال إعادة التأهيل وليس بالضرورة أن تستفيد كل المحلات من ذلك.

من المهم الإشارة إلى أن المجتمع المحيط بالطرق لن يعاني من أزمة اقتصادية ، على سبيل المثال ، فقدان الأصول أو فقدان مصادر الدخل أو وسائل الاحتمال.

بمجرد إتمام أعمال التأهيل، فإنه من المتوقع أن يؤدي المشروع إلى تحسين ظروف السلامة على الطرق والحد من حوادث المرور وازدحام المرور وفي نهاية المطاف تعزيز فرص كسب العيش. من ناحية أخرى ، يمكن أن تنتج الآثار البيئية المتوقعة الرئيسية على المياه والتربة من أنشطة الصيانة خلال "فترة الضمان" التي يتحمل خلالها المقاول مسؤولية أنشطة الصيانة إذا لم تتم إدارتها بشكل صحيح.

## خطة الإدارة البيئية

تعتبر خطة الإدارة البيئية والاجتماعية ضرورية لضمان الحفاظ على التأثيرات المحددة ضمن المستويات المسموح بها وتخفيف الآثار السلبية غير المتوقعة في مرحلة مبكرة وتحقيق فوائد المشروع المتوقعة. وبالتالي فإنه من أجل التخفيف من الآثار السلبية و/أو المخاطر المحددة، فقد تم إعداد خطة الإدارة البيئية والاجتماعية لطرق قضاء الهرمل قبل البدء بالشروع في أي أعمال مدانية. إن الهدف من خطة الإدارة البيئية والاجتماعية هو المساعدة في التعرف السريع على المشكلات وتشجيع الإجراءات الفعالة لتصحيحها وتحقيق الهدف من تطبيق الخطة البيئية والاجتماعية في نهاية المطاف. إن الفهم السليم للأولويات والسياسات البيئية وإدارة المشروع بشكل صحيح وتحديد المتطلبات التنظيمية وتحديث المعلومات المتعلقة بفترة التشغيل هي أمور أساسية لضمان الأداء البيئي الفعال والمرضي.

قد تم توفير خطة إدارة مناسبة لمتطلبات محددة ضمن مشروع طرق الهرمل الموضحة في التقييم البيئي والاجتماعي الذي تم إجراؤه. تتضمن الخطة تدابير ومعدات للتحكم في انبعاثات العوادم وانبعاثات الغبار والروائح وأنشطة معالجة التربة خلال مرحلة إعادة التأهيل. علاوة على ذلك، تم توفير التدابير والمبادئ التوجيهية المناسبة بشأن التحكم في التسرب العرضي لمواد البناء لمنع تلوث التربة. يمكن لأي تسرب عرضي لمياه الصرف الصحي على أرض مفتوحة أن يتسبب بسهولة إلى التكوين الكارستي ومن المرجح بشدة أن يلوث المياه الموجودة في باطن الأرض. علاوة على ذلك، فإن أي تصريف للمياه العادمة في القنوات الشتوية سيؤدي بشكل أساسي إلى آثار سلبية على "نهر العاصي".

فيما يتعلق بالتنوع البيولوجي، تم تقديم توصيات لتوجيه مقاول المشروع في الحد من الآثار السلبية على الموائل الطبيعية والتنوع البيولوجي. تتضمن إجراءات التخفيف المقترحة في خطة الإدارة البيئية والاجتماعية توصيات بشأن أعمال إعادة التأهيل وإدارة النفايات الصلبة من أجل تجنب تدهور المواقع أو إزعاج الحيوانات المحلية. على الرغم من أن الطرق المعنية تخضع بشكل أساسي لتأثيرات بشرية، يجب على المقاولين توخي الحذر أثناء أعمال إعادة التأهيل بحيث تكون التأثيرات المباشرة (التدمير المباشر) على النظم البيئية والحيوانات المرتبطة بها ضئيلة. يجب اعتماد خطة إدارة النفايات لتجنب تلوث التربة والمياه الذي يمكن أن يكون له آثار لا رجعة فيها على التنوع البيولوجي. بمعنى آخر، يجب عدم إلقاء النفايات وإعادة التأهيل في الموائل الطبيعية (مثل الجداول والقنوات المائية التي تمت مواجهتها في قضاء الهرمل على طول الطرق المدروسة).

كما ويمكن التخفيف من المخاطر الاجتماعية لهذا المشروع من خلال المراقبة الدورية لظروف العمل، والبنود المحددة المطلوبة في العقود التي تهدف إلى حماية العمال، ومدونة قواعد السلوك (CoC) لقضايا العنف القائم على النوع الاجتماعي (GBV). توجه خطة الإدارة البيئية والاجتماعية (ESMP) المقاول إلى ضرورة (١) توظيف عمال محليين، (٢) عدم توظيف أفراد دون السن القانوني للعمل وفقاً لقانون العمل في لبنان، و (٣) ضمان الامتثال والتنفيذ المناسبين لمدونة قواعد السلوك. كما ويوصى بالتنسيق الوثيق مع البلديات والمدارس المتضررة فيما يتعلق بقضايا إعاقة الطرق. بالإضافة إلى ذلك، يجب إبلاغ جميع الأشخاص المتأثرين بالمشروع بألية معالجة قوية لآلية معالجة المظالم بوضوح قبل وأثناء تنفيذ المشروع.

أما بالنسبة للتحويلات والالتفافات، فسيتم تحديد المواقع والمسافات الدقيقة للالتفافات من قبل مهندس الموقع، في وقت لاحق أثناء مرحلة إعادة التأهيل. وفقاً لذلك، يوصى باتخاذ الإجراءات الاحترازية العامة عند اختيار الالتفاف. من المهم أن نلاحظ أن المشروع لن يستخدم أو يؤجر الأرض لغرض التحويل.

علاوة على ذلك، حددت خطة الإدارة البيئية والاجتماعية مؤشرات المشروع الرئيسية لرصد نجاح تنفيذ المشروع. وهو مصمم لضمان الفعالية في قياس نتائج ومخرجات المشروع الرئيسية بناءً على مؤشرات قابلة للقياس. يمكن رصد مخاطر الآثار البيئية والاجتماعية (على سبيل المثال، مراقبة التخلص من النفايات الصلبة وتصريف مياه الصرف الصحي، ومراقبة عمالة القصر، ومراقبة سلوكيات العمال أثناء أعمال إعادة التأهيل). سيتولى مجلس الإنماء والإعمار مراقبة المشروع لضمان تنفيذ الشروط التي تتماشى مع الأهداف المقترحة لتحقيق النتائج المتوقعة. يقوم مجلس الإنماء والإعمار بإعداد التقارير المرحلية للمشروع وتقديمها إلى البنك الدولي لمراجعتها.

وأخيراً، تم إنشاء آلية معالجة المظالم متعددة البنود للطرق المعنية في قضاء الهرمل. بحيث تتضمن تحديد أي شكوى والتعامل معها بشكل صحيح وضمن الجدول الزمني المحدد.

(<http://www.cdr.gov.lb/study/RoadsEmp/RoadsEmp.htm>)

## الخلاصة

أظهرت التقييمات أن للمشروع المقترح آثارا محتملة، سلبية وإيجابية على حد سواء على كافة الأطر الاجتماعية والبيئية .  
وعليه، يجب أن يلتزم المعتهد بتنفيذ التدابير التخفيفية للآثار السلبية البيئية والاجتماعية والصحية والسلامة العامة والاجتماعية  
المرتبطة بعمل المشروع مع الالتزام بالمعايير والسياسات الاجتماعية والبيئية للبنك الدولي



## 1. Introduction

### 1.1 Project Background

The Roads and Employment Project (REP) funded by the World Bank (WB) aims to improve the efficiency of road sector expenditures through the prioritization of road works and the improvement of road asset management techniques.

The project will have the following components:

- Component 1: Roads Rehabilitation and Maintenance
- Component 2: Improving Road Emergency Response Capacity
- Component 3: Capacity Building and Implementation Support

This ESMP report only deals with the first component of the REP project. This includes the rehabilitation and maintenance of primary, secondary, and tertiary roads, including road safety and spot improvements. The investments under this component will improve transport connectivity and create jobs for Lebanese and Syrians.

A set of criteria were decided upon to objectively select the roads to be rehabilitated. The main criteria are pavement and road safety condition; traffic level; road functional classification; fairness in road distribution between different towns; and finally, potential for job creation and other socioeconomic benefits.

The project covers classified roads in 25 Cazas<sup>1</sup> throughout Lebanon with an expected total length of 835 km and grouped into six lots as follows:

- Lot 1: roads in Cazas of Jbeil, Kesrouane and El Maten.
- Lot 2: roads in the Cazas of Aley, Baabda, Chouf and Zahle.
- Lot 3: roads in the Cazas of Bent jbeil, Hasbaya, Jezzine, Marjaoun, Nabatiye, Rachaya, Saida, Sour and Bekaa West.
- Lot 4: roads in the Cazas of Akkar, Minieh-Danniyeh and Zgharta.
- Lot 5: roads in the Cazas of Batroun, Bcharre, Koura and Tripoli.
- Lot 6: roads in the Cazas of Baalbek and Hermel.

The maintenance and rehabilitation activities include asphalt overlays, drainage works, base and subbase reconstruction on selected sections, slope stabilization works, retaining walls, road safety activities (edge safety barriers, marking, signing, etc...) as well as roadside improvements.

Considering that the anticipated civil works will result in environmental and social impacts, an environmental and social management plan (ESMP) shall be prepared under the requirements of OP4.01, that classifies the project as Category B. Accordingly, TEAM International will develop an Environmental and Social Management Plan for Lot 5 and Lot 6 as it was assigned by the

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<sup>1</sup> Caza is a synonym of District: Second largest administrative division below the national level. Each governorate is divided into districts or cazas (REACH, 2015). Lebanon is divided into six administrative regions (called Governorate or Mouhafaza) and 25 sub-regions (called Caza) not including Beirut.

CDR to prepare all the tender documents needed for the rehabilitation of roads included in these lots.

This report is the specific ESMP for Hermel Caza (LOT 6) and is structured as follows:

Executive Summary

Chapter 1 – Introduction;

Chapter 2 – Existing Policies and Regulatory Framework

Chapter 3 – Description of the Proposed Project

Chapter 4 – Description of the Environment and Social Context

Chapter 5 – Potential Environmental and Social Impact

Chapter 6 – Mitigation of Environmental and Social Impacts

Chapter 7 – Environmental and Social Management and Monitoring Plan

Chapter 8 – Consultation, Disclosure, and GRM

Chapter 9 – Conclusion

References

Annexes

## **1.2 Project Rationale**

According to the World Economic Forum's (WEF) Competitiveness Index 3, Lebanon's infrastructure is the second main restriction to growth and its supply and quality is substantially below various sets of comparator countries. This situation can further threaten the country's delicate political, social, and economic situation. As the influx of Syrian refugees continues to increase, the capacity of the existing and deteriorating infrastructure will no longer be appropriate to meet the excess demand, and pressing public investments will be needed. In other words, road rehabilitation needs have been heightened by the influx of Syrian refugees, which has substantially increased traffic demand and the utilization of the road network.

More specifically, according to the Global Competitiveness Report of the World Economic Forum in year 2018, Lebanon ranked as the 127th for quality of roads out of 140 studied countries, and achieved a very low score of 2.6 out of 7. Moreover, in terms of road connectivity, Lebanon ranked 95th and achieved a poor connectivity score index of 48.7 out of 100 (Schwab, 2017). In terms of road conditions, approximately 95% of the roads are paved but lack proper maintenance. In Lebanon, road traffic injuries are growing to be a public health and developmental concern. Yearly, more than 1,000 people are killed due to road conditions, where one-third of the mortality cases happen to pedestrians, motorcyclists, and other vulnerable groups (Choueiri et al., 2013). Moreover, Lebanon has one of the highest per capita rates of road accidents in the world. The World Health Organization estimated that the total number of road traffic fatalities in 2015 to be 1,088, and their associated economic cost is between 3 percent and 5 percent of GDP (World Bank, 2017).

To deal with increasing road traffic and safety challenges, the Lebanese Government announced the implementation of "Road and Employment Project" which aims to improve transport connectivity and to create direct and indirect jobs for Lebanese and Syrians.

However, infrastructure projects can exert a substantial strain on the environment and natural resources. Sustainable infrastructure designs are the only solution to reduce the built-up pressure and promote the well-being of local communities. With sustainable practices and proper waste

management plans enforced, the burden on the environment can be reduced. Sustainable construction can generally be defined and achieved by satisfying the following criteria: increase the lifetime; limit material consumption; use durable materials; and; consider the environmental impact of the construction process (Hoeckman et al, 2012). Similarly, the socio-economic effects of infrastructure projects can be reduced through transparency and fair compensation processes (Morris, 2007). In this context, integrating environmental and social issues and concerns in development plans and strategies would be crucial in the context of Lebanon's commitment to sustainable development. This ESMP is prepared for economic decisions and development to go hand in hand with environmental and social protection. Accordingly, the developed ESMP should be viewed as a decision-making instrument for growth and environmental protection and should not be considered as a development restraint.

### **1.3 Report Objectives**

The main aim of this study is to bring into focus all the environmental and social aspects that could affect directly and indirectly the project area and the society. This study will enable the project developers and the authorities to consider the potential environmental and social consequences, and accordingly ensure that mitigation measures, monitoring plans, and contingency strategies are provided to mitigate these identified negative impacts.

This ESMP for Hermel Caza was developed in accordance with environmental laws and regulations in Lebanon and WB guidelines to ensure that all environmental and social requirements related to the project are properly implemented by the selected contractor during the rehabilitation phase of the project and by the concerned municipalities and MoPWT during the operation of the project.

The specific objectives of this ESMP are to:

1. Establish an environmental and socio-economic baseline
2. Set the Legal, Institutional, Standards & Policies Frameworks
3. Conduct an inclusive public consultation session that takes into consideration the views of Project-Affected People (PAPs) to feed into project design
4. Identify potential social and environmental impacts caused by the project
5. Manage the various environmental and social impacts by specifying several project specific mitigation measures, as stated in the Environmental and Social Management Framework (ESMF) document prepared by CDR;
6. Achieve feasible and applicable mitigation measures during all the project's phases;
7. Provide appropriate compensation for any loss caused by project implementation;
8. Emphasize, improve, and enhance the positive outcomes of the project;
9. Guide on creating short term jobs for communities within a gender workforce equality environment;
10. Identify the responsible authorities and assign roles for different organizations in the efficient implementation of this ESMP.
11. Ensure transparency throughout the project preparation and implementation
12. Implement a robust GRM that is clearly communicated to all PAPs.

### **1.4 Methodology**

This ESMP report was prepared by Geoflint s.a.r.l at the request of TEAM International, as a fulfillment of the environmental and social requirements stated in component 1 (Road Rehabilitation and Maintenance) of the REP project.

The report (1) provides the relevant information regarding the environmental and social baseline conditions prevailing along the chosen roads to be rehabilitated in Hermel (Hermel R4, Hermel R6, Hermel R7a, Hermel R8, and Hermel R9) that are part of Lot 6 and have a total length of 38.9 km (refer to Figure 1-1), (2) discusses the project activities, (3) identifies the possible adverse impacts during both roads rehabilitation and operation, and (4) sets out an ESMP for the five roads within Hermel Caza to alleviate or prevent any likely negative impacts on the local environment.

The methods used for data collection and stakeholders' engagement are elaborated in this chapter.

#### **1.4.1 Collection of Environmental and Social Baseline Information**

Baseline data (environmental and social baseline information) were collated in conjunction with the project design concept and plans to highlight issues and opportunities identified within the site location and to inform the project proponents about any constraints or potential impacts.

Available data was collected from concerned municipalities, literature review, field surveys, and side meetings when needed for the social assessment.

Meteorological data, which play a vital role in transport and dispersion of air pollutants, were investigated and collected in shape of a statistical distribution of weather conditions over a period of time. Also, air pollution test results were acquired from the Ministry of Environment (MoE) in order to assess the ambient air quality for the targeted areas. In addition, water quality of nearby water resources was investigated in order to accurately assess the potential impacts of the rehabilitation works. The geology, hydrogeology, and seismicity of the targeted areas were studied in order to identify any viable water resources and define the level of seismic hazards of the area.

Two site visits were conducted during February 2020 for road, social, acoustic environment, and natural habitat assessments. Regarding natural habitat assessment, a single field visit was set for each road (given the limited timeframe of this study). The field investigation did not aim for an exhaustive inventory of the biodiversity of the project area but a general overview of present species (mainly flora) and key habitats. This general approach allows the identification of the conservation status of the natural habitats. Walking transects were recognized to obtain an understanding of the vegetation communities in the area and record existing species. Knowing that a single visit is not enough, the study had to consider some species as potentially present and it was difficult to perform a complete faunal survey. Further, Land Use Land Cover (LULC) maps were generated for the concerned areas.

Regarding the social assessment, socio-economic information about the area was obtained from several national sources and studies, as well as from the Ministry of Social Affairs (MoSA), and informal meetings with municipal council members during the field visits. Moreover, sensitive receptor maps were generated for the concerned roads in Hermel for a better understanding of the project potential environmental and social implications.

#### **1.4.2 Methodology for Stakeholders Engagement**

According to Bourne (2016), every stakeholder and every stakeholder community is unique and has their own distinct set of expectations and perceptions. Engaging with and influencing such diverse parts within a community through a traditional “one-size-fits-all” approach is no longer deemed effective. As a result, an operative communication strategy was set, accounting for the complexity of the people whose support and involvement are vital to project success.

Multiple communication means were used to secure stakeholder involvement. The aim was that project’s stakeholders become aware of the project’s components and results, and that they get prepared to have the needed involvement in the work.

The Stakeholder Circle methodology was used as it provides a flexible approach for defining the stakeholder community, and recognizing the information and communication needed to influence each stakeholder’s prospects and actions.

The five steps to the Stakeholder Circle methodology (Bourne, 2016) were conducted and are listed below.

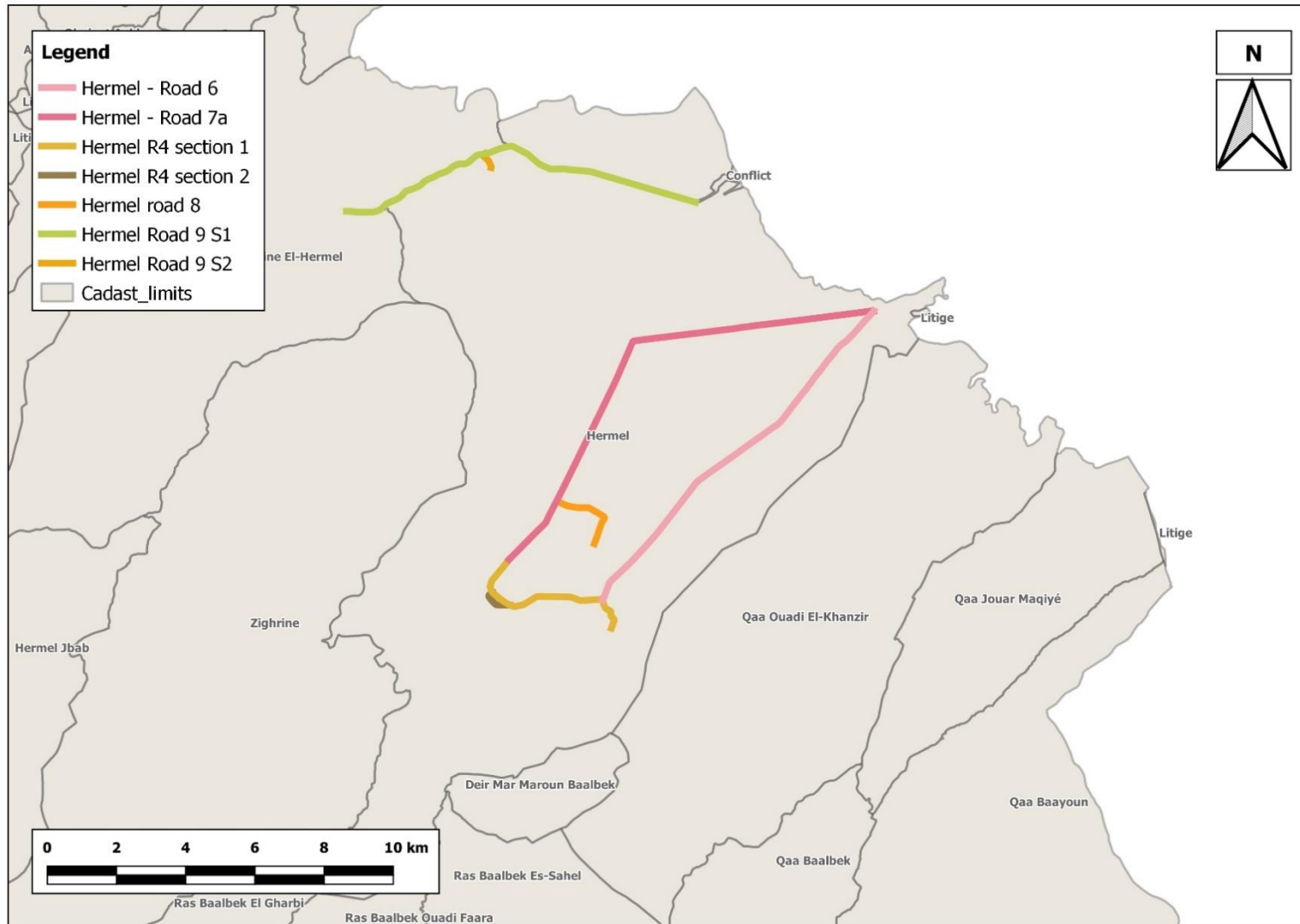
1. Identification of all stakeholders
2. Prioritization to determine who is important
3. Visualization to understand the overall stakeholder community
4. Engagement through effective communications
5. Monitoring the effect of the engagement.

The aim was to understand stakeholders’ needs, identify support from the key positive stakeholders, and reduce opposition from negative stakeholders.

Subsequently, a directed communication with the identified important stakeholders was conducted. The aim was to make as much information as possible easily accessible. Additional different channels to deliver information were used (this includes formal and informal channels).

Emails and direct phone calls to personalize the direct communication with identified stakeholders were adopted. Further, formal invitation letters were sent to these stakeholders for the arranged public meeting in the Union of Hermel Municipalities.

Figure 1-1 Lot 6 – Roads Key Plan Drawing (Hermel roads)



Source: Geoflint s.a.r.l. & TEAM International, 2020

## **2. Existing Policies, Legal and Administrative Framework**

The environmental, economic and social implications of the proposed project must be addressed within the context of applicable legal and policy framework impacting the decision-making process at the national, regional and international levels. More specifically, the ESMP is conducted in accordance with the World Bank Safeguards and national and international laws/regulations that are related to social and environmental impact assessments (EIAs).

The project must comply with environmental regulations, labor and occupational health and safety laws to avoid adverse impacts on the environment, health and safety of workers and affected communities. More specifically, it must comply with Lebanese Labor laws, International Labour Organization (ILO) standards, applicable collective agreements and international Human rights conventions.

### **2.1 Applicable Legal and Regulatory Framework**

This section detailing the applicable legal provisions aims to provide a review of relevant national and international legal instruments as well as legislation, regulations, and policy documents, which are applicable to the proposed project in the Republic of Lebanon. The following table presents an overview of the main Lebanese environmental legislations dealing with the management of natural resources, solid waste and wastewater as well as air quality and pollution control. Moreover, laws, decisions in relation labors, human rights and biodiversity are elaborated in this section as well.

**Table 2-1 National Applicable Legal Framework**

Relevant Sector	Legislation	Date	Brief Description	Relevance to The Project
<b>Environment</b>	Decree 2761	19/12/1933	Guidelines related to Wastewater Management and Disposal	Wastewater generated by the project activities should be managed and disposed of according to this decree. This decree provides guidelines related to wastewater management and disposal to avoid pollution caused by the discharge of liquid waste illegally into water streams and valleys.
	Decree 8735	23/08/1974	All generated rehabilitation solid wastes are to be properly collected, handled and disposed	Solid wastes generated by project activities should be managed according to guidelines set in this decree.
	Decision 52/1	29/06/1996	Environment quality standards and criteria for air, water and soil pollution. Revised standards for water, air and soil pollution (partly updated in Decision 8/1 dated 30/1/2001).	Decision 52/1 was referenced in the study to specify the National Standards for Environmental Quality and the Environmental Limit Values for Air and Water. The described decision (Annex 12 in decision 52/1) was used for monitoring air emissions.
	Decision 189	19/11/1998	Declares Al Aassi river as a Natural Site protected by the Minister of Environment	Hermel R4 passes Aassi River bridge.
	Decision 8/1	30/01/2001	Amendment to part of MoE Decision 52/1 dated 29/6/1996. National Standards for Environmental Quality (NSEQ) that covered air and liquid emissions for all sectors.	This decision will be used to monitor air and water quality during implementation of project activities.



	Law 444	29/07/2002	Environment Protection Law: Fundamental principles and public rules (7 parts, 68 articles), Organization of environmental protection, Environmental information system and participation in the management and protection of the environment, Environmental Impact Assessment, Protection of environmental media, Responsibilities and fines, Other regulations (miscellaneous, institutional).	It is essential for the proposed project as the protection of the environment is a must throughout all of the steps of the project.
	MOE Decree 8803/2002 and its amendments	04/10/2002	Organizes the activity of quarries and crushers, licensing procedures, as well as the operation, management and rehabilitation of quarries.	Ensures the provision of construction material and the disposal of construction waste comply with the decree
	Law 77	13/04/2018	Water Resources Law	Penalizes unauthorized discharges or disposal of any kind of waste in water resources
	Law 78	13/04/2018	Law for the protection of air quality	The requirements of the law shall be adhered to for the management of air emissions from the project
	Law 80	10/10/2018	Integrated Solid Waste Management which sets integrated solid waste management principles and provides guidelines for the management of waste.	Solid waste generated during the project should be managed in accordance with Law 80, which includes limiting quantities generated when possible, as well as properly disposing of any generated waste.
<b>Health and safety</b>	Law 64	12/8/1988	Protection against hazardous wastes that could harm air, water, biodiversity, soil, and people.	Precautionary measures should be taken to limit any potential

				damage from generated hazardous wastes (if any)
	Decree 11802	30/01/2004	Occupational health and safety decree	The occupation health and safety conditions during the rehabilitation period should comply with this decree.
<b>Labor Laws</b>	Labor Law	23/09/1946	Labor Law that sets basic labor rights in Lebanon including minimum working age, working and resting hours etc....	It protects employees from any sort of violations dictated in this law
	Law 335	2/8/2001	This law is the ratification of ILO convention No. 182: The agreement required the ratifying country to take immediate and effective measures to prohibit the worst forms of labor and eliminate it and specify the types of work that harm the health, safety or ethical behavior of children and their location.	Does not allow the employment of children and protects them from engaging in any work activities that could harm their health and safety.
	Law 400	5/6/2002	This law is the ratification of ILO convention No. 138: This agreement aims to develop a general instrument on the subject of minimum age for employment to gradually replace the instruments applied in specific economic sectors, aiming to completely eliminate child labor	Minimum age of employment on tasks and works that pose risks or hazards to health and safety
	Decree 8987	29/09/2012	Prohibition of employment of minors under the age of 18 in work that may harm their health, safety or morals	Adhere to the requirements of this decree with regards to employment for this project.

	Decree 3791	30/06/2016	Sets minimum wage for employees and workers	Adhere to the requirements of this decree with regards to wages of employees on this project.
<b>Traffic</b>	Law 243	22/10/2012	Aims at the elimination of any kind of traffic violations such as: exceeding the speed limit, driving without a license or driving under any substance alternating the normal mental and physical state.	All transportation vehicles utilized during project implementation should abide by the general rules specified in Law 243.
<b>General</b>	Decree law 166	7/11/1933	Antiquity law	Defines chance find procedures that should be followed in case antiquities were identified in the project site
	Decree 340	01/03/1943	The text of Article 522 of the Lebanese Penal Code, applies to cases of assault of women, by force, violence, and manipulations which are acts that affect a woman's dignity, physical health, psychological state, and moral integrity.	This law was mentioned as the project may hold risks on women during rehabilitation work.
	Law 118	30/06/1977	Municipalities Law. It stipulates the role of the Municipalities and Municipalities councils.	Defines the roles of municipalities in the provision of environmental services such as solid waste management, wastewater management, etc.
	Law 58	29/05/1991	Law of properties and expropriation	Despite that no expropriation activities will be done; this law is added because OP 4.12 was triggered by the project
	Law 53	14/09/2017	Abolishment of article 522 of the penal code that exempts a rapist from punishments if he marries a victim	This law was mentioned as the project may hold risks on women during rehabilitation works (influx of workers (men) to the concerned area).

Lebanon's legislative body is represented by the Lebanese Parliament that approves and issues Laws. Lebanon's executive body is represented by the Council of Ministers (COM) and is headed by the Presidency of the Council of Ministers. The COM enacts regulations in the form of Decisions (denoted COM Decision Number) and Decrees. Decisions are issued by a specific minister and are limited to the affairs of the ministry that promulgated it. Ministerial Decisions are subject specific.

## 2.2 Institutional Framework

### *Institutional and Implementation Arrangements*

The project works will be executed on the main road network which is under the jurisdiction of the Ministry of Public Works and Transport (MoPWT). MoPWT is in charge of the construction and maintenance of the main road network, consisting of the primary, secondary, and tertiary roads.

In Lebanon, donor-funded road works projects are implemented by CDR upon the request of the Council of Ministers (CoM). Therefore, in the context of REP project, CDR will execute the project on behalf of the government/MoPWT.

The main national institutions that are in relation to this project and their corresponding mandates are presented in the table below.

**Table 2-2 National Institutions in relation to REP project**

<b>Institutions</b>	<b>Roles and Responsibilities</b>
<b>MoPWT</b>	<p>MoPWT is responsible for the management of public roads, and for developing a sustainable strategy for the transportation sector within the urban and rural areas.</p> <ul style="list-style-type: none"> <li>• MoPWT will work closely with CDR during project implementation to ensure that important decisions on road (selection priorities, road designs, equipment specifications, and road asset management) are well coordinated.</li> <li>• MoPWT will be responsible to manage the rehabilitated roads upon the completion of the project.</li> </ul>
<b>CDR</b>	<p>The Council for Development and Reconstruction is a public institution established through Decree No. 5 dated 31st January 1977. CDR's main responsibilities is to:</p> <ul style="list-style-type: none"> <li>• Coordinate with relevant government agencies and with the relevant government agencies, particularly MoPWT, regarding roads priorities, technical aspects, and project's requirements.</li> <li>• Monitor the project. In particular, every six months CDR must submit to the Bank project progress reports summarizing all project aspects and progress achieved in project implementation.</li> </ul>
<b>Municipalities<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• Municipalities are responsible for their municipal area. According to Decree 118/1977, municipalities are responsible for supervising projects' implementation in their municipal territories. In this context they were consulted for this project.</li> </ul>
<b>Ministry of Environment (MoE)</b>	<ul style="list-style-type: none"> <li>• MoE is responsible for planning and monitoring of environmental issues.</li> <li>• MoE is in charge of protecting the environment in general, setting regulations and standards, and advising on implementing projects and programs in a sustainable manner. Accordingly, this ESMP must comply with the Lebanese environmental standards and regulations issued by MoE.</li> </ul>
<b>Ministry of Agriculture (MoA)</b>	<ul style="list-style-type: none"> <li>• MoA is responsible for monitoring all activities related to forestry and agriculture. It regulates the introduction of new species in agriculture and</li> </ul>

<sup>2</sup> Concerned Municipalities in Hermel Caza Hermel R4: Hermel / Hermel R6 :Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail / Hermel R7a: Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail / Hermel R8:Tall El-Far / Hermel R9: Qasr - Fissane

	<p>livestock, protects, supervises and manages natural resources and provide technical assistance whenever necessary.</p> <ul style="list-style-type: none"> <li>• The REP will not involve the construction of new roads or widening of existing ones (i.e. no tree cutting will occur). However, in the context of building retaining walls, if the contractor had to cut trees, the MoA must be consulted. Tree cutting permits are provided by MoA.</li> </ul>
<b>Ministry of Labour (MoL)</b>	<ul style="list-style-type: none"> <li>• MoL is responsible for all labour and employment issues. Labour inspection is the responsibility of the Department of Labour Inspection, Prevention and Safety (DLIPS) under the Labour Relations Authority of the MoL.</li> <li>• DLIPS supervises the implementation of all laws, regulations, decrees and rules pertaining to the terms and conditions of employment, and the protection of workers in the workplace, including the provisions of international labour Conventions ratified. Labour inspectors ensure the supervision of compliance with regulations regarding conditions of employment and protection of workers including occupational safety and health. This ESMP must be in accordance with labor laws, regulations and conventions.</li> </ul>

## 2.3 Environmental Standards

The National emission levels for wastewater effluent, ambient noise and ambient air quality are provided in this section.

### Wastewater Discharge Targets

The allowable contaminants concentration for wastewater when discharged into the sewage network, sea or surface water are indicated in the MoE decision 8/1 dated 30/1/2001. The table below shows a list of allowable contaminants concentrations.

**Table 2-3 The allowable contaminants concentration for wastewater when discharged into different bodies**

Contaminants	Surface Water	Sewage Network	Sea Water
pH	6 – 9	6 – 9	6 – 9
BOD mg/l	25	125	25
COD mg/l	125	500	125
temperature Co	30	35	35
Total nitrogen mg/l	30	60	30
Total phosphorus mg/l	10	10	10
Oil and grease mg/l	30	50	30
Mercury mg/l	0.05	0.05	0.05
Total suspended solids mg/l	60	600	60
Total coliform bacteria (Most Probable Number/100 ml)	2,000	-	2,000

### Air Emissions Targets

The maximum allowable limits for outdoor air pollutants are specified in Annex 14 of the MoE Decision No. 52/1 dated 1996. The table below shows the list of allowable criteria pollutants concentrations.

**Table 2-4 Maximum allowable limits for outdoor air pollutants**

Pollutants	Maximum Limit ( $\mu\text{g}/\text{m}^3$ )	Exposure duration
Sulphur dioxide ( $\text{SO}_2$ )	350	1 hr
	120	24 hrs
	80	1 yr
Nitrogen dioxide ( $\text{NO}_2$ )	200	1 hr
	150	24 hrs
	100	1 yr
Ozone ( $\text{O}_3$ )	150	1 hr
	100	8 hrs
Carbon monoxide (CO)	30,000	1 hr
	10,000	8 hrs
Total Suspended Particles (TSP)	120	24 hrs
$\text{PM}_{10}$	80	24 hrs
Lead (Pb)	1	1 yr
Benzene	5 ppb	1 yr

### Noise Emissions Targets

The expected noise pollution levels should not exceed the values listed in the MoE Decision 52/1 dated 1996. The limited; values are presented in the table below.

**Table 2-5 Sound pressure limits according to MoE Decision 52/1, 1996**

Phase	Sound Pressure Level dB(A)
Working Location (less than 8 working hrs.)	90
Working Location (requires good speech hearing)	80

Therefore, the maximum national standard of 90 (dB) for occupational noise exposure limits should not exceed an average duration of 8 hours working days. If the limits are higher than the acceptable limits, then the exposure duration should be reduced as mentioned in the table below.

**Table 2-6 Noise exposure limits**

Sound Pressure Level dB(A)	Exposure Duration (hrs.)
95	4
100	2
105	1
110	0.5
115	0.25

Moreover, the following table indicates the Lebanese noise guidelines in different zones and at different periods of the day.

**Table 2-7 Lebanese noise guidelines for different zones (MoE 52/1, 1996)**

Area classification	Maximum accepted noise level dB(A)		
	Day <sup>1</sup>	Evening <sup>2</sup>	Night <sup>3</sup>
Residential area with few construction sites, activities or on a highway	50 – 60	45 – 55	40 – 50
Urban residential area	45 – 55	40 – 50	35 – 45
Residential suburb	40 – 50	35 – 45	30 – 40
Rural residential, hospital, public garden	35 – 45	30 – 40	25 – 35
	<sup>(1)</sup> 7 a.m. to 6 p.m.	<sup>(2)</sup> 6 p.m. to 10 p.m.	<sup>(3)</sup> 10 p.m. to 7 a.m.

## **2.4 World Bank Policies and Guidelines**

### **2.4.1 Safeguard Policies**

In addition to the Lebanese legislation, two World Bank safeguards policies apply to Lebanon Road and Employment Project (1) OP 4.01 Environmental Assessment and OP 4.12 and (2) Involuntary Resettlement.

#### *OP 4.01 Environmental Assessment.*

The ESMP for the selected roads in Hermel should comply with the safeguard policy of the World Bank, specifically, the OP/BP 4.01 regarding Environmental Assessment. The OP 4.01 is triggered as the project could have impacts on the environment due to the rehabilitation of roads infrastructures and associated civil works.

Under the requirements of OP4.01, the proposed project is classified as Category B (impacts are localized, short-term, and reversible and have no severe effects on the environment). Simple and low/moderate cost mitigation measures will be sufficient to restore the potential damage or keep it to the lowest possible) since the environmental impacts are expected to be minimal, during the rehabilitation phase, and can be mitigated via an environmental management plan.

#### *OP 4.12 Involuntary Resettlement*

The project will rehabilitate and maintain roads on the existing right of way. Minor realignments or other small-scale construction may require land, however, and could impact squatters or encroachers on government-owned lands or otherwise result in the involuntary taking of land. Therefore, the Bank policy on Involuntary Resettlement OP 4.12 has been triggered in this project and a Resettlement Policy Framework was accordingly prepared and disclosed on the CDR website:

<https://www.cdr.gov.lb/CDR/media/CDR/StudiesandReports/Roads%20and%20Employment/RPF.pdf>.

However, in the case of Hermel, the design of roads under study did not implicate land acquisition since no involuntary resettlement or land acquisition will take place. In other words, the project will be implemented primarily within the existing “right of way” there will be no displaced persons by the project activities (this includes local and Syrian refugees).

### **2.4.2 Access to Information**

This Policy governs the public accessibility of information in the World Bank’s possession. The World Bank allows access to any information in its possession that is not on a list of exceptions. This Policy is based on five principles:

1. Maximizing access to information;
2. Setting out a clear list of exceptions;
3. Safeguarding the deliberative process;
4. Providing clear procedures for making information available; and
5. Recognizing requesters’ right to an appeals process.



### **2.4.3 Consultations and Disclosure Policy**

Transparency is essential to building and maintaining communal dialogue, and increasing public awareness about the WBG’s development role and mission. It is also critical for enhancing good governance, accountability, and development effectiveness.

Openness promotes engagement with stakeholders, which, in turn, improves the design and implementation of projects and policies, and strengthens development outcomes. In this context, a formal consultation process with the public took place during the preparation of this ESMP for Hermel Caza. A public participation meeting was held at the Union of Hermel Municipalities on Thursday February 27, 2020 addressing all five concerned roads in Hermel Caza (Hermel R4, R5, R6, R7a, R8, and R9). The number of attendees was 16 of which 2 were women.

This ESMP will be disclosed on CDR’s website on the following link <https://cdr-lebanon.com/en-US/Studies-and-reports/Roads-and-Employment.aspx>

### **2.4.4 Useful Guidelines and Manuals**

This ESMP was based on Environment Health and Safety (EHS) Guidelines that are referred to in the WB’s Environmental and Social Framework. The EHS Guidelines contain the performance levels and measures that are normally acceptable to the WB Group, and that are generally considered to be achievable.

The management plan must meet as well the IFC Performance Standard 6 (PC6) in relation to Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012). Finally, guidelines from World Bank handbook on roads and environment were used for this ESMP.

## **2.5 Gap Analysis**

The only national Decree 8633 in relation to social and environmental impact assessment does not impose any environmental study for road rehabilitation projects, however, WB guidelines impose conducting an ESMP for such projects.

Some of the WB’s policies and emission limits are more stringent than those of the Lebanese Government. The Lebanese wastewater emission standards are, in general, less strict than World Bank standards (Table 2-10), but more strict for ambient air quality and similar for noise (Table 2-8 and Table 2-9). In this context, the stricter limits will prevail.

**Table 2-8 Comparison of ambient air quality standards between Lebanese and WB standards**

Pollutants	Lebanese Standards		WHO Standards	
	Maximum Limit (µg/m <sup>3</sup> )	Exposure duration	Maximum Limit (µg/m <sup>3</sup> )	Exposure duration
Sulfur dioxide (SO <sub>2</sub> )	350	1 hr	500	10 mins
	120	24 hrs	20	24 hrs
	80	1 yr	-	-
	200	1 hr	200	1 hr

<b>Nitrogen dioxide (NO<sub>2</sub>)</b>	150	24 hrs	-	-
	100	1 yr	40	1 yr
<b>Ozone (O<sub>3</sub>)</b>	150	1 hr	-	-
	100	8 hrs	100	8 hrs
<b>Carbon monoxide (CO)</b>	30,000	1 hr	30,000	1 hr
	10,000	8 hrs	10,000	8 hrs
<b>Total Suspended Particles</b>	120	24 hrs	-	-
<b>PM<sub>2.5</sub></b>	-	-	25	24 hrs
	-	-	10	1 yr
<b>PM<sub>10</sub></b>	80	24 hrs	50	24 hrs
<b>Lead (Pb)</b>	1	1 yr	0.5	1 yr
<b>Benzene</b>	5 ppb	1 yr	1.7	1 yr
<b>Benzo[a]Pyrene (BaP)</b>	-	-	0.00012	1 yr
<b>Arsenic (As)</b>	-	-	0.0066	1 yr
<b>Cadmium (Cd)</b>	-	-	0.005	1 yr
<b>Nickel (Ni)</b>	-	-	0.025	1 yr

**Table 2-9 Comparison of allowable noise level standards between Lebanese and WB standards**

Region type (receptor)	Limit for ambient noise levels dB(A)					
	Day time (7 a.m. - 6 p.m.)		Evening time (6 p.m. - 10 p.m.)		Night time (10 p.m. - 7 a.m.)	
	Lebanese standards	WB standards	Lebanese standards	WB standards	Lebanese standards	WB standards
commercial and administrative area in town centers	55-65	70	50-60	70	45-55	70
residential areas with some construction sites or along a main road	50-60	55	45-55	55	40-50	45
urban residential areas	45-55	-	40-50	-	35-45	-
residential suburbs with slight traffic	40-50	55	35-45	55	30-40	45

industrial area	60-70	70	55-65	70	50-60	70
rural residential areas, public gardens and hospitals	35-45	-	30-40	-	25-35	-

**Table 2-10 Comparison of allowable wastewater discharge levels standards between Lebanese and WB standards**

Parameters/pollutant	Wastewater Effluent Pollutants Threshold			
	Lebanese requirements			WB requirements
	Surface Water	Sewage Network	Sea Water	
pH	6 – 9	6 – 9	6 – 9	6 – 9
BOD mg/l	25	125	25	30
COD mg/l	125	500	125	125
temperature Co	30	35	35	-
Total nitrogen mg/l	30	60	30	10
Total phosphorus mg/l	10	10	10	2
Oil and grease mg/l	30	50	30	10
Mercury mg/l	0.05	0.05	0.05	0.01
Total suspended solids mg/l	60	600	60	50
Total coliform bacteria (Most Probable Number/100 ml)	2,000	-	2,000	400

## 2.6 International treaties and conventions

The main international treaties and conventions in relation to REP are listed in Table 2-11 and Table 2-12 below.

**Table 2-11 International Treaties and Conventions in relation to REP.**

Date	Convention/Agreement	Status	Relevance to Project
1992	United Nations Framework Convention on Climate Change.	Covered by Law No. 359 dated 11th August 1994.	This project must control activities that release green-house gases such as emissions from machineries used (most of which rely on fuel) and excavation activities, among others. (Refer to section 5.3.1.3)
1992	Rio de Janeiro Convention on Biological Diversity.	Covered by Law No. 360 dated 11th August 1994.	This project should abide by this convention to avoid or control activities that may pose a threat on biodiversity at all levels, since improvement of roads sometimes leads, directly or indirectly, to the loss and degradation of natural habitats and biodiversity (refer to section 5.3.1.6).

**Table 2-12 Labors conventions**

ILO Convention	Name	Entry into force	Ratification Date	Description	Relevance to Project
ILO no. 29	Convention Concerning Forced or Compulsory Labor	01/05/1932	25/06/1977	Its object and purpose are to suppress the use of forced labor in all its forms irrespective of the nature of the work or the sector of activity in which it may be performed. With some exceptions such as military service.	This project should abide by this convention to protect employees from being forced into any type of work activity that they do not want to engage in.
ILO no. 105	Abolition of Forced Labor Convention	17/01/1959	25/06/1977	Aims at the elimination of forced labor and cancels certain forms of forced labor still allowed under the Forced Labor Convention of 1930	This project should comply with the guidelines of this convention in order to protect employees from being forced into any type of work activity without their will.
ILO no. 111	Discrimination (Employment and Occupation) Convention	15/06/1960	25/06/1977	Enable legislation which prohibits all discrimination and exclusion on any basis including of race/color, sex, religion, political opinion, national or social origin in employment.	This project should abide by this convention to ensure a healthy environment between the employees and between the employer and employees in the work place by enforcing equality and respect between them.
ILO no. 122	Employment Policy Convention	09/07/1965	25/06/1977	Aim at ensuring that there is freedom of choice of employment and the fullest possible opportunity for each worker to qualify for, and to use his skills and endowments in, a job for which he is well suited, irrespective of race, color, sex, religion, political opinion, national extraction or social origin.	This project should comply with the guidelines of this convention to ensure that employees are given the right opportunities, based on their qualifications, irrespective of their origin, affiliations.
ILO no. 138	Minimum Age Convention for Admission to Employment and Work	19/06/1976	25/06/1977	It stipulates that States should progressively raise the minimum age to a level consistent with the fullest physical and mental development of young people. It establishes 15 as the minimum age for work in general and 18 as the minimum age for hazardous work.	This project should abide by this convention in order to abolish the employment of children below the specified minimum age.

### 3. Description of the Proposed Project

The first element of the REP includes the rehabilitation and maintenance of primary, secondary, and tertiary roads, including road safety and spot improvements. During the execution of rehabilitation activities, roads will not be closed or shutdown. Works will be executed on the road right of way/passageway only and will not use or undermine any existing adjacent facilities. In addition, the rehabilitation activities will maintain a passing corridor within the alignment to grant access to nearby properties.

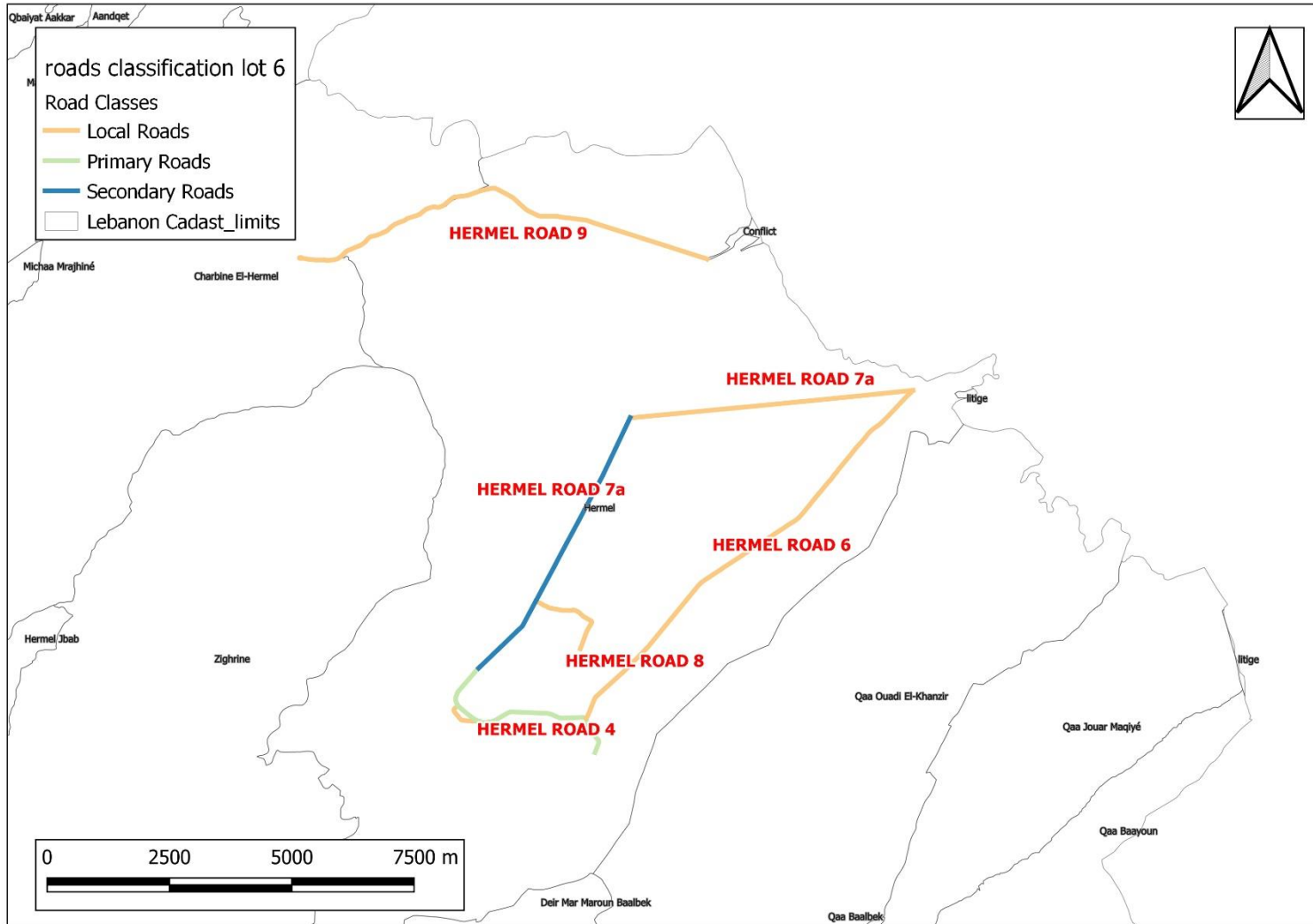
In case the works imply any temporary closure of the road, traffic will be secured by the project Contractor via alternative routes to reach relevant destinations. Detours and diversions were not included in the design. Therefore, before the execution of rehabilitation works, the Contractor, based on the schedule of works and if needed, will secure the access and traffic movement via other alternative routes and means in coordination with the related Municipality. Accordingly, all detours will be on existing alternative roads (public domain properties) and there is no need to use or rent some land to create the detour.

As mentioned before, the subject of this report is the selected roads for rehabilitation in Hermel Caza. Five roads with a total length of 38.9 km will be rehabilitated in Hermel caza (Table 3-1).

**Table 3-1 Roads to be rehabilitated within Hermel Caza**

Caza	Road Code	Cadastral Area Name	Length (km)	Road Classification (refer to Figure 3-1)	
Hermel	4	1	Hermel	5.0	Primary & Local
		2	Hermel		
	6	Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail	10.0	Local	
	7a	Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail	13.0	Secondary & Local	
	8	Tall El-Far	1.9	Local	
	9	1	Qasr – Fissane	9.0	Local
		2	Fissane		

Figure 3-1 Classification of road segments among Hermel roads



Source: TEAM International, processed by Geoflint, 2020

### 3.1 Roads Location and Classification

#### 3.1.1 Hermel R4 (Hermel)

Hermel R4 is located in the town of Hermel within Hermel Caza and consists of two sections or alignments that have a combined length of 5.0 km.

- Section 1 starts at an elevation of 597 m, descends slightly to reach its minimum elevation of 589 m, and then ascends until it ends at 748 m.
- Section 2 consists of a short 750 m segment that starts at an elevation of 715 m and ascends until it ends at its highest elevation of 737 m.

The road is classified as a primary road for around 4.6 km (section 1) and local road for the remaining part (section 2), where primary roads have a roadway width varying between 8 m and 10 m, and local sections have a width varying between 4 m and 6 m, as shown in Table 3-2. Refer to Figure 3-1 for road classification and Figure 3-2 for the road alignment.

**Table 3-2 American Association of State Highway and Transportation Officials AASHTO 2018**

Classification	Width (m)
International Roads	10-14
Local Roads	4-6
Primary Roads	8-10
Primary Roads (highways)	10-14
Secondary Roads	5-8

#### 3.1.2 Hermel R6 (Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail)

Hermel R6 is located in Hermel Caza and consists of a single alignment with a total length of 10.0 km.

It starts at the periphery of Hermel (at 600 m), sharply ascends to reach its maximum elevation of 635 m, then descends as it passes through Chouaghir and Mazraat Beit Et-Tachem until it ends at Haouch Beit Ismail at its minimum elevation of 557 m.

The road is classified as a local road (Figure 3-1). Refer to Figure 3-3 for the road alignment.

#### 3.1.3 Hermel R7a (Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail)

Hermel R7a is located in Hermel Caza and consists of a single alignment with a total length of 13.0 km.

It starts at Hermel, at an elevation of 750 m, and descends, passing through Mansoureh, Bouaida, and Nasriye, until it ends at Haouch Beit Ismail at its minimum elevation of 557 m.

The road is classified as a secondary road for approximately 6 km and as a local road for the remaining part (Figure 3-1). Refer to Figure 3-4 for the road alignment.

### **3.1.4 Hermel R8 (Tall El-Far)**

Hermel R8 is located in Tall El-Far within Hermel Caza and consists of a single alignment with a total length of 1.9 km.

It starts at an elevation of 709 m, and descends until it ends at its minimum elevation of 650 m.

The road is classified as a local road (Figure 3-1). Refer to Figure 3-5 for the road alignment.

### **3.1.5 Hermel R9 (Qasr – Fissane)**

Hermel R9 is located in Hermel Caza and consists of two sections or alignments that have a combined length of 9.0 km.

- Section 1 starts in Qasr (at 590 m) and ascends until it ends at Fissane at its maximum elevation of 1,087 m.
- Section 2 consists of a short 417 m segment within Fissane that starts at an elevation of 847 m and gradually ascends until it ends at its highest elevation of 867 m.

The road is classified as a local road (Figure 3-1). Refer to Figure 3-6 for the road alignment.

## **3.2 Project Activities**

### **3.2.1 Hermel R4**

The road cross sections and safety conditions assessment are provided in a separate technical report provided by the engineers (TEAM International).

In summary, the safety assessment showed that, due to the road's urban nature, barriers are generally not warranted. Also, while some signage was encountered in the city of Hermel, traffic signs and information signs require rehabilitation throughout the road length. Marking was absent all throughout the road's length. Furthermore, the road passes Aassi River Bridge that requires some structural maintenance.

Drainage maintenance is required on the second half of section 1, while lighting rehabilitation is necessary on the first half of section 1.

As for pavement conditions, milling and overlay is generally required on all both sections throughout their lengths.

For relevant data regarding this road, refer to Table 3-4, Table 3-5, and Figure 3-2.

The legend for abbreviations used in Figure 3-2 and latter maps showing work activities is displayed in Table 3-3 below.

**Table 3-3 Legend for work station activities**

<b>Abbreviation</b>	<b>Description</b>
P.R.C.	Pavement Reconstruction
M&O	Milling & Overlay



O	Overlay
E.C.	Edge Curb Construction
S.B.	Safety Barrier Construction
R.W.	Retaining Wall Construction
F.W.	Foot Wall Construction
C.C.C.	Covered Concrete Channel Installation
SR	Steel Guard Rail

**Table 3-4 Existing road condition survey – Hermel R4 Section 1**

Beg	End	Cadastral Area Name	Road Classification	Urban / Rural	Drainage Assessment	Pavement Assessment	Road Assessment	Safety	Lighting Assessment
0+000	1+900	Hermel	Primary	Urban	Acceptable	Overlay	Marking & Improvements	Signage	Rehabilitation
1+900	4+600	Hermel	Primary	Urban	Rehabilitation	Milling & Overlay	Marking & Improvements	Signage	Acceptable

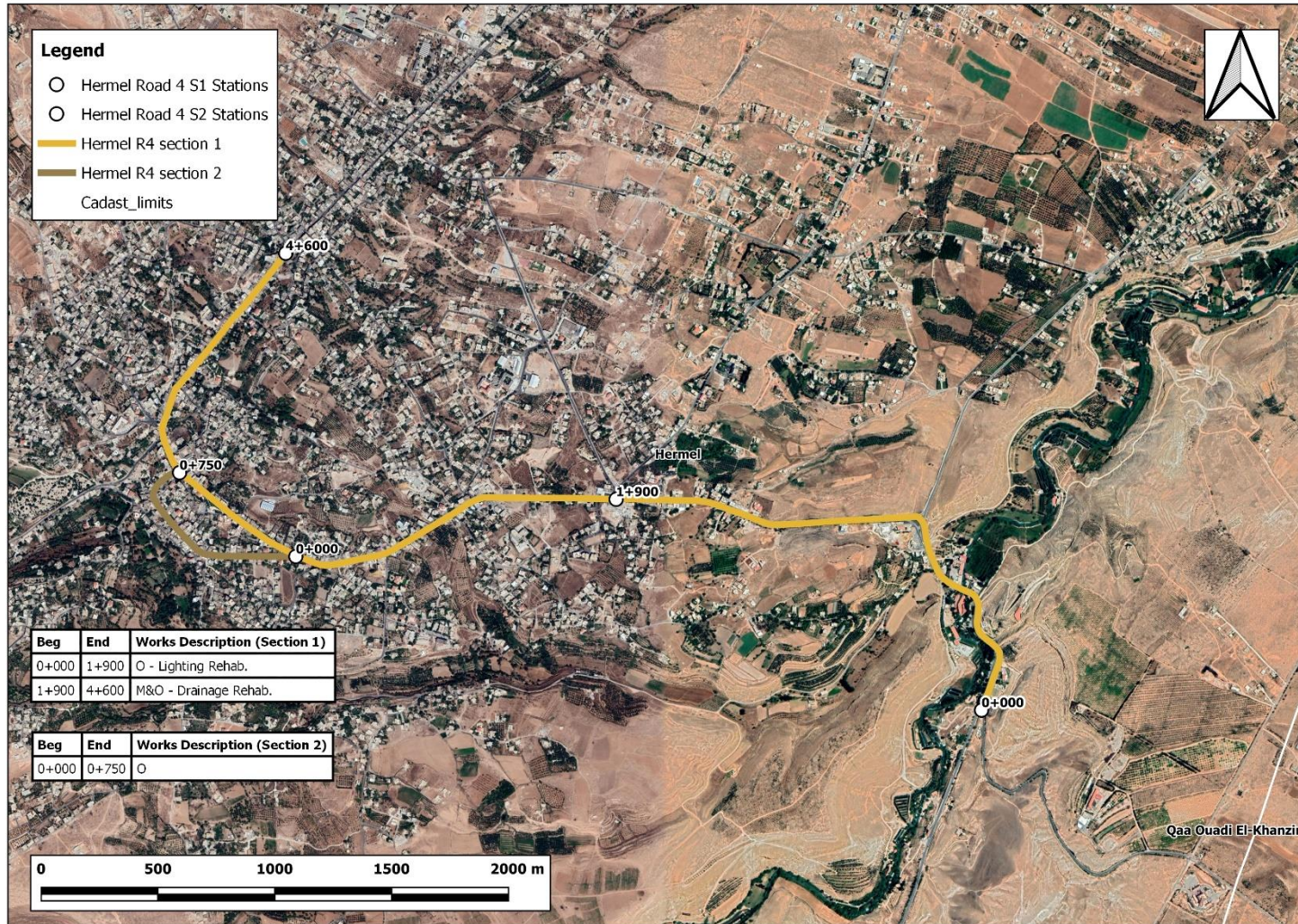
Source: TEAM International, processed by Geoflint

**Table 3-5 Existing road condition survey – Hermel R4 Section 2**

Beg	End	Cadastral Area Name	Road Classification	Urban / Rural	Drainage Assessment	Pavement Assessment	Road Assessment	Safety	Lighting Assessment
0+000	0+750	Hermel	Local	Urban	Acceptable	Overlay	Marking & Improvements	Signage	Acceptable

Source: TEAM International, processed by Geoflint

Figure 3-2 Work stations with road rehabilitation activities along Hermel R4 alignments



Source: Geoflint s.a.r.l. & TEAM International, 2020

### **3.2.2 Hermel R6**

In summary, the safety assessment showed that, due to the area's flat nature, safety barriers are generally not required. Traffic signs, information signs, and marking are absent all throughout the road's length.

Also, due to the surrounding land's agricultural nature, the present drainage channels are generally sufficient. Regarding lighting, the first part in Hermel requires some rehabilitation, the second part around Chouaghir has sufficient lighting, while the third part requires rehabilitation and some additional lighting as well.

As for pavement conditions, overlay is required throughout the road's length.

For relevant data regarding this road, refer to Table 3-6 and Figure 3-3.

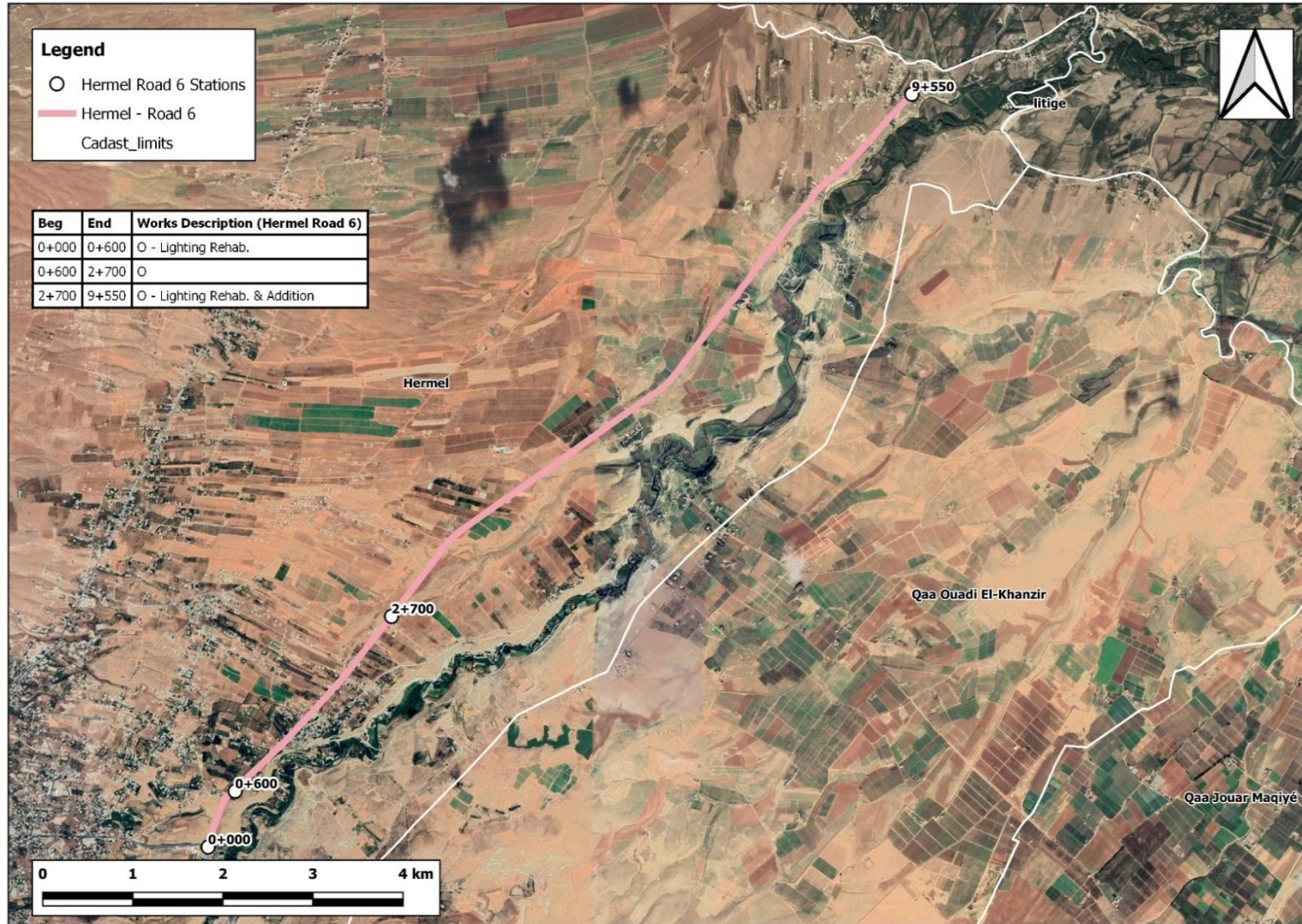
**Table 3-6 Existing road condition survey – Hermel R6**

Beg	End	Cadastral Area Name	Road Classification	Urban / Rural	Drainage Assessment	Pavement Assessment	Road Assessment	Safety	Lighting Assessment
0+000	0+600	Hermel	Local	Rural	Acceptable	Overlay	Marking & Improvements	Signage	Rehabilitation
0+600	2+700	Chouaghir -	Local	Urban	Acceptable	Overlay	Marking & Improvements	Signage	Acceptable
2+700	9+550	Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail	Local	Rural	Acceptable	Overlay	Marking & Improvements	Signage	Rehabilitation & Addition

Source: TEAM International, processed by Geoflint



**Figure 3-3 Work stations with road rehabilitation activities along Hermel R6 alignment**



Source: Geoflint s.a.r.l. & TEAM International, 2020

### **3.2.3 Hermel R7a**

In summary, the safety assessment showed that concrete barriers are required on the first part of the road as opposed to the second part which is flat and generally does not require any safety barriers. Traffic signs, information signs, and marking are absent throughout the road's length. Drainage is acceptable on the road's outer parts, but rehabilitation and some additional drainage is required especially between the towns of Mansoureh, Bouaida, and Nasriye. Also, lighting rehabilitation is required on the second half of the road (between Nasriye and Haouch Beit Ismail).

As for pavement conditions, some milling and overlay is required on the first half of the road while the second half requires pavement reconstruction.

For relevant data regarding this road, refer to Table 3-7 and Figure 3-4.

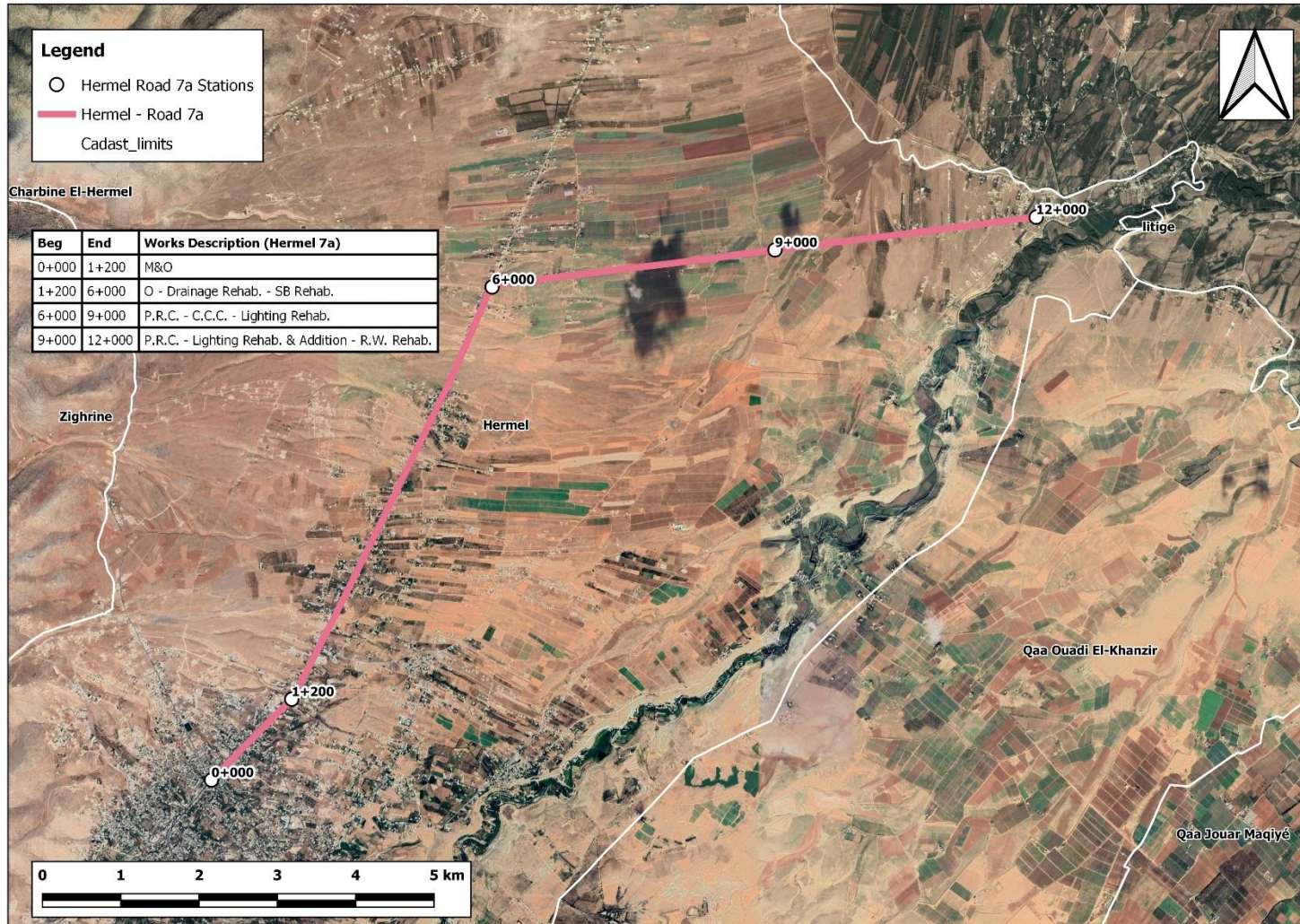
**Table 3-7 Existing road condition survey – Hermel R7a**

Beg	End	Cadastral Name	Area	Road Classification	Urban / Rural	Drainage Assessment	Pavement Assessment	Road Assessment	Safety	Lighting Assessment
0+000	1+200	Hermel		Secondary	Urban	Acceptable	Milling & Overlay	Marking & Improvements	Signage	Acceptable
1+200	6+000	Mansoureh Bouaida - Nasriye	-	Secondary	Urban	Rehabilitation	Overlay	Safety Rehabilitation	Barrier	Acceptable
6+000	9+000	Nasriye		Local	Rural	Installation	Reconstruction	Marking & Improvements	Signage	Rehabilitation
9+000	12+000	Haouch Beit Ismail		Local	Rural	Acceptable	Reconstruction	Retaining Rehabilitation	Wall	Rehabilitation & Addition

Source: TEAM International, processed by Geoflint



Figure 3-4 Work stations with road rehabilitation activities along Hermel R7a alignment



Source: Geoffint s.a.r.l. & TEAM International, 2020

### **3.2.4 Hermel R8**

In summary, the safety assessment showed that, due to the surrounding area's flat nature, safety barriers are generally not required. Traffic signs, information signs, and marking are absent all throughout the road's length.

Drainage channels are in an acceptable condition, barring a section near the middle of the road which requires some rehabilitation. Also, additional lighting is required on the second half of the road.

As for pavement conditions, milling and overlay is required throughout the road's length.

For relevant data regarding this road, refer to Table 3-8 and Figure 3-5.

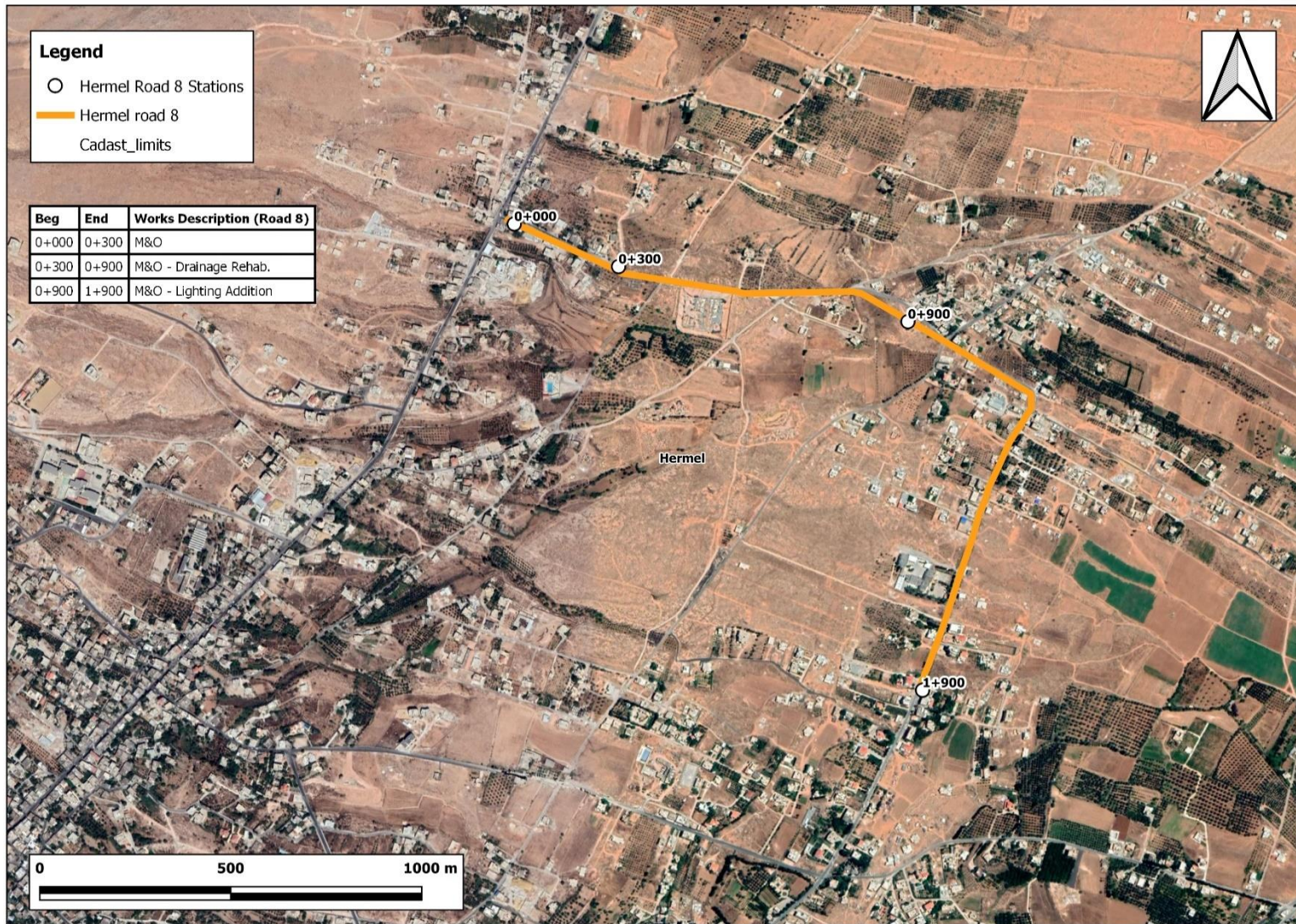
**Table 3-8 Existing road condition survey – Hermel R8**

Beg	End	Cadastral Name	Area	Road Classification	Urban / Rural	Drainage Assessment	Pavement Assessment	Road Assessment	Safety	Lighting Assessment
0+000	0+300	Tall El-Far		Local	Rural	Acceptable	Milling & Overlay	Marking & Improvements	Signage	Acceptable
0+300	0+900	Tall El-Far		Local	Rural	Rehabilitation	Milling & Overlay	Marking & Improvements	Signage	Acceptable
0+900	1+900	Tall El-Far		Local	Rural	Acceptable	Milling & Overlay	Marking & Improvements	Signage	Addition

Source: TEAM International, processed by Geoflint



**Figure 3-5 Work stations with road rehabilitation activities along Hermel R8 alignment**



Source: Geoflint s.a.r.l. & TEAM International, 2020

### **3.2.5 Hermel R9**

In summary, the safety assessment showed that rehabilitation of safety barriers is required in section 1, barring a small section at its beginning. Traffic signs, information signs, and marking are absent all throughout the road's length.

Although the present drainage channels are generally sufficient, some drainage covering is required on the middle part of section 1. Also, lighting is generally sufficient throughout the road's length.

As for pavement conditions, milling and overlay is required on both sections, barring the final part of section 1 near Fissane which has an acceptable pavement condition.

For relevant data regarding this road, refer to Table 3-9, Table 3-10, and Figure 3-6.

**Table 3-9 Existing road condition survey – Hermel R9 – Section 1**

Beg	End	Cadastral Name	Area	Road Classification	Urban / Rural	Drainage Assessment	Pavement Assessment	Road Assessment	Safety	Lighting Assessment
0+000	1+700	Qasr		Local	Rural	Acceptable	Milling & Overlay	Marking & Improvements	Signage	Acceptable
1+700	4+000	Qasr		Local	Rural	Covering	Overlay	Safety Rehabilitation	Barrier	Acceptable
4+000	9+100	Fissane		Local	Rural	Acceptable	Acceptable	Retaining Rehabilitation	Wall	Acceptable

Source: TEAM International, processed by Geoflint

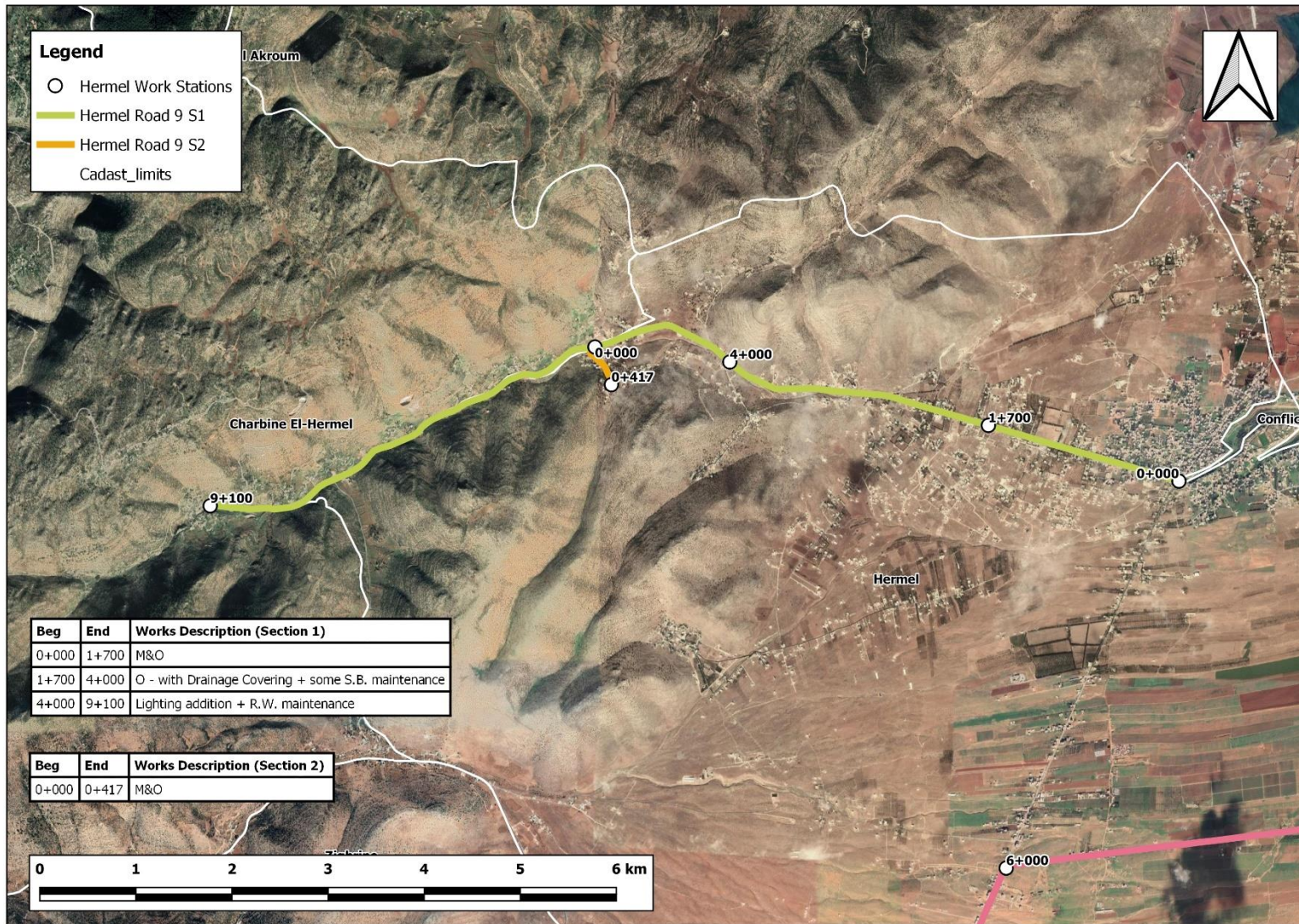
**Table 3-10 Existing road condition survey – Hermel R9 – Section 2**

Beg	End	Cadastral Name	Area	Road Classification	Urban / Rural	Drainage Assessment	Pavement Assessment	Road Assessment	Safety	Lighting Assessment
0+000	0+417	Fissane		Local	Rural	Acceptable	Milling & Overlay	Marking & Improvements	Signage	Acceptable

Source: TEAM International, processed by Geoflint



**Figure 3-6 Work stations with road rehabilitation activities along Hermel R9 alignment**



Source: Geoflint s.a.r.l. & TEAM International, 2020

### 3.3 Contractor's Equipment and Materials

The contractor's equipment needed for the rehabilitation activities are presented in Table 3-11. The quantities of raw materials to be used during the rehabilitation phase are presented in Table 3-12).

**Table 3-11 Contractor's Equipment to be used**

<b>Contractor's Equipment</b>	
Description	No
Excavator	4
Shovel	4
Bob cat	6
Pick-up	5
Truck	7
Water tank	5
Steel roller	4
Conc. transit mixer	4
Asphalt cutter	5
4x4 Vehicles	5
Vehicles	7
Plate compactor	6
Asphalt Paver	3
Jack Hammer	5

**Table 3-12 Quantities of main materials to be used during the whole period of the rehabilitation works**

<b>Material</b>	<b>Unit</b>	<b>Quantity</b>
Excavated Volume	m3	29,200
Retaining Walls	m	80
Culverts	Number	31
Sidewalks	m	5,160
Construction Material	m3	26,100

### 3.4 Site Rehabilitation Staffing

It is estimated that rehabilitation works for Hermel roads will require a total of 18 months. Moreover, around 175 workers will be involved in rehabilitation activities. These workers must be hired preferably from the surrounding local communities (including Syrian labors that reside in the concerned project areas) (Table 3-13)

**Table 3-13 Contractor's Personnel**

<b>Contractor's Personnel</b>	
Project Manager	1
Civil Engineer	6
Surveyor	5
Foreman	6
Watchman	6
Skilled labor	27
Labor	72
Steel fixer	10
Carpenter	10
Operator	26
Office boy	6



Total	175
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### 3.5 Site Facilities & Infrastructure

The Project site will not include any facilities on-site including site offices for Engineers and for the Contractor, laborers camps, lodging on site, containers, power generators and repair garages.

During the work implementation, the Contractor will have to rent a flat located in the Project area to serve as a Project Offices. These offices will be used by the Contractor Engineers, technical skilled workers and Supervising Consultants. The flat will be equipped with toilet, kitchen (including drinking water and appliances), lockers and other supplies needed for the daily administrative activities. It might also serve as a meeting point for all Project workers at the start and end of their shifts.

The work implementation will also require unskilled workers (laborers) needed to perform earthworks on-site. The Contractor will be encouraged to hire laborers from the local community living in the Project area. During working hours, laborers will be entitled with a one-hour break on-site. Usually, every laborer brings from home his own food and drinking water. The on-site rest point will be decided by the Contractor at the time of works.

The Contractor will have to service the on-site with portable cabin toilet. The porta cabin will be mobile and its placement depends on the length of the work zone. Accordingly, the Contractor will have to move it based on the progress of rehabilitation works. The Contractor should link the porta cabin toilet to the existing wastewater network. In case the network is not available within the work zone, the Contractor will need to link it to a polyethylene storage tank and the Supervising Consultant shall inspect it on a regular basis and ensure the application of proper mitigation measures (as guided in section 6.1.1). Mitigation measures include inspecting for leaks and ensuring that the tank is either transported to a nearby WWTP or taken (pumped out) by a specialized contractor.

For vehicles and equipment, the Contractor will have to rent a land within the Project area. This land should be fenced and used for parking purpose only. The Contractor shall not perform any repair on site and is obliged to execute vehicles and equipment maintenance in a repair shop preferably located within the Project area.

## 4. Description of the Environment and Social Context

The environmental and social baseline assessment is a key component in any ESMP study. This assessment will grant an initial assessment of all existing phenomena and conditions in the study area and within the area of influence before the implementation of the project. The aim is to identify key environmental and social issues/impacts that need to be mitigated and monitored during project implementation.

### 4.1 Physical Environment

#### 4.1.1 Topography

Roads under consideration are Hermel R4 (Hermel), R6 (Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail), R7a (Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail), R8 (Tall El-Far), and R9 (Qasr – Fissane) located in Hermel caza. The variation in mean sea level elevations of the vertical alignments are shown in Table 4-1 and the elevation contour lines are shown consecutively in (Figure A to Figure F in Annex 1).

**Table 4-1 Mean sea level elevations of Hermel roads**

Road	Cadastral Area Name		Altitude Range (m)	Mean Elevation (m)
Hermel R4	Section 1	Hermel	589 – 748	676
	Section 2	Hermel		
Hermel R6	Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail		557 – 635	598
Hermel R7a	Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail		557 – 750	642
Hermel R8	Tall El-Far		650 – 709	669
Hermel R9	Section 1	Qasr – Fissane	590 – 1,087	815
	Section 2	Fissane		

#### 4.1.2 Geology

The geology of the studied roads was investigated for outcropping formations, subsurface stratigraphy, structure (faults, folds, seismic, etc.), hydrogeology (groundwater and sea water intrusions) and hydrology (surface water).

All the studied roads are situated on the Quaternary (Q) fluvial terraces and Neogene (N) formations. Hermel R9 encounters one additional formation which is the Q<sub>cg</sub> (quaternary formation consisting of conglomerates). The description of the outcrops is presented in Table 4-2.

**Table 4-2 Geological outcrops exposed along Hermel roads**

Geology	Name	Description
Q <sub>cg</sub>	Quaternary formation	Consisting mainly of conglomerates
Q	Quaternary formation	This formation can reach a thickness of 100 m and typically consists volcanic alluvial deposits or fluvial terraces

N	Middle Miocene Neogene	Thickness between 300m to 400m. Consists of reefy marl limestone with continental conglomerates and a sequence of fractured limestone.
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Source: Dubertret, (1945)

### 4.1.3 Hydrogeology

Geological units can be defined as aquifer or aquiclude in terms of storing and transmitting water, and these types depend on the geological environment in which they occur.

An aquifer can be a subsurface rock or sediment unit that is porous and permeable, high enough that it stores and transmits useful quantities of water. Aquifers are divided into the following categories:

- Confined: overlain by an impermeable rock unit,
- Unconfined: that is not overlain by an -impermeable rock unit, where the water in this aquifer is under atmospheric pressure and is recharged by precipitation that falls on the land surface directly above the aquifer,
- or Semi-confined: partially confined, or overlain, by gravel, sand, silt or soil layers of low permeability through which recharge and discharge can still occur.

Aquiclude is a geological formation which, although porous and capable of absorbing water, does not permit its movement at rates sufficient to furnish an appreciable supply for a well or spring. Alternatively, it could be an impermeable body of rock or stratum of sediment that acts as a barrier to the flow of groundwater.

In the context of Hermel roads, the following characteristics apply:

- All roads encounter a number of surface winter drainage channels which lead to El Assi river
- El Assi river:
  - R4 section 1 crosses the river at station 0+000
  - R6 road flows parallel to the river with less than few meters at certain locations
  - R8 crosses several winter drainage channels leading to the river
- El Sharbin river:
  - R7a at station 7+000 and encounters a number of channels that lead to the river
  - R8 crosses several winter drainage channels leading to the river
  - R9 section 1 crosses several winter drainage channels leading to the river
- Wadi El Fissane:
  - R9 section crosses the river and runs parallel to it between station 4+000 and 9+100

In terms of hydrostratigraphy, all roads encounter two different subsurface classes 2 and 7. Class 2 is a highly karstified formation which is distinguished by a high porosity, permeability, and transmissivity. The aquifer hosted by the subsurface of this formation is highly likely to be contaminated in case accidental spill occur during rehabilitation works. In addition, class 7 is a porous formation that has good permeability but the underlying semi-aquifer has a poor transmissivity which limits spread of contamination if it occurred.

## **Summary**

All Hermel roads are considered highly sensitive in terms of surface and groundwater vulnerability. In terms of the subsurface, the roads are situated on karsitified formations that allow the infiltration of any liquid spilled on the surface due to their high permeability characteristics. This can lead to increased likelihood of groundwater contamination. In terms of surface water quality, the roads cross or are in close proximity to Al Assi Perennial River and other secondary rivers (El Sharbine and El Fissane).

**Table 4-3 Legend of the hydrogeology maps presented in Annex 1**

Geology Class	Groundwater Sheets		Permeability	Lithology	Age	Flows of the sources I/sec.	Probable instantaneous flows of the works I/sec.	Transmissivity m <sup>2</sup> /sec
				Facies				
2	<b>IN KARSTIC FORMATIONS</b> Wide and rich watertable		High	Limestone regularly bedding Thickness: 800 to 1000 m.	Cretaceous Cenomanian-Turonian	<100 100-1000 >1000	>100	10 <sup>-2</sup> ≤ T ≤ 1 Generally high
7	<b>IN POROUS FORMATIONS</b>	<b>Water Table extended</b>	Medium	Coarse conglomerate torrential - marly conglomerates Thickness: 500 to 600 m.	NEOGENE Miocene and Pliocene (continental facies)	<100 OR DISPERSED DIFFUSE DISCHARGES	<30	<10 <sup>-3</sup> Poor or changing

Road (Hermel)	Geology Class		
	2	7	
R4		x	<i>The roads lie on the following geology classes</i>
R6		x	
R7a		x	
R8		x	
R9	x	x	

#### **4.1.4 Climate and Meteorology**

The climate and meteorological parameters play a vital role in transport and dispersion of pollutants in the atmosphere. Thus, the collection and analysis of meteorological information, including primarily precipitation, ambient temperature, wind direction and speed, are essential data for adequately assessing environmental impacts. The most significant meteorological parameters that influence the direct environmental impacts at the proposed project are: wind due to its ability to carry dust and odors to nearby communities; and precipitation due to its ability to enhance the infiltration of accidental spills and contaminated rehabilitation wastewater within the area depending on site operation procedures. Meteorological data are obtained either from the closest available stations and whenever not available satellite data are used and referenced in the text.

##### **Hermel Roads**

###### *Precipitation rates*

Precipitation in the summer season between the month of June and September is negligible (~ 6.5 mm) (Figure V in Annex 1). The highest precipitation is recorded in January with an average value of 127 mm and the total annual precipitation is 594 mm.

###### *Temperature (Land Surface)*

The hottest month in the area is August (32.8 °C) and the coldest month is January (3 °C). Fluctuations in the temperature values are shown in Figure W (in Annex 1).

###### *Wind Records*

This report will use freely publicly available modelled or prognostic data provided by meteoblue. Meteoblue is a prognostic climate model that has more than 220 million data points and a resolution of 30 arc seconds, with a spatial resolution of maximum 30 km, and has been collecting climate data from the year 1982 until 2012 (30-year period).

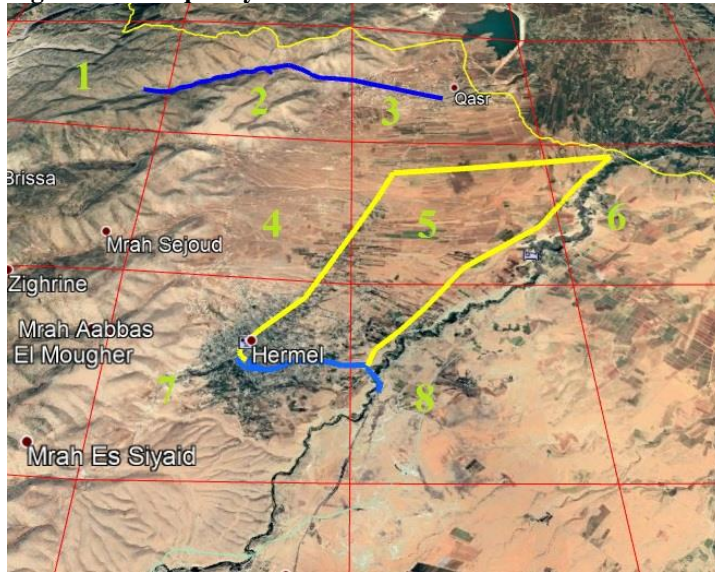
In this context, with reference to Figure X, dominant wind in the area blows from the North-West and West-North West, with speeds varying between 0.3 m/s and 8 m/s.

#### **4.1.5 Air quality and Noise**

##### a) Air Quality

Air quality is an essential component in assessing social wellbeing and health status of a community. Developing baseline information will help in comparing the impacts of the project relative to the existing conditions. Ambient air quality data was gathered from the UNDP project “Air quality assessment in an East Mediterranean country: the case of Lebanon” which is based at the Ministry of Environment. The UNDP/MoE monitors the criteria pollutants: Particulate Matter (PM), Ozone (O<sub>3</sub>), Carbon monoxide (CO), Nitrogen dioxide (NO<sub>2</sub>), Sulfur dioxide (SO<sub>2</sub>) which are recognized by national and international organizations as good indicators of anthropogenic emissions.

**Figure 4-1 Air quality cells for Hermel roads**



Source: MoE, 2019

**Table 4-4 Ambient air quality in  $\mu\text{g}/\text{m}^3$  for Hermel roads**

Cell ID	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	CO
1	7.00	85.62	14.08	12.45	6.51	184.59
2	5.67	85.68	13.97	12.43	6.12	180.13
3	8.48	81.66	15.09	13.54	8.38	187.62
4	5.07	85.68	13.14	11.78	5.20	175.40
5	17.23	73.32	16.67	15.09	12.46	206.18
6	7.96	80.20	14.80	13.26	7.91	189.90
7	4.32	84.26	12.61	11.36	4.56	173.02
8	8.28	80.03	14.03	12.62	6.99	190.34
<b>Average</b>	<b>8.00</b>	<b>82.06</b>	<b>14.30</b>	<b>12.82</b>	<b>7.27</b>	<b>185.90</b>
Lebanese Ambient Air Quality standards, Decision 52/1	100	100	80	-	80	10,000
NAAQS, EPA	107.6	147.7	150	35	84.6	11,070
Exposure Duration	1 year	8 hours	24 hours	24 hours	1 year	8 hours

The average concentration of the chosen criteria pollutants presented in Table 4-4 above show good ambient air quality along the roads as the numbers are much less than permissible limits presented in the national guidelines (Decision 52/1) and the international USEPA National Ambient Air Quality Standards (NAAQS) standards.

b) Noise

Noise levels were measured at each of the road sections using a handheld decibel meter. The meter used is of type Nady DSM-1X Specs having an accuracy of  $\pm 1.4$  dB with a frequency range of 31.5 to 8,000 Hz.

Measurements were taken based on the working stations assigned by TEAM INTERNATIONAL. The schedule of the acoustic survey was planned based on availability of transportation, availability of the handheld decibel meter, availability of staff, and availability of time.

#### **(1)Hermel R4**

Results are reported in Table A (in Annex 1), showing minimum, equivalent continuous A-weighted sound level, maximum, allowable noise level according to Lebanese guidelines, and date and time of acquisition per road work station. Measured sound exposure levels varied from as low as 47.6 decibels (dB) to as high as 81.9 (dB), where the equivalent continuous noise level ( $L_{eq}$ ) varied between 64 (dB) and 66.4 (dB) along the whole road section. The road has an average  $L_{eq}$  of 65 (dB).

A study done in 2004 aimed at comparing magnitudes of different sound pressure values (dB) with the noise generated from an ordinary conversation (refer to Table F in Annex 1). In this context, on average, a person walking along this road will experience an average sound magnitude of 65 (dB), which falls between the sound pressure generated by an ordinary conversation or twice as loud.

#### **(2)Hermel R6**

Similar to the above, measured sound exposure levels (Table B in Annex 1) varied from as low as 46.9 decibels (dB) to as high as 74.6 (dB), where the equivalent continuous noise level ( $L_{eq}$ ) has an average of 64.5 (dB).

Similarly, with reference to Table F (in Annex 1), a person walking along this road will experience a sound magnitude of 64.5 (dB), which falls between the sound generated by an ordinary conversation or twice as loud.

#### **(3)Hermel R7a**

Similar to the above, measured sound exposure levels (Table C in Annex 1) varied from as low as 42.7 decibels (dB) to as high as 85.8 (dB), where the equivalent continuous noise level ( $L_{eq}$ ) has an average of 62(dB).

Similarly, with reference to Table F (in Annex 1), a walking along this road will experience a sound magnitude of 62 (dB), which is equivalent to an ordinary conversation.

#### **(4)Hermel R8**

Similar to the above, measured sound exposure levels (Table D in Annex 1) varied from as low as 38.8 decibels (dB) to as high as 81.5 (dB), where the equivalent continuous noise level ( $L_{eq}$ ) has an average of 60 (dB).

Similarly, with reference to Table F (in Annex 1), a walking along this road will experience a sound magnitude of 60 (dB), which is equivalent to an ordinary conversation.



## **(5)Hermel R9**

Similar to the above, measured sound exposure levels (Table E in Annex 1) varied from as low as 40.6 decibels (dB) to as high as 83.4 (dB), where the equivalent continuous noise level ( $L_{eq}$ ) has an average of 60 (dB).

Similarly, with reference to Table F (in Annex 1), a walking along this road will experience a sound magnitude of 52 (dB), which is equivalent to an ordinary conversation.

### **4.2 Biological Environment and Land use/Land Cover**

In the context of this ESMP for the road rehabilitation project in Hermel Caza, the direct influence area concerns existing roads. Consequently, a rapid biological assessment has been carried out to draw the ecological profile of the adjacent areas to the concerned road, assess key habitats and flora diversity to identify those species endangered or IUCN-listed that are at added risk from the proposed project. This will serve the management plan and the mitigation measures that will be taken in order to reduce the project's potential impact on the local environment.

The assessment was based on field surveys and generated Land use/Land Cover (LULC) maps for each studied road.

#### **4.2.1 Field Survey**

##### *Dates, Methodology, and Limitations*

Given the limited timeframe of this study, a single field visit was set for each road (not necessarily during the best period for field visits due to time limitations). The field investigation did not aim for an exhaustive inventory of the biodiversity of the project area but a general overview of present species (mainly flora) and habitats. This general approach allows the identification of the conservation status of the natural habitats.

Moreover, LULC maps were generated for each road and compiled with site visits observations with respect to adjacent key habitats to the concerned roads.

Walking transects were recognized to obtain an understanding of the vegetation communities in the area and record existing species. Knowing that a single visit is not enough, the study had to consider some species as potentially present. Moreover, it was difficult to perform a complete faunal survey. Thus, information on fauna does not only include the encountered species during the field visit, but also potential species were considered in this assessment (fauna listing is only provided for roads that involve rich habitats). The potentiality of presence of a species was based on: (a) the occurrence of the species habitat; (b) observations of the species near the study area; (c) the fact that the study area is in the distribution range of the species; and (d) related scientific papers.

#### **4.2.2 Evaluation Criteria**

Various regulatory and scientific criteria allow organizing in a hierarchy the importance of habitats and species observed in a given area. These criteria include the endemism, rarity, the ecological importance (key species, specialized species, etc.); the biological status (migratory species, breeding species, etc.); and the biological susceptibility.

There is no list of protected species in Lebanon. The protected species are therefore considered based on international conventions for which Lebanon is part of and the IUCN Middle East red list. In this assessment, the ecological value of species was based on their local ecological importance (distribution of species and degree of endemism (Tohmé and Tohmé, 2014) and IUCN classification).

### **4.2.3 Results**

#### 4.2.3.1 Hermel R4 (Hermel)

### **Study Area**

#### Project settlement

Hermel R4 consists of two sections or alignments that have a combined length of 5.0 km.

- Section 1 starts at an elevation of 597 m, descends slightly to reach its minimum elevation of 589 m, and then ascends until it ends at 748 m.
- Section 2 consists of a short 750 m segment that starts at an elevation of 715 m and ascends until it ends at its highest elevation of 737 m.

The road is classified as a primary road for around 4.6 km (section 1) and local road for the remaining part (section 2). It is settled between 589 and 750 m. Hence, the studied area covers the 'Eu-Mediterranean' zone. According to CORINE classification, the Eu-Mediterranean' zone ranges from 500 to 1,000 m. The altitudinal range plays an important role in plant composition (Abi Saleh, 1996).

### **Natural Habitats and Associated Flora**

The main encountered habitats that are adjacent to Hermel R4 are primarily artificial areas, agricultural lands, grasslands, and unproductive lands as per field visit and the LULC map provided by the National Center for Scientific Research. Refer to Figure Y and Figure Z (in Annex 1), and Table 4-5.

The main landscape is characterized by grasslands and degraded grasslands, woodlot (riparian formations along the river), agricultural, artificial and unproductive areas (unproductive soils). More specifically, section 1 of Hermel R4 consists of agricultural lands, grasslands, and fallow lands, whereas section 2 consists of residential areas. Despite the importance of Semi-arid Mediterranean grasslands, these systems are generally degraded due to land use changes and invasive species. In other words, land-use intensification due to grazing and cropland conversion have certainly affected grassland productivity in the area. Hence, no listing of flora or fauna will be provided for this road.

Further, section 1 of Hermel R4 crosses El Assi River at station 0+000. Aquatic ecosystems (rivers and groundwater) support the delivery of crucial ecosystem services, such as water provisioning, purification of water and its storage in good quality, active biodegradation of anthropogenic contaminants, nutrient recycling, and mitigation of droughts. However, sustainable protection and management of important groundwater ecosystem services will require assessment of their resistance and resilience with regard to common anthropogenic impacts (Grizzetti et al., 2016).

**Table 4-5 Main Habitats Encountered along Hermel R4**

Habitats types in LULC Map	Field Visit Observation
Agricultural areas	<ul style="list-style-type: none"> <li>• Agricultural terraces</li> <li>• Fallow lands</li> <li>• Cultivated trees</li> </ul>
Artificial areas	<ul style="list-style-type: none"> <li>• Residential and commercial units bordering the road</li> </ul>
Grasslands	<ul style="list-style-type: none"> <li>• Grasslands (continuous cover of grasses).</li> <li>• Degraded grasslands (Land-use intensification due to grazing and cropland conversion have certainly affected grassland productivity in the area).</li> </ul>
Unproductive lands	<ul style="list-style-type: none"> <li>• Unproductive soils</li> </ul>

**Figure 4-2 Shops and residential units bordering Hermel R4**



#### 4.2.3.2 Hermel R6 (Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail)

##### **Study area – Project settlement**

Hermel R6 consists of a single alignment with a total length of 10.0 km. It starts at the periphery of Hermel (at 600 m), sharply ascends to reach its maximum elevation of 635 m, then descends as it passes through Chouaghir and Mazraat Beit Et-Tachem until it ends at Haouch Beit Ismail at its minimum elevation of 557 m.

The road is classified as a local road and covers the ‘Eu-Mediterranean’ zone as it is settled between 557 m and 635 m. According to CORINE classification, the Eu-Mediterranean’ zone ranges from 500 to 1,000 m.

### Natural Habitats and Associated Flora

The main encountered habitats that are adjacent to Hermel R6 are primarily agricultural lands, and grasslands as per field visit and the LULC map provided by the National Center for Scientific Research. Refer to Figure AA (in Annex 1) and Table 4-6.

The studied road involves a path that is already under anthropogenic influences. The road is mainly bordered by agricultural lands and grasslands. Hermel R6 flows parallel to Al Assi River that is protected by MoE under decision No. 189 (dated 1998) with less than few meters at certain locations. Despite the importance of riparian ecosystems no listing of flora or fauna will be provided for this road (limited time and data). The Contractor should be careful when work activities will take place near this critical ecosystem. The project should not add pressures on the river and riparian habitats.

**Table 4-6 Main Habitats Encountered along Hermel R6**

Habitats types in LULC Map	Field visit observation
Agricultural areas	<ul style="list-style-type: none"> <li>• Agricultural lands including Olive groves</li> <li>• Fallow lands</li> <li>• Cultivated trees namely pseudo acacia</li> </ul>
Grasslands	<ul style="list-style-type: none"> <li>• Grasslands</li> <li>• Degraded grasslands</li> </ul>

**Figure 4-3 Olive groves bordering Hermel R6**



**Figure 4-4 Cultivated trees bordering Hermel R6**



**Figure 4-5 Fallow lands bordering Hermel R6**



#### 4.2.3.3 Hermel R7a (Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail)

### Study Area

#### Project settlement

Hermel R7a consists of a single alignment with a total length of 13.0 km. It starts at Hermel, at an elevation of 750 m, and descends, passing through Mansoureh, Bouaida, and Nasriye, until it ends at Haouch Beit Ismail at its minimum elevation of 557 m.

The road is classified as a secondary road for approximately 6 km and as a local road for the remaining part. The studied area covers the ‘Eu-Mediterranean’ zone as the road is settled between 589 and 750 m. According to CORINE classification, the ‘Eu-Mediterranean’ zone ranges from 500 to 1,000 m. The altitudinal range plays an important role in plant composition (Abi Saleh, 1996).

### Natural Habitats and Associated Flora

The main encountered habitats that are adjacent to Hermel R7a are primarily agricultural lands, and grasslands as per field visit and the LULC map provided by the National Center for Scientific Research. Refer to Figure BB (in Annex 1) and Table 4-7.

The studied road involves a path that is already under anthropogenic influences. The road is mainly bordered by agricultural lands and grasslands. Hermel R7a crosses el Charbin River at station 7+000 and encounters a number of channels that lead to the river.

**Table 4-7 Main Habitats Encountered along Hermel R7a**

Habitats types in LULC Map	Field visit observation
Agricultural areas	<ul style="list-style-type: none"> <li>• Agricultural terraces</li> <li>• Fallow lands</li> <li>• Cultivated trees</li> </ul>
Grasslands	<ul style="list-style-type: none"> <li>• Grasslands (continuous cover of grasses).</li> <li>• Degraded grasslands</li> </ul>

**Figure 4-6 Scrubland and degraded grasslands**



#### 4.2.3.4 Hermel R8 (Tall El-Far)

### Study Area

Hermel R8 is located in Tall El-Far within Hermel Caza and consists of a single alignment with a total length of 1.9 km. It starts at an elevation of 709 m, and descends until it ends at its minimum elevation of 650 m. The road is classified as a local road and covers the ‘Eu-Mediterranean’ zone. According to CORINE classification, the Eu-Mediterranean’ zone ranges from 500 to 1,000 m. The altitudinal range plays an important role in plant composition (Abi Saleh, 1996).

### Natural Habitats and Associated Flora

The main encountered habitats that are adjacent to Hermel R8 are primarily agricultural lands, and grasslands as per field visit and the LULC map provided by the National Center for Scientific Research. Refer to Figure CC (in Annex 1) and Table 4-8.

The studied road involves a path that is already under anthropogenic influences. The road is mainly bordered by agricultural lands and grasslands. Hermel R8 crosses several winter drainage channels leading to the Sharbin River.

**Table 4-8 Main Habitats Encountered along Hermel R8**

Habitats types in LULC Map	Field visit observation
Agricultural areas	<ul style="list-style-type: none"> <li>• Agricultural terraces</li> <li>• Fallow lands</li> <li>• Cultivated trees</li> </ul>
Artificial areas	<ul style="list-style-type: none"> <li>• Residential units and small shops</li> </ul>
Grasslands	<ul style="list-style-type: none"> <li>• Degraded grasslands</li> </ul>
Riparian habitats	<ul style="list-style-type: none"> <li>• Riparian habitats</li> </ul>

**Figure 4-7 Urban settlements bordering Hermel R8**



#### 4.2.3.5 Hermel R9 (Qasr – Fissane)

Hermel R9 is located in Hermel Caza and consists of two sections or alignments that have a combined length of 9.0 km.

- Section 1 starts in Qasr (at 590 m) and ascends until it ends at Fissane at its maximum elevation of 1,087 m.
- Section 2 consists of a short 417 m segment within Fissane that starts at an elevation of 847 m and gradually ascends until it ends at its highest elevation of 867 m.

The road is classified as a local road and covers the ‘Eu-Mediterranean’ and Supra-Mediterranean Zones as it is settled between 590 and 1,087m.

#### **Natural Habitats and Associated Flora**

The main encountered habitats that are adjacent to Hermel R9 are primarily agricultural lands, grassland, and wooded lands as per field visit and the LULC map provided by the National Center for Scientific Research. Refer to Figure DD and Figure EE (in Annex 1) and Table 4-9.

Further, R9 section 1 crosses several winter drainage channels leading to El Sharbine River and crosses Wadi El Fissane and runs parallel to it between station 4+000 and 9+100

**Table 4-9 Main Habitats Encountered along Hermel R9**

Habitats types in LULC Map	Field Visit Observation
Agricultural areas	<ul style="list-style-type: none"> <li>• Agricultural terraces and fallow lands</li> <li>• Cultivated trees bordering the studied road</li> </ul>
Grasslands	<ul style="list-style-type: none"> <li>• Grasslands (continuous cover of grasses).</li> </ul>
Wooded lands	<ul style="list-style-type: none"> <li>• Patches of Kermes Oak</li> <li>• Cultivated trees, namely umbrella pine and Pseudo Acacia.</li> </ul>



**Figure 4-8 Woodland bordering Hermel R9**



#### **4.2.4 Summary of Results**

In summary, the assessment showed that the studied roads are mainly bordered by grasslands and degraded grasslands, woodlot (riparian formations along the river), agricultural, artificial and unproductive (unproductive soils) areas. In this context, the area does not provide an important habitat for a large variety of flora and fauna (i.e. the studied area is impacted by human activities).

Despite the importance of Semi-arid Mediterranean grasslands, these systems are generally degraded due to land use changes. In other words, land-use intensification due to grazing and cropland conversion have certainly affected grassland productivity in the area.

Finally, rivers, riparian habitats, and groundwater dependent ecosystems need special attention during the rehabilitation phase. These ecosystems are of high ecological significance. All the studied roads encounter a number of surface winter drainage channels which lead to El Assi River. Further, El Assi River and Hermel R4 section 1 intersect and Hermel R6 road flows parallel to the River with less than few meters at certain locations. Whereas, Hermel R7a intersects with Sharbin River and Hermel R8 and Hermel R9 section 1 crosses several winter drainage channels leading to the same River. Lastly, R9 crosses Wadi El Fissane.

### **4.3 Socio-Economic Condition**

This section describes the social and economic conditions of Hermel Caza where Hermel R4 (Hermel), R6 (Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail), R7a (Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail), R8 (Tall El-Far), and R9 (Qasr – Fissane) will be rehabilitated.

#### **4.3.1 Relevant Caza Background**

##### *Demographic Profile*

The district of Hermel is one out of the 26 districts of Lebanon, occupying 731 km<sup>2</sup> of surface area. According to the latest national report (MoPH, 2016), Hermel caza has a total population of 61,955 (excluding Syrians displaced), accounting for 1.42 % of the total national population. According to UNDP (2008), the overall headcount poverty within Hermel-Baalbek strata is 32%, compared to Lebanon's average of 27. Approximately 6,632 Syrian refugees are



registered in Hermel (UNHCR, 2019). Syrian refugees are generally spread out through different areas of the community.

### Syrian Refugees

Out of the total population of 61,955 in Hermel, 6,039 are registered Syrian displaced. Out of the total registered displaced Syrian families in Hermel, 68.1% reside in informal settlements. For instance, the 532 informal settlements are hosting 53,585 registered Syrians displaced. Also, 2.5% of the displaced people live in collective shelters (OCHA, 2015).

**Table 4-10 Number of Syrians Displaced as per UNHCR**

Caza	Total No. of Persons	Total No. of Families
Hermel	6,039	1,269

Source: UNHCR, 2016

### Infrastructure and Healthcare Sector

Due to the increase in the overall population of Hermel in the past few years and a decrease in the average precipitation level over the past 30 years, the area continues to suffer from scarcity in water supply and inadequate water quality and sanitation services. Regarding infrastructure, no wastewater treatment plants are available in the Hermel Caza. In fact, safe sewage networks are almost non-existent. Most residents rely entirely on sewage pits, with all the related risks for the environment and for human health. Even open discharge into valleys or along roads is practiced. It can be safely assumed that the poor management of sewage indicates an equally poor status of handling solid waste. These observations confirm the elevated environmental risks in Hermel (CDR, 2005)<sup>3</sup>.

Hermel is part of the group of districts that are considered to have the least developed infrastructure. While about 90% of residents in Beirut, Mount Lebanon, Tripoli, Bekaa, Nabatiyeh, and the South are connected to the public water network, this percentage is much lower in other regions as only 60% are connected in Hermel and Baalbek.

Also, it was observed that in Hermel the bad road conditions are leading to numerous accidents (CDR, 2005).

The roads in Hermel are damaged and greatly lack proper safety measures, hence increasing the risk of accidents. Such deteriorating roads also hinder the easy access to the rural peripheries by limiting the mobility of the general population. Moreover, the absence of sufficient rainwater collection canals leads to often blocked roads during severe weather, mainly during the winter.

Regarding health care facilities, Hermel caza consists of different facilities ranging from public and private hospitals, and private clinics. However, the number of these facilities is not very high. For example, Hermel has 10 or fewer dispensaries (CDR, 2005). The main healthcare

<sup>3</sup> Despite its date, this is the latest source that is published, available online, and contains comprehensive information regarding different aspects of Hermel's caza background (the situation remains the same based on site visit of February 2020).

centers in Hermel are: Al Assi Hospital (480 m away from Hermel R4 section 1), Al Batoul Hospital and Hermel Governmental Hospital (1 km away from Hermel R4 section 1). Therefore, these hospitals will not be affected by the project.

### Educational Sector

Illiteracy remains a social problem in Hermel, which contains a total of five schools. The overall average of illiteracy exceeds 16 %, compared to a national average of 13.4 %. In the case of Hermel, illiteracy rates reach 25.30 % and above. Moreover, illiteracy among women is very pronounced. It reaches often more than twice the frequency of illiteracy among men. Also, it is one of the districts that have the lowest concentration of private schools (CDR, 2005).

Several public and private schools are established in the project area such as Hermel School (10 m away from Hermel R4 section 1), Ecole Normal de Hermel (Hermel Normal School) (40 m away from Hermel R6), ثانوية الهرمل النموذجية الرسمية (Hermel Official High School) (20 m away from Hermel R8), المدرسة الفندقية (Hospitality School) (25 m away from R4 section 1) and معهد الهرمل الفني (Hermel Technical Institute) (60 m away from R7a). Therefore, the nearest sensitive receptor to be mostly affected is Hermel Normal School.

### Electricity

The electricity network suffers from poor distribution, in addition to the problems of power shortages. In general, electricity is supplied through Electricité du Liban (EDL), an autonomous state-owned entity under the jurisdiction of the Ministry of Energy and Water (MoEW). Although EDL provides the electrical power to Hermel, not all houses are connected to the electricity grid. The region witnesses frequent power outages and weak electricity supply. Significant instabilities including lack of proper maintenance and power supply interruptions are common.

### Economic Background

Rafting is well developed in the Hermel area, due to the presence of the Aassi River there, which led to the operation of several rafting clubs and a significant number of restaurants. However, together with its directly related sub-sectors of input supply, processing, marketing and transport of farming produce, agriculture represents by far the most important livelihood opportunity, especially in the poorest sub governorates of Baalbek-Hermel. In other words, agriculture is the primary source of income and employment, particularly for the poorest communities. In fact, an estimated 20% of all farmers in Lebanon are located in Baalbek-Hermel and the Bekaa (UN/FAO, 2014). Also, the overall headcount poverty rate in Baalbek/Hermel is 32%, compared to Lebanon's average of 27 % (UNDP, 2008).

#### **4.3.2 Road Sensitive Receptors**

Sensitive receptors were collected during the field visits and previous surveys for similar projects. The data was analyzed using ArcGIS. Categories considered as sensitive receptors during road rehabilitation are schools, churches, hospitals, mosques, closest residential buildings, and other archeological features (refer to Figure FF, Figure GG, Figure HH, Figure II, Figure JJ, Figure KK and Figure LL in Annex 1).

The main sensitive receptors encountered along the Hermel roads are presented as follows:

#### **Hermel R4 section 1**

- Agricultural lands, degraded grasslands, fallow lands and dispersed residential units from station 0+000 to station 1+900
- Residential agglomerations and commercial areas from station 1+900 to station 4+600
- The highly affected sensitive receptors along the road include Hermel School and a Cemetery (ضريح الرئيس صبري حمادة) which are 10 m away from the road.

#### **Hermel R4 section 2**

The road is mainly surrounded by residential agglomerations and commercial areas.

#### **Hermel R6**

- Agricultural lands and dispersed residential areas from station 0+000 to station 2+700
- Agricultural areas, fallow lands and degraded grasslands from station 2+700 to station 12+000

#### **Hermel R7a**

- Residential agglomerations from station 0+000 to station 1+200
- Dispersed residential areas, agricultural lands and fallow lands from station 1+200 to station 12+000

#### **Hermel R8**

The road is mainly surrounded by degraded grasslands, agricultural lands and dispersed residential areas.

#### **Hermel R9 section 1**

- The road is surrounded by residential areas and agricultural lands between stations [0+000 to 1+700].
- Grasslands and wooded lands from station 1+700 to station 9+100.

#### **Hermel R9 section 2**

The road is mainly surrounded by grasslands and wooded lands in addition to few residential units.

A summary of the nearby sensitive receptors surrounding the studied roads along with their respective distances is shown in Table G (in Annex 1).

#### **4.3.3 Traffic Survey**

For the purpose of road rehabilitation; which requires pavement analysis and design, a traffic survey was conducted by TEAM INTERNATIONAL. The survey focused on the gathering of baseline data for the existing road conditions, and the Average Daily Traffic (ADT) was the main parameter collected.

The data collection program consists of automatic classified counts with wide range of traffic count conditions and road characteristics.

The distribution of the ATC Stations throughout Hermel caza is shown in Figure MM and Figure NN (in Annex 1). The ADT values for all the roads are presented in Table H.

One ATC station was installed along each of the roads in order to determine level of traffic. The ADT counts are the following: R4: 4,699 veh/day, R6: 1,202 veh/day, R7a: 6,952 veh/day, R8: 2,254 veh/day, and R9: 2,781 veh/day.

The traffic counts varied where the lowest volume is encountered at Hermel R6 (1,202 vehicles/day) and the highest at Hermel R7a (6,952 vehicles/day), where both alignments are classified local roads. Hermel R4, which is a primary road, hosts a traffic volume of 4,699 vehicles per day.

## 5. Potential Environmental and Social Impacts

The expected social and environmental impacts were assessed during both the rehabilitation and operation phases of the project (refer to impact methodology in Annex 2). Regarding the operation phase, this assessment entails the “**Defects Liability Period**” during which the Contractor is responsible for maintenance activities.

Regarding the social assessment, potential beneficiaries of the project and the adversely affected groups, including Lebanese and Syrians involved in the project and/or living in the surrounding communities of Hermel R4 (Hermel), R6 (Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail), R7a (Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail), R8 (Tall El-Far), and R9 (Qasr – Fissane) were considered in this assessment.

Moreover, concerning refugee camps, during the site visits to Hermel R4, R6, R7a, R8, and R9 refugee camps of vulnerable groups such as Syrians were not observed. As such, impacts on socio economic conditions of vulnerable groups (poor households, elderly and Syrian refugees) were assessed as part of the impacts on the surrounding residential areas. At the project area, displaced Syrians are not living in specific camps, and thus are considered as part of the local communities of Hermel. Moreover, it is important to mention that rehabilitation and maintenance works in Hermel R4, R6, R7a, R8, and R9 will not require land acquisition, therefore, vulnerable groups (poor households, elderly and Syrian refugees) residing along the roads to be rehabilitated in Hermel Caza will not be relocated.

### 5.1 Positive Impacts during Rehabilitation

#### 5.1.1 Positive Social Impacts

Positive socio-economic impacts, during rehabilitation, is creating direct and indirect short-term jobs for Lebanese and Syrians living in the community around the selected roads. In turn, local economic development and livelihood opportunities will be enhanced. Direct job opportunities at the selected road rehabilitation sites will be offered to poor communities and vulnerable groups (low skilled Lebanese and Syrians) in order to enhance their socio-economic conditions. The roads rehabilitation project will also create indirect jobs for low skilled Lebanese and Syrians in supporting industries and services (such as production of construction materials at local shops and factories, transportation of materials, maintenance of equipment).

In addition, it is important to mention that the REP may positively impact the commercial shops mainly surrounding Hermel R4 S1 (between stations 1+900 – 4+600) and Hermel R4 S2 by the rehabilitation activities as workers will buy goods from local shops. However, it is to be noted that this a temporary potential positive impact during construction works and not all shops may necessarily benefit from this. It is important to mention, the community surrounding the roads will not experience economic displacement, for instance, loss of assets or loss of income sources or means of livelihood.

Moreover, the road rehabilitation project will also enhance the local economic development of the surrounding community in the following three cases:

- Knowing that the Contractor will not perform vehicle and equipment repair onsite, preferably maintenance activities will be done in repair shops surrounding the Hermel R4, R6, R7a, R8, and R9.
- The Contractor will rent a fenced land for the equipment in addition to, possibly, an office space in the surrounding area of Hermel R4, R6, R7a, R8, and R9.

Further, Lebanese and Syrian workers' skills and experience in road rehabilitation and maintenance will be strengthened, as a result of the learning and training programs of the job onsite.

## **5.2 Potential Negative Impacts during Rehabilitation**

### **5.2.1 Potential Negative Environmental Impacts**

Negative impacts that may derive from the project rehabilitation phase are namely adverse impacts on the local environment. This section elaborates the potential impacts on each environmental component.

#### **5.2.1.1. Impacts on Water Quality**

The roads in Hermel Caza fall on the Quaternary (Q) fluvial terraces and Neogene (N) formations. Hermel R9 encounters one additional formation which is the Q<sub>cg</sub> (quaternary formation consisting of conglomerates).

All Hermel roads are considered highly sensitive in terms of surface and groundwater vulnerability. The road segment between stations [1+700 – 9+100] of Hermel R9 section 2 fall karsitified formations which means that permeability and transmissivity are high in these areas. Therefore, accidental discharge of wastewater (from the port cabin toilet or chemical substances) or solid waste can easily infiltrate the subsurface and spread. Whereas, the remaining roads in Hermel Caza fall on porous formation that has good permeability but the underlying semi-aquifer has a poor transmissivity which limits spread of contamination, if it occurred.

In terms of surface water quality, generally, all the roads in Hermel Caza are in close proximity to streams and rivers namely Al Assi, El Sharbine and El Fissane Rivers. Accidental spillages or discharge of wastewater (from the port cabin toilet or chemical substances) into the streams and winter channels will lead to adverse impacts to the Al Assi, El Sharbine and El Fissane Rivers, knowing that the roads in Hermel Caza either cross or are in close proximity to these rivers. Any impacts on the rivers in the area will consequently affect all activities that rely on these rivers, namely rafting and fish farming.

The major impacts on groundwater and surface water during the rehabilitation works can be associated with the following activities:

- During installation of concrete barriers, on-site concrete pouring may leach and get deposited in nearby streams.
- During paving of road, any accidental deposition of toxic asphalt substances into nearby streams can cause pollution of surface water (Al Assi River, El Sharbine River and El

Fissane River) and underground aquifers since the road alignments either fall on karst formations that are highly permeable and transmissive or fall on semi aquiferous formations that are permeable (refer to Figure O, Figure P, Figure Q, Figure R, Figure S, Figure T, and Figure U in Annex 1).

- During installation of road markings, spillage of chemical paint substances can also pollute open channel watercourses.
- Excavations, drilling, and milling produce substantial amounts of dust and scattered pavement materials. Dust can enter water courses when it is mixed and directed by rain or it can be deposited naturally. This can cause cloudiness and increased water turbidity.
- The port cabin toilet is a source of wastewater generation. Improper management of the generated waste will pollute nearby surface water bodies, streams and underground aquifers since the road alignments either fall on karst formations that are highly permeable and transmissive or fall on semi aquiferous formations that are permeable. Thus, proper management practices should be implemented to avoid contamination of surface and groundwater resources.
- Contaminated stormwater runoff along with sediment transport from the rehabilitation site into the surrounding streams is possible. Storm water runoff or a direct point source discharge can transport pollutants, deposits and residues as well as eroded materials from the site into the receiving environment. Storm water may carry with it the following:
  - Spilled fuels
  - Slurry from pavement milling, drillings, and excavations for drainage ditches
  - Suspended particles, such as sand, slits, bentonite, cements
  - Solid waste, such as plastic, paper, bottles, wood

All of the aforementioned discharges can significantly impact water quality in the area. Proper management modalities would be crucial in order to reduce and prevent contamination of water resources surrounding the roads to be rehabilitated in Hermel Caza.

Accordingly, the impacts on water quality are assessed as: direct, moderate, local, short-term, irreversible, of high likelihood of occurrence and of medium significance.

### **5.2.1.2.Impacts on Soil Quality**

#### *Excavation*

Excavation of soil to install new drainage ditches will result in disturbance of soil structure and thus may cause an increase in soil erosion and release of sediments. This will permanently change the structure of the soil and surface geology.

#### *Mismanagement of Solid Waste and Wastewater*

Rehabilitation activities, specifically pavement reconstruction will result in the generation of solid and hazardous wastes; mainly rehabilitation waste such as old asphalt layers, crushed sub base aggregates, etc....Improper management of the waste generated from the rehabilitation works, direct disposal of the domestic-like solid waste (mainly plastic, paper, bottles...), and

the direct discharge of domestic-like wastewater (from the portable toilet) generated by the engineers and workers onsite will significantly impact soil quality.

#### *Accidental Leakages*

Accidental spills of bituminous materials with construction runoff and storm water might result in soil quality deterioration.

Accordingly, the impacts on soil quality are assessed as: direct, moderate, local, short-term, irreversible, of high likelihood of occurrence and of medium significance.

### **5.2.1.3. Impacts on Air Quality**

#### *Exhaust emissions*

Impacts on air quality during the rehabilitation works include exhaust emissions of CO, CO<sub>2</sub>, NO<sub>x</sub>, and SO<sub>2</sub> due to increased traffic flow, combustion of diesel for the movement of vehicles/machinery. Construction vehicles involved in pavement works include but are not limited to:

- Excavators (emission factors presented in Table 5-1)
- Vehicles transporting workers to/from site (i.e. buses, mini-vans, cars).
- Delivery vehicles (i.e. aggregate delivery trucks, trucks transporting removed pavement, and light delivery vehicles)

Combustion and vehicle exhaust gases constitute a complex mixture of organic and inorganic substances such as: PM<sub>10</sub>, NO<sub>2</sub>, SO<sub>2</sub>, Toluene, Xylenes, and Ozone. These combustion sources are likely to be extremely difficult to quantify due to the unpredicted operational needs throughout the rehabilitation process.

**Table 5-1 Emission factors for construction equipment (Ahn, Pan, et.al, 2010)**

<b>Equipment</b>	<b>HC (g/hr)</b>	<b>CO (g/hr)</b>	<b>NO<sub>x</sub> (g/hr)</b>	<b>PM (g/hr)</b>	<b>CO<sub>2</sub> (g/hr)</b>
Bulldozer	130.09	270.01	806.53	5.56	55.13
Dumper	100.53	272.45	962.29	8.78	83.44
Excavator	56.78	128.26	385.64	2.94	28.84
Grader	75.52	200.45	655.43	5.86	56.48
All equipment	18.34	63.00	105.96	0.367	6.72

#### *Dust emissions*

Dust is an almost inevitable consequence of roadwork. Gravel and crushed gravel and hard rock aggregates always contain a proportion of fines, and if the material is dry, a fairly heavy dust cloud can be raised when it is mobilized.

The following activities associated with the rehabilitation phase are anticipated to lead to the generation of dust:

- Excavation and leveling works
- Movement of raw materials transporting vehicles on unpaved surfaces



- Unloading of raw materials
- Open storage of raw materials
- Disturbances to material stockpiles by local winds and material handling, which is of great significance depending on the road location.
- Wind blow during transportation of materials by vehicles and specifically when transporting on unpaved roads.

Dust emissions from each of the sources described above will be largely dictated by the wind conditions in the area. Emission of large quantities of fugitive dust may adversely impact air quality, construction workers and surrounding communities.

Nearby receptors such as churches, schools and residential buildings (refer to Figure FF, Figure GG, Figure HH, Figure II, Figure JJ, Figure KK and Figure LL in Annex 1) to be disturbed by the generated fugitive emissions are presented in section 4.3.2.

The assessment showed that the highly urbanized sections to be affected by the generated air emissions are Hermel R4 section 2, the road segments between stations [1+900 - 4+600] of Hermel R4 section 1 and [0+000 - 1+200] of Hermel R7a. For instance, the sensitive locations that will be adversely affected by the generated dust emissions are Hermel School and a Cemetery (ضريح الرئيس صبري حمادة) which are 10 m away from Hermel R4 section 1.

Further, the agricultural lands, fallow lands (along Hermel R6, R8 and between stations [0+000 - 1+900] of Hermel R4 section 1, [1+200 - 12+000] of Hermel R7a, [0+000 to 1+700] of Hermel R9 section 1), the wooded lands and grasslands (along Hermel R9 section 2, between stations [1+700 - 9+100] of R9 section 1) will be mostly impacted by the generated fugitive emissions.

#### *Odor emission*

Odors from asphalt fumes can cause unpleasant smells to the surrounding. Sensitive receptors such as churches and schools near the roads at a distance of less than 10 m (Table G) can be highly affected.

*Accordingly, the impacts on air quality can be assessed as: direct, high, local, medium-term, irreversible, of high likelihood of occurrence and of high significance.*

#### **5.2.1.4. Impacts on Acoustic Environment**

A significant increase in noise is expected during pavement reconstruction along the road sections. Rehabilitation activities may create a problem of noise and vibration generated by construction equipment, truck traffic, and other similar sources. Noise will be mainly generated while mobilizing equipment for the transportation, excavation of land, and raw material transportation.

The road rehabilitation noise and vibration levels highly depend on the type of the equipment/heavy machinery, magnitude and duration of the rehabilitation activities. The main sources of noise are heavy machinery such as, excavators, bob cat, steel roller, pick-up, dump trucks (i.e. truck transporting materials), etc.... Noise generating activities, such as pavement

milling and drilling, can cause unpleasant noise levels and disrupt teaching activities at nearby schools. The potential impact depends on the magnitude and duration of rehabilitation-related activities. Works such as road markings, signing, etc...., do not generate high noise levels and do not disturb the surrounding environment.

Nearby receptors such as churches, schools and residential buildings (refer to Figure FF, Figure GG, Figure HH, Figure II, Figure JJ, Figure KK and Figure LL in Annex 1) to be disturbed by the generated noise are presented in section 4.3.2. For instance, residential agglomerations and commercial areas along Hermel R4 section 2, the road segments between stations [1+900 - 4+600] of Hermel R4 section 1 and [0+000 - 1+200] of Hermel R7a will be adversely impacted by the noise emissions of the rehabilitation works. In specific, the sensitive receptors that are at a distance of 10 m namely, Hermel School and a Cemetery (ضريح الرئيس صبري حمادة) will be highly impacted by the noise emissions.

Therefore, high noise levels should be minimized to avoid nuisance of the surrounding residents and minimize the health effects of vibration and high noise levels on the construction workers.

Accordingly, the impacts on the acoustic environment are assessed as: direct, moderate, local, short-term, reversible, of high likelihood of occurrence and of moderate significance.

#### **5.2.1.5. Impacts on Visual Intrusion**

Visual impacts relate to changes in available views of the landscape, and the effect of those changes on the surrounding environment. Visual intrusion during road rehabilitation works is unlikely to be significant. The road already exists and no major excavation works will be taking place to block a natural scenery view. Impacts on visual intrusion are of very low significance.

Accordingly, the impacts on visual intrusion are assessed as: direct, low, local, short-term, reversible, of low likelihood of occurrence and of negligible significance

#### **5.2.1.6. Impacts on Biodiversity**

Given that the project aims to upgrade existing roads by improving drainage, slopes, embankments, traffic signs, shoulders, and other structures; strengthening pavements; and completing resurfacing (i.e. no widening of roads will take place), expected impacts on natural habitats are potential spillages of wastes, dust raised, and increase in noise, light, and traffic movement during rehabilitation work.

In particular, direct effects on wildlife include the generation of emissions and disturbances such as noise, dust, and pollutants in the soil and vegetation (Rajvanshi *et al.* 2001). In fact, it was shown that dust particles reduce the pigmentation in plant leaves (affect photosynthesis and growth rate of plants) and dust fall on open lands reduces their fertility (Supe *et al.*, 2013). Similarly, noise from construction equipment influences animal behavior, altering activity patterns, and causing stress, loss of reproductive success, and physiological disturbance. Normally, some animals may vacate the area, while, others may get used to the noise (responses may vary among species). Further, wastewater discharge and illegal dumping of solid waste into the roadside shrublands and riparian habitats can severely affect the local fauna and flora and eventually lead to population destruction. In addition, given that lighting poles will be rehabilitated when needed, additional lighting might affect local fauna in sensitive habitats.

Finally, during rehabilitation, there is an increase in traffic movement; this can induce increased roadkill (i.e. mortality due to vehicular collisions). Animals that are attracted to roads or that need to cross them are more vulnerable.

However, given that the concerned roads generally involve paths that are already under anthropogenic influences, the potential impacts of the project on the local biodiversity are expected to be limited due to potential illegal dumping and discharge of wastes into rivers and water channels (involves all Hermel roads) and dust accumulation on nearby vegetation and agricultural lands (all Hermel roads). All the studied roads in Hermel Caza encounter a number of surface winter drainage channels which lead to El Assi River. Further, El Assi River and Hermel R4 section 1 intersect and Hermel R6 road flows parallel to the River with less than few meters at certain locations. Whereas, Hermel R7a intersects with Sharbin River and Hermel R8 and Hermel R9 section 1 crosses several winter drainage channels leading to the same River. Lastly, R9 crosses Wadi El Fissane.

Accordingly, the impacts on biodiversity are assessed as: direct, moderate, local, short-term, irreversible, of medium likelihood of occurrence and of medium significance

#### **5.2.1.7. Impacts on Existing Infrastructure**

The road rehabilitation works might have adverse impacts on the existing infrastructure, however, in the case of Hermel, there are no underground cables or sewage networks under the road pavements. However, previous investigation of possible existence of underground appliances must be done before random digging and milling of deteriorated road pavement. This will avoid damaging existing infrastructure that possible existence of underground appliances, may interfere with any existing infrastructure; that is possibly serving nearby surrounding residential and agricultural areas. Damage of existing infrastructure, for instance wastewater infrastructure or water networks, can cause several undesirable impacts such as cutting off water supply for irrigation, generation of bad smells, and attraction of water borne diseases and vectors due contaminated water accumulation.

Accordingly, impacts on existing infrastructure are assessed as direct, moderate, local, short-term, reversible, of medium likelihood of occurrence, and of low significance

#### **5.2.1.8. Impacts on Resources Consumption**

##### *Freshwater Demand*

During the rehabilitation phase, freshwater will be mainly used for dust suppression of the temporary stockpiles onsite.

Worker camps will not be installed since the Contractor will employ low skilled Syrians and Lebanese from the surrounding communities of Hermel R4, R6, R7a, R8 and R9. As a result, the unskilled workers will get their food and water supply from their homes. In addition, the nearby office will provide water for the Contractor's engineers, technical/skilled labor, and the supervising consultants. Consequently, water resources will not be required for domestic purposes.

Water consumption varies and it cannot be estimated as it highly depends on the rehabilitation activities, working days per year and other factors. Rehabilitation activities will consume moderate volumes of water, it will only be for a relatively short finite period.

### *Energy Demand*

During the rehabilitation phase, required works will require the use of several heavy equipment/machinery that highly consume energy in the form of fossil fuel, leading to the depletion of fossil fuel resources. However, the rehabilitation phase will be of short-term.

### *Raw Materials Demand*

During the rehabilitation phase, required works will necessitate the use of raw materials (refer to Table 3-12), leading to depletion of natural resources such as aggregates from unsustainable quarries.

Accordingly, the impacts on resource consumption are assessed as: direct, moderate, local, short-term, irreversible, of high likelihood of occurrence and of medium significance.

## **5.2.1.9. Impacts on Public and Workers Health and Safety**

### **a) Occupational Health and Safety**

Occupational hazards during the rehabilitation works are associated with working in all weather conditions, handling heavy machinery and other sophisticated rehabilitation equipment and long hours of work. In addition, continuous exposure to environmental emissions resulting from the rehabilitation activities can induce health problems. Moreover, a badly planned site can increase the risk of accidents and injuries from falls of materials and collisions between workers and machinery or equipment. Finally, prevention and protective measures should be introduced according to priorities. The potential types of occupational hazards that might occur during the rehabilitation works of the roads include the following:

#### *Physical hazards*

Physical hazards are potential accidents or injuries or illnesses that occur due to repetitive exposure to mechanical action or work activity (WBG, 2007). Forms of physical hazards are but not limited to the following:

Slips, Trips and Falls: Slips, trips and falls have been identified as being the most hazardous feature of survey sites. Occasionally, as a survey progresses, increasing numbers of people crossing these areas results in gradually worsening conditions.

Unplanned Trenching: Vibration may be caused from heavy equipment or from street traffic. Moving heavy equipment may include bulldozers, backhoes, loaders, and/or dump trucks. Equipment and materials may collapse trench walls if operated or stored too close to the trench edge. Water and temperature changes can pose a serious threat to excavations and trenches. Sources of water on job sites include surface water, the level of the water table, moisture content, rain, and cities with existing utilities in the right-of-way.

Environment Hazard: those types of hazards are due to environmental factors like the weather, sun and similar factors and they may lead to the following:

- Hypothermia and Hyperthermia due to sun exposure or sudden temperature change
- Hypotension and Hypertension due to lack of nutrients and medical history
- Dehydration lost due to lack of fluids and excess loss of body water through urine, tears, stool and sweat. An individual can sweat an average of 1.1 liters / hour when exposed to sun.
- Fire caused by accident or ignited by outsiders that will lead to external and internal burns.
- Bites and stings from the wilderness and most common are bees and snakes.

Noise: Extended exposure to excessive noise levels can cause noise-induced hearing loss specifically noise levels above 85 (dB) can cause hearing loss.

Vibrations: Earthwork activities and material loading / unloading activities generate levels of vibrations. Exposure to high level of vibrations for a significant duration will affect workers' health such as carpal tunnel syndrome and permanent damage to the nerves. Whole-body vibration can occur from operating large mobile equipment such as drillers, air hammers, pile drivers, tractors, graders, excavators and many more. Hand-arm vibration can result from using hand-held equipment such as drills, hammers and disc grinders. Hand-arm vibration may cause carpal tunnel syndrome, a disease that affects the fingers and hands.

### Vehicle Hazards

Vehicles transporting personnel and equipment to the study area are subject to vehicle hazards (transport impacts, road accidents, vehicle crashes). Vehicle crashes can be divided into the following types:

- Frontal and rear impact
- Rotational impact
- Rollover

### *Chemical Hazards*

Chemical hazards occur due to exposure to toxic, corrosive, sensitizing or oxidative substances. During rehabilitation activities, employees are mainly at risk of being exposed to asphalt fumes from pavement works among other solvents. Exposure to asphalt fumes is linked to acute effects such as headache, fatigue, reduced appetite, breathing problems, and skin irritation (Norseth et al, 1991).

### *Ergonomic Hazard*

Ergonomic factors, such as repetitive motion, overexertion, and manual handling lead to occupational injuries such as strains, low back pain, fatigue and others. According to Sang et al (2007), there has been, for years, an increase in rates of work-related musculoskeletal

disorders in highway construction specifically and the construction industry in general. Common causes are manual material handling and awkward postures, especially when lifting.

## **b) Public Health and Safety**

Most of the potential impacts on public health and safety comprise of those described in the previous sections. For instance, the impacts on water quality and availability, air quality soil quality, etc... all have consequences on human health. Nonetheless, some potential impacts, which were not yet discussed, are addressed in this section. First, during the rehabilitation activities, risk of road traffic accidents might increase in between vehicles, pedestrians and vehicles, specifically in highly populated areas surrounded by residential buildings and schools. Second, the proximity of the roads to communities and the open access to rehabilitation sites consist of a potential risk to the public, namely the risk of injuries as a consequence of falls or contact with heavy equipment. This might occur in case of unauthorized or accidental entry of residents into areas where the rehabilitation activities are taking place. This risk, however, is commonly encountered in cases of road rehabilitation projects and will be addressed through a standard set of best practices. This includes the usage of proper signage and barriers, in addition to flagmen and temporary traffic signs when necessary (refer to section 6.1.8).

Accordingly, impacts on health and safety are assessed as: negative, moderate, local, short-term, irreversible, of high likelihood of occurrence and of medium significance

### **5.2.2 Potential Negative Social Impacts during Rehabilitation**

Generally, during the rehabilitation and maintenance activities, adverse impacts on socio-economic conditions are associated with nuisance, traffic disturbance, labor influx and increase in GBV risks associated with Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH), inappropriate labor conditions, potential child labor, social tensions and obstruction of temporary access routes to sensitive receptors and others. Therefore, the potential impacts on socio-economic conditions of laborers onsite and the residents of the surrounding communities of Hermel R4 (Hermel), R6 (Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail), R7a (Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail), R8 (Tall El-Far), and R9 (Qasr – Fissane) are presented below.

The adverse impacts of the project on socio-economic conditions will be temporary in nature, however, implementing appropriate measures to mitigate these impacts is the core responsibility of the Contractor.

#### **5.2.2.1. Impacts on Socio-Economic Conditions of Surrounding Communities**

##### **(1) Traffic Disturbance and Nuisance**

Roads under study will not be closed or shutdown, access and traffic will be secured via other alternative routes and means. This would be the case if the Contractor will be obliged to temporary close the road. As mentioned before, the location of these detours will be specified by the contractor during the rehabilitation phase. However all detours (if needed) will be on existing alternative roads (public domain properties). During the rehabilitation works of the Hermel R4, R6, R7a, R8 and R9 potential socioeconomic impacts include, nuisance and traffic

disturbance from the rehabilitation activities onsite and from traffic disturbance. As a result of rehabilitation works, the road width might become narrower and might experience a delay in traffic. This could particularly be an issue in case of local roads, which are relatively narrow (4 – 6 m). The most significant sources of noise and traffic are heavy machinery and the movement of transport vehicles into and from the rehabilitation site, leading to increase in commuting time and inconvenience to roads users.

## **(2) Labor Influx and Labor Induced SEA**

Potential labor influx will increase the risk of labor induced SEA towards women in the surrounding communities. SEA is defined as “any actual or attempted abuse of a position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another”. Sexual abuse is further defined as “the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions” (World Bank, 2018). In this context, project beneficiaries or members of project-affected communities may experience SEA (World Bank, 2018).

Knowing that the project is expected to employ low skilled Syrians and Lebanese already living in the community around the selected roads for rehabilitation, large labor influx of outsiders into the communities might not occur. Therefore, SEA risks towards women in the surrounding community is anticipated to be low.

## **(3) Obstruction of Access Routes to Sensitive Receptors**

Impacts on sensitive receptors include, temporary obstruction of access routes to residential units, schools, places of worship and hospitals (refer to Figure FF, Figure GG, Figure HH, Figure II, Figure JJ, Figure KK and Figure LL in Annex 1), as presented in section 4.3.2. In specific, the assessment showed that the most urbanized roads to be affected by the temporary obstruction of sensitive receptors are Hermel R4 section 2, the road segments between stations [1+900 - 4+600] of Hermel R4 section 1 and [0+000 - 1+200] of Hermel R7a. For instance, Hermel School and a Cemetery (ضريح الرئيس صبري حمادة) along Hermel R4 section 1 will be highly impacted by the temporary obstruction of routes (refer to Table G).

### **5.2.2.2. Impacts on Socio-Economic Conditions of Labor**

#### **(1) Labor Induced SH**

The employment of both men and women in REP project might increase the risk of SH towards female employees at the workplace. SH is defined as “Unwelcome sexual advances, requests for sexual favors, and other unwanted verbal or physical conduct of a sexual nature occurring between personnel/staff working on the project” (World Bank, 2018).

#### **(2) Child Labor**

The immense needs of vulnerable communities may result in underage workers making themselves available for work. This could result in the employment of child laborers. Employment of underage labors is a violation of the Lebanese Labor Law dated 1946. Given

the type of planned rehabilitation works, children can get injured in the workplace. In this context, employers are subject to the youth employment provisions under Labor Law.

### **(3) Inadequate Labor Conditions**

The project can result in poor labor conditions in the case of the violation of labor law. The project beneficiaries, Lebanese and Syrian communities, might not have work permissions or contractual protections with contractors and their wages are to be set by the market. While Contractors should follow local labor laws, in Lebanon, monitoring of whether local labor laws are followed is not always performed. Therefore, large and vulnerable population of beneficiaries may be at risk of working for wages that are less than those recognized by the law and may be forced into accords that are not consistent with the law (e.g. work schedules or rest periods).

### **(4) Social tensions and conflict over job-sharing and dissatisfaction with allocation of project-generated jobs.**

The project is expected to provide job opportunities for both Syrians and low-skilled Lebanese in host communities. Syrians already tend to work in low-paid work, often decreasing the rate of salaries in the formal labor market and inducing conflicts within local communities. Moreover, potential perceptions that project employment ratios favor Syrian communities might further worsen the social tensions between the two groups.

### **(5) Risk of under-participation or underemployment or discrimination of women**

The risk of under-participation or underemployment or discrimination of women in the context of REP project will be high, if the Contractor doesn't set specific percentage of women employment to benefit from the project. Moreover, women's engagement in construction works is not common and also not encouraged, according to Lebanon's social and cultural norms.

## **5.3 Potential Positive Impacts during Operation**

### **5.3.1 Potential Positive Environmental Impacts**

The potential positive environmental impacts of the project are associated with enhanced road conditions.

First, improved drainage helps in decreasing contaminated storm water run-off and consequently helps limit the impact on the streams surrounding Hermel R4, R6, R7a, R8, and R9. Further, slope stabilization activities will result in a positive impact as it decreases the chances of soil erosion. Improved drainage decreases likelihood of run-off water to reach and contaminate nearby soil. As a result, the project is expected to have a positive impact on soil quality during operation. Finally, the proposed rehabilitation works will result in less congestion and delays. Moreover, it is predicted that the project will increase the average speed per vehicle and reduce travel time which would typically improve the overall air quality through potential reduction in CO<sub>2</sub> emissions.

### **5.3.2 Potential Positive Social Impacts**



The social benefits of the rehabilitation work, during operation, include transport connectivity and easier access to rural, peri-urban and urban areas. Additionally, the rehabilitated roads will result in potential reduction in traffic congestion, reduced travel time and transport cost. The improvement in the safety conditions of the roads (due to improved drainage and lighting, additional safety barriers, fixing appropriate speed limit and slope protection measures).. Moreover, employment opportunities will be offered for a short period of time, knowing that the Contractor will be responsible for the routine maintenance of the roads, during the one year of Defects Liability Period (post rehabilitation phase).

## **5.4 Potential Negative Impacts during Operation**

The negative impacts assessment, during the operation phase, mainly focuses on the maintenance activities that might be required during the Defects Liability Period (one-year period). Since maintenance activities are equivalent to additional rehabilitation works, then the impacts of any future maintenance would subsequently be similar in nature to those discussed for the rehabilitation phase. In this context, any negative impacts discussed in the rehabilitation phase apply for the operation phase in case maintenance is needed during the Defects Liability Period. However, it is important to mention that the Contractor might not perform any maintenance activities, if not necessary.

### **5.4.1 Potential Negative Environmental Impacts**

#### **5.4.1.1. Impacts on Water and Soil Quality**

As discussed in the impacts during the rehabilitation phase, potential impacts on water quality should be considered due to the particularity of the project area, knowing that Hermel R4, R6, R7a, R8 and R9 are surrounded by streams and rivers (Al Assi River, El Sharbine River and El Fissane River) and since the road alignments either fall on karst formations that are highly permeable and transmissive or fall on semi aquiferous formations that are permeable. Spills of chemicals and pollutants during maintenance activities can affect soil and water quality, if such activities are not managed properly.

Moreover, contaminated storm-water runoff along with sediment transport from the maintenance site into the surrounding streams is possible. Storm water runoff or a direct point source discharge can transport pollutants, deposits and residues as well as eroded materials from the site into the receiving environment. Storm water may carry with it the following:

- Spilled fuels
- Slurry from pavement milling, drillings, and excavations for drainage ditches
- Suspended particles, such as sand, slits, bentonite, cements
- Solid waste, such as plastic, paper, bottles, wood

All of the aforementioned discharges can significantly impact water quality in the area. Proper management modalities would be crucial in order to reduce and prevent contamination of water resources surrounding the maintenance sites in Hermel Caza.

Accordingly, impacts on water and soil quality are assessed as: direct, moderate, long-term, local, and irreversible, of medium likelihood of occurrence and of medium significance

#### 5.4.1.2. Impacts on Air Quality and Odor Emission

During the operation phase of the project, impacts on air quality are associated with maintenance activities and movement of vehicles. This includes dust and exhaust emissions. The extent of the impact will depend on type and duration of required maintenance activities.

Moreover, the main expected vehicle emissions are (World Bank, 1997):

- Nitrogen oxides (NO<sub>x</sub>) which is a by-product of fuel combustion in combustion chambers, under conditions of extreme heat and pressure,
- Hydrocarbons (HC) which are produced due to the incomplete combustion of fuel and its evaporation. The emissions of hydrocarbons are strongly correlated with the type of fuel used. The most notorious HC produced are benzene and ethylene.
- Carbon monoxide (CO) which is the result of incomplete combustion in engines
- Sulfur dioxides (SO<sub>x</sub>) emissions which are directly linked to the sulfur content of the fuel.

Accordingly, impacts on air quality are assessed as: direct, moderate, short-term, local, and irreversible, of medium likelihood of occurrence and of medium significance

#### 5.4.1.3. Impacts on Acoustic Environment

The operational phase is expected to be associated with increased noise levels during maintenance activities. Noise is mainly associated with four main sources: a) vehicles noise, b) friction between vehicles and the road surface, c) driver behavior, and d) maintenance activities (Table 5-2) (World Bank, 1997).

**Table 5-2 Sources of acoustic pollution during road operation**

Noise Source	Impacts
Vehicle noise	Transportation vehicles generally produce noise from the engine, transmission, suspension, braking, and stop-and go traffic conditions. The noise levels are expected to increase with the poor maintenance of vehicles accessing the road.
Road noise	Contact between tires and pavement significantly contributes to overall traffic noise. The level depends on the type and condition of tires and pavement. The frictional noise increases with higher speed and during sudden braking.
Driver behavior	Vehicles' horns, loud music, shouting, sudden braking or accelerating contributes to traffic noise.
Road maintenance	Periodically, road maintenance is generally required. Such activities will utilize heavy machinery which will contribute to noise pollution.

The exposure to increased noise levels can affect the wellbeing of local residents, both physiologically and psychologically. Noise exposure is considered a source of annoyance which might result in increased stress levels and health impacts. It can cause auditory fatigue, temporary and permanent lessening of hearing ability and sleep disorders (World Bank, 1997).

Accordingly, impacts on acoustic environment are assessed as: direct, moderate, long-term, local, and reversible, of high likelihood of occurrence and of medium significance

#### **5.4.1.4. Impacts on Biodiversity**

During the operation phase of the project, in general, the impacts on biodiversity are expected to be very limited as no additional roads will be built. On the contrary, rehabilitation of existing roads will probably improve the conditions of adjacent lands and plant communities (the impacts of vehicle-generated dust from unpaved roads will be reduced).

The main expected impacts during operation on the local ecosystem include (1) the potential sedimentation of heavy metals due to surface runoff (Batoool et al, 2012) if drainage systems were not fixed; and (2) the potential spills during maintenance activities.

However, given that the concerned roads generally involve paths that are already under anthropogenic influences, potential impacts are expected to be of low significance. Only limited segments of ecological significance can witness further disturbance from the project. These segments consist of woodlots (namely for Hermel R9) and riparian habitats when roads encounter winter drainage channels (all Hermel roads) and intersect with rivers (El Assi River and Hermel R4 section 1 intersect, Hermel R7a intersects with Sharbin River and Hermel R9 crosses Wadi El Fissane).

Accordingly, impacts on biodiversity are assessed as: direct, moderate, local, long-term, irreversible, of high likelihood of occurrence, and of medium significance

#### **5.4.1.5. Impacts on Energy Consumption**

Energy consumption is expected to be high during the operation phase of the project due to additional lightings. Moreover, maintenance works will require the use of several heavy equipment/machinery that highly consume energy in the form of fossil fuel, leading to the depletion of fossil fuel resources.

Accordingly, impacts on energy consumption were assessed as: direct, low, short-term, local, and irreversible, of moderate likelihood of occurrence and of medium significance.

#### **5.4.1.6. Impacts on Public and Workers Health and Safety**

During the operation phase of the project, occupational health hazards can be attributed to maintenance-related accidents. Proper supervision and the implementation of adequate safety measures will limit the occurrence of accidents from maintenance activities. Any maintenance works and their potential impacts are expected to be similar in nature to those of this project's rehabilitation phase (disturbance of traffic and road accidents).

Accordingly, impacts on health and safety are assessed as: direct, moderate, local, short-term, reversible, of medium likelihood of occurrence and of medium significance

## 5.5 Summary of Potential Environmental Impacts

### Rehabilitation phase

During the rehabilitation phase of the project, the impact on air quality is expected to be of high significance.

**Table 5-3 Summary of potential negative environmental impacts during rehabilitation**

Environmental Receptor	Impact														Significance	
Sources	Accidental leakages of concrete pouring, toxic asphalt substances, chemical paints	Excavations, milling and drillings	Contaminated storm water runoff	Domestic-like solid waste (plastic, paper, bottles and others)	Waste such as old asphalt layers, crushed sub base aggregates	Vehicles transporting workers	Delivery vehicles	Unloading and open storage of raw materials	Odors from asphalt fumes	Mobilization and use of are heavy machinery	Changes in available views of the landscape	Exposure to environmental emissions	Road traffic accidents	Handling heavy machinery	Physical, chemical, biological and ergonomic hazards	
Water Quality	x	x	x	x												
Soil Quality	x	x	x	x	x											
Air Quality		x				x	x	x	x							
Acoustic Environment		x				x	x			x						
Biodiversity	x	x	x	x	x						x					
Visual Amenity											x					
Existing Infrastructure		x														
Resources Consumption										x						
Health and Safety												x	x	x	x	

### Operation phase

Summary of negative environmental impacts during the operation phase are presented in Table 5-4.

**Table 5-4 Summary of potential negative environmental impacts during operation**

Environmental Receptor	Impact						Significance
	Accidental spills of chemicals and pollutants	Dust and exhaust emissions	Use of vehicles heavy equipment and machinery	Accidents from Handling of heavy machinery	Disturbance of traffic and road accidents	Light and noise pollution	
Water and Soil Quality	x						
Air Quality		x	x				
Acoustic Environment			x				
Biodiversity	x	x				x	
Resources Consumption			x				
Health and Safety				x	x		

Significance	
High	
Medium	
Low	
Negligible	

During the operation phase of the project, the main environmental positive impacts are presented in Table 5-5.

**Table 5-5 Summary of positive environmental impacts during operation**

Environmental Component	Positive Impacts
Water quality	Decreased contaminated stormwater runoff due to the improved drainage
Soil quality	Decreased chances of soil erosion due to slope stabilization
Air quality	Improvement in the overall air quality through potential reduction in CO <sub>2</sub> emissions, as a result of increased the average speed per vehicle and reduced travel time

## 5.6 Summary of Potential Social Impacts

### Rehabilitation Phase

Summary of expected positive and negative social impacts of the project during its rehabilitation are presented in Table 5-6

**Table 5-6 Summary of potential positive and negative social impacts during rehabilitation**

<b>Potential Positive Social Impacts</b>
<ul style="list-style-type: none"> <li>• Creating direct and indirect short-term jobs for Lebanese and Syrians living in the surrounding community</li> <li>• Enhancing economic development and livelihood opportunities</li> <li>• Strengthening Lebanese and Syrian workers' skills and experience in road rehabilitation and maintenance</li> </ul>
<b>Potential Negative Social Impacts</b>
<ul style="list-style-type: none"> <li>• Labor influx (in case the contractor doesn't recruit labor from the surrounding community) and potential risk of labor induced SH towards female workers and SEA towards women in the surrounding community.</li> <li>• Potential risk of child labor</li> <li>• Poor labor conditions</li> <li>• Dissatisfaction with job allocation (i.e. social tension)</li> <li>• Risk of under-participation or underemployment of women</li> <li>• Nuisance and traffic disturbance</li> <li>• Temporary obstruction of access routes to sensitive receptors</li> </ul>

### Operation Phase

Summary of expected positive social impacts of the project during its operation are presented in and Table 5-7.

**Table 5-7 Summary of potential positive social impacts during operation**

<b>Potential Positive Social Impacts</b>
<ul style="list-style-type: none"> <li>• Enhanced transport connectivity</li> <li>• Potential reduction in traffic congestion, reduced travel time and transport cost</li> <li>• Economic savings from the reduced cost of road crash injuries and fatalities</li> <li>• Short-term employment opportunities for routine maintenance (during the first year of operation)</li> </ul>

## 6. Mitigation of Environmental and Social Impacts

### 6.1 Mitigation Measures during Rehabilitation

As part of the ESMP, mitigation refers to the set of measures taken to eliminate, reduce, or remedy potential undesirable effects resulting from the rehabilitation of the proposed project.

Generally, mitigation measures are to be considered in all the developmental stages of the project. Mitigation is a description of the measures visualized in order to avoid, reduce and where practicable remedy significant adverse impacts. In this context, this section lists the recommended mitigation measures to be implemented during the rehabilitation of the concerned roads in Hermel, namely Hermel R4 (Hermel), R6 (Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail), R7a (Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail), R8 (Tall El-Far), and R9 (Qasr – Fissane).

#### 6.1.1 Water and Soil Quality

Impacts on water and soil quality were assessed as: direct, high, local, short-term, irreversible, of high likelihood of occurrence and of medium significance. Thus, the proposed mitigation measures include:

##### *Control of Soil Manipulation Activities*

- Installation of retaining walls before starting with drainage ditch excavations to block soil erosion
- Excavations for drainage channels should be carried out in complete precision

##### *Control of Accidental Spills*

- All refueling and maintenance operations shall take place off-site, vehicles should be fueled up before arriving to the road section
- A spill response plan shall be in place and all workers should be trained on its implementation.

##### *Management of Solid Waste and Wastewater*

- Good site practices including the effective disposal of all wastes generated on-site should be adopted.
- The generated waste onsite should be properly segregated at source into recyclables and organic waste in appropriately labelled waste bins. Sorting at source of domestic and general waste should be implemented.
- Sufficient waste disposal points must be provided and regular collection for disposal must take place near the road.
- Adequate bins for collection and storage of waste materials should be provided.
- Prevent the overfilling of the waste containers.
- Wastewater shall not be discharged onto the open ground or into any water body. The port cabin toilet must be linked directly to it, the port cabin toilet will be linked to a polyethylene storage tank. If so, the following should be done:

- A specialized contractor will be selected to periodically collect (pump out) the wastewater from the polyethylene tank.
- The supervising consultant should inspect it regularly to check for any leakages and to ensure that the generated wastewater is properly collected before it's full.
- Domestic-like waste shall be removed daily from the site.
- Excavated soil should be stored and transported offsite to nearest licensed dumpsites that are near the project area.
- Any excavated unsuitable material should be removed from site within 24 hours. Reuse of contaminated soil material is prohibited and random disposal of this material in open abandoned areas is never allowed.

#### *Control of Stormwater Runoff*

In case of temporary storage of excavated materials, accidental contamination or spills of the removed soil should be avoided to limit contamination of storm water runoff and in turn the surrounding streams.

Any stockpiled construction material should be covered with an impermeable layer to avoid contamination of stormwater runoff.

### **6.1.2 Air Quality**

Impacts on air quality were assessed as: direct, high, local, medium-term, irreversible, of high likelihood of occurrence and of high significance. Thus, the proposed mitigation measures include:

#### *Control of Exhaust Emissions*

- Ensuring maintenance of all rehabilitation equipment regularly, at least once a month.
- Machinery and equipment should be equipped with air pollution control equipment that should be monitored regularly to ensure its effective operation.
- Avoiding idling time of machinery.
- Ensuring regular maintenance of vehicles.

#### *Control of Dust Emissions*

- Using dust-suppression methods to reduce emission of particulate matter into the surroundings.
- Prohibit dust-generating activities during excessively windy periods.
- Prohibit burning of generated waste material.
- Covering raw materials stockpiles with plastic impermeable layers, when raw materials are not in use.
- Avoid excessive vehicular movement on unpaved roads.
- Vehicle maximum speed limit in work zones should be decreased to 25 km/hr.



- Trucks hauling raw materials into the rehabilitation site should be covered properly with tarpaulins.
- All trucks and vehicles exiting the rehabilitation site should be dust-free.
- Stockpiles of fine material such as topsoil material, aggregates etc. shall be protected from wind.
- In case of asphalt milling, spray water on exposed surfaces during dry periods especially near schools, hospitals, rural communities, agricultural areas, etc....
- Maintaining stockpiles at minimum heights
- Contractors shall regularly inspect stockpiles, exposed work areas and rehabilitation work practices.
- Spills or leakages are effectively recorded and reported to the adequate management entity, along with immediate clean-up.
- Daily cleaning of streets and pathways in vicinity of rehabilitation site that are affected by soil and dust

#### *Control of Odor Emissions*

- Transport trucks, specifically trucks transporting asphalt, are to be tightly covered at all hauling times to reduce as much as possible release of unpleasant odors.

#### **6.1.3 Acoustic Environment**

Impacts on acoustic environment were assessed as: direct, moderate, local, short-term, reversible, of high likelihood of occurrence and of medium significance. Thus, the proposed mitigation measures include:

During the road bypass rehabilitation works, excessive noise emissions can be reduced by adopting the following measures:

- Applying an appropriate schedule such as from 8 am to 4 pm to avoid any works that may cause noise and vibration during nighttime. Additionally, nighttime activities should be done using noise reducing means or low-noise technologies.
- Using vehicles and equipment that meet national standards for noise and vibration.
- Regular maintenance of the machinery, equipment and vehicle should be carried out to prevent excessive noise.
- Publishing and registering allowed working time of rehabilitation machines with local authorities and ensuring strict compliance with set times.
- Restricting the use of noisy machines and/or adopting noise-reducing means (silencers) for rehabilitation machines, especially near sensitive areas.

#### **6.1.4 Biodiversity**

Impacts on biodiversity were assessed as: direct, moderate, local, medium-term, irreversible, of medium likelihood of occurrence and of medium significance. Thus, the proposed mitigation measures are:

Induced negative impacts of road projects on biodiversity can be minimized by taking special care when passing through rich or critical natural ecosystems (wooded lands, rivers...etc.).

- A waste management plan must be adopted to avoid contaminating the soil and water and hence affecting the local biota;
- Workers should be instructed to protect flora and fauna when feasible as well as their habitats;
- Washing of vehicles and machinery should be done offsite and away from particular biotopes (wooded lands, grasslands, and riparian habitats);
- Solid waste, rehabilitation debris should not be dumped into the natural habitats (woodlots (namely for Hermel R9) and riparian habitats when roads encounter winter drainage channels (all Hermel roads) and intersect with rivers (El Assi River and Hermel R4 section 1 intersect, Hermel R7a intersects with Sharbin River and Hermel R9 crosses Wadi El Fissane).
- Restricting the use of noisy machines and/or adopting noise-reducing means (silencers) for rehabilitation machines, especially near sensitive areas (wooded lands and riparian habitats);
- Water spraying must be done frequently in order to avoid dust accumulation on adjacent vegetation (all Hermel roads).
- Road cross-section must be fixed during the rehabilitation phase to reduce the impact on biodiversity, for example, by flattening side slopes. This makes crossing easier for animals that find roads a physical barrier (WB). Also, providing longer sight lines for drivers is recommended as it can reduce collisions with animals by allowing more reaction time.
- Lamps shall comply with the minimum intensity required

#### **6.1.5 Existing Infrastructure**

The impacts on the existing infrastructure were assessed as direct, moderate, local, short-term, reversible, of medium likelihood of occurrence, and of low significance. Following are the mitigation measures:

Prepare procedures for rapid notification to the concerned Municipality or public entity and assistance with re-instatement, in the event of any disruption of public utilities.

Splitting works into the road segments will be done to ensure quick progression through roads while causing minimal disruption to traffic.

#### **6.1.6 Visual Amenity**

The impacts on visual intrusion were assessed as of negligible significance. Thus, the proposed mitigation measures are:

- Covering of temporary stockpiled excavations on the side of the road
- Ensuring that the light source is the minimum intensity for the required purpose;
- Ensuring that lights are turned off by timer or manually when they are not needed;
- Ensuring that fittings are chosen that direct light accurately to where it is needed;
- Ensuring that the type of light chosen is the least likely to cause light pollution;

#### **6.1.7 Resource Consumption**

Impacts on resource consumption were assessed as: direct, high, moderate, short-term, irreversible, of high likelihood of occurrence and of medium significance. Thus, the proposed mitigation measures include:

#### *Energy Demand Control*

- Ensuring that equipment that are not in use are turned off.
- Conducting regular maintenance and efficient operation of machinery.
- Vehicles should not be allowed to remain idle for long periods.
- Recording monthly fuel consumption.

#### *Raw Material Demand Control*

In the context of the project, the Contractor must acquire the required raw materials from a licensed quarry.

### **6.1.8 Health and Safety**

#### **6.1.8.1. Occupational Health and Safety (OHS)**

Impacts on health and safety were assessed as: negative, moderate, local, short-term, irreversible, of high likelihood of occurrence and of medium significance.

According to WBG (2007), preventive and protective measures should be introduced according to the following order of priority:

- Elimination through eradicating the activity or source of risk from the work process, such as by substituting a hazardous chemical by a safer chemical.
- Control through adopting engineering controls at the source of impact, such as by acoustic insulation.
- Minimization through designing safe work systems and administrative or institutional control measures, such as by job rotation or training safe work procedures.
- Limitation through providing, using, and maintaining appropriate PPE in conjunction with training, such as by using masks and gloves.

Specific measures according to WBG (2007) to limit impacts due to the open nature of rehabilitation sites and their proximity to the community include:

- Measures to prevent unauthorized access to dangerous areas should be in place
- Openings should be sealed by gates or removable chains
- Fall prevention and protection measures should be implemented, such as the installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area
- Signage should be in accordance with international standards and be well known to, and easily understood by workers, visitors and the general public as appropriate
- Marking all energized electrical devices and lines with warning signs

- Establishing rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures, and control of traffic patterns or direction

### *Training of Personnel*

Training is an essential component of safety and health management since workers who perform tasks without adequate training can cause themselves or others serious injuries or even death. Therefore, the following trainings should be implemented (Muiruri & Mulinge, 2014):

- Ensure that all workers are given proper site-specific instructions on occupational health and safety prior to commencing work.
- The Occupational Health and Safety training should consist of hazard awareness and control measures.
- The training should ensure proper usage of personal protective equipment (PPE).
- The trainees should acquire knowledge of emergency procedures and preventive actions.
- There should also be job-specific health and safety training.
- Additional training should be provided if risks change.
- Refresher training should be provided periodically, if skills are not frequently used.

### *Noise Emissions*

According to WBG (2007), the following should be implemented:

- Employees should not be exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection.
- Another way of protection can be achieved through limiting the duration of noise exposure. For instance, for every 3 dB (A) increase in sound levels, the allowed exposure period should be reduced by 50 percent.
- Periodic medical hearing checks should be performed on employees who are exposed to high noise levels.

### *Health and Safety Signs*

Examples of signs that must be present at the rehabilitation site include but are not limited to the following (DOLIDAR, 2017):

- Wear safety helmets and reflective jackets
- Permit to work areas
- Falling Hazard, Use safety belt
- Watch for moving equipment
- Wear safety footwear
- Wear hearing protection
- Wear eye protection
- First aid
- Danger of electricity
- No smoking

- Work in progress
- Stop and go

### *First Aid and Injuries*

The availability of first aid kits and the adoption of the following recommendations is essential in order to respond quickly and efficiently to any accident or injury:

- At least one laborer per each group of workers onsite should be appointed to respond to emergency cases, on condition that adequate first aid training is provided.
- One employee for every 25 employees on site should be trained in first aid. The assigned personnel should be provided with appropriate identification, including a red hard hat with a white "red cross" symbol and an identification badge (CDR, 2007).
- All workers onsite should know where the first aid facilities are located and how to adequately use first aid kits.
- A full list of nearby hospitals, medical centers and emergency contact numbers should be provided to workers onsite.
- All injuries or accidents at the rehabilitation site should be reported immediately and the contractor should maintain and keep a record of accidents or illnesses.
- Designing machines to eliminate trap hazards and ensuring that extremities are kept out of harm's way under normal operating conditions.
- Turning off or disconnecting machinery with exposed moving parts.
- Marking all energized electrical devices and lines with warning signs.
- Checking all electrical cords, cables and hand power tools for frayed and exposed cords and following manufacture recommendations for maximum permitted operational voltage.
- Protecting power cords and extensions from physical damages like traffic and environmental factors like getting wet from rain.
- Use mechanical assists to eliminate or reduce exertions required to lift heavy material, hold tools and work objects.

### *Personal Protective Equipment (PPE)*

Proper use of PPEs is essential to limit the occurrence of occupational hazards. Accordingly, the following should be implemented (DOLIDAR, 2017):

- An adequate supply of suitable personnel protective equipment (PPE) such as hard hats, safety boots, reflective jackets, and others should be maintained.
- The PPEs (specifically hard hat and reflective jacket) provided to managers and safety officers should have a different color than the PPEs of the rehabilitation workers onsite.
- Ensure that workers wear PPEs all the time during working hours.
- Workers must be trained on the proper and effective use of personal protective equipment.
- Workers should be aware of the potential risks that they might encounter, in case of not wearing their PPEs.
- Where there is a risk of injury from falling objects, safety helmets must be provided, and worn by the workers.

- Adequate eye protection should be provided and worn whenever there is a possibility of eye injuries.
- When working in an area or with machines that have high noise levels, hearing protection must be worn.
- Gloves must be provided to the workers and the type of the gloves must be appropriate to the type of work being executed.
- Respiratory protection appropriate to a given working activity should be provided to the workers who are exposed to respiratory hazards.

The following PPE should be used when handling and working with asphalt (NIOSH, 2003):

- Wearing thermally insulated gloves to keep asphalt from burning or irritating the skin.
- Wearing long-sleeve shirts and long pants without cuffs and keeping the sleeves rolled down and close to the collar.
- Wearing Steel-toed safety shoes.
- Wearing a face shield, not just safety glasses.

The following mitigation measures should be adopted by labor when handling and working with asphalt (NIOSH, 2003):

- Never stick your head in an asphalt tank or mixing container.
- Never lean over a kettle. Stay upwind from asphalt if possible.
- Enclosing mixing and stirring operations.
- Stop what you're doing if you notice symptoms. Ask your foreman for advice.
- Keep asphalt off your skin and out of your eyes.
- If you do get asphalt in your eyes, flush with water for 15 minutes.
- Eating, drinking and smoking are prohibited during any asphalt activity.

### **6.1.8.2.Public Health and Safety (PHS)**

#### **Site Layout and Planning**

- Designing carefully the rehabilitation site in order to avoid or reduce accidents due to trips, slips, and collisions (General layouts are set in Annex 3).
- Providing roads within the zones being rehabilitated with speed limits signs of 25 km/hr to decrease risks of collisions and accidents.
- Restricting access to the zones of unfinished works and providing guards to control entrances and exits.
- No work activities are to be conducted without the presence of barriers, temporary traffic lights, and flagmen if necessary, which are required to warn the public of the existing rehabilitation site and its activities.

#### **Traffic Diversion**

Exact locations and distances of detours are to be set by the site engineer. These points are set according to work progress, location and traffic. As such, general precautionary measures are

provided to be considered when selecting the detour. It is important to note that the project will not use or rent land for the purpose of diversions.

Moreover, illustrated detour signage should be displayed around the site as necessary. In addition, the approximate location of signs is shown on the drawings (Annex 3). Exact locations are to be determined on site upon engineer's approval.

- The contractor must make informed route choices, thereby avoiding areas with a high risk of erosion or slope instability, or which are particularly sensitive of fuel spills, and to contamination, where feasible.
- The contractor has to ensure access diversions for traffic at each stage of work and to provide all necessary requirements to facilitate the continuity of traffic circulation.
- Prior to any works, the contractor shall submit to the engineer a detailed method statement showing and describing the following:
  - The division of the works into phases and sections
  - The various traffic diversions related to each phase of the works.
  - The temporary diversion of the different services and utilities (avoid continuous disturbance).
- Adequate warning signs and security of the site, namely through barriers, should be provided during non-working hours.
- Where the pavement crosses service entrances (houses or shops) which are higher or lower than the pavement edge level, the contractor has to construct concrete steps as directed by the engineer on site. Steps are constructed wherever the difference in elevation between the entrance and pavement levels are more than 250 mm.
- In case where the pavement edge limit crosses a parking or a pedestrian footpath, a depressed sidewalk curb shall be applied as shown on drawings (Annex 3) and directed by the engineer.

### *Noise Emissions*

- Noise levels should be maintained within the national permissible limits (presented in Table 2-4) and limited to working hours as allowed by obtained permits.
- Transportation of construction material during regular working hours should be minimized, when possible.

## **6.2 Mitigation Measures during Operation**

### **6.2.1 Water and Soil Quality**

The impacts of the project on water and soil quality were assessed as: direct, moderate, long-term, local, and irreversible, of medium likelihood of occurrence and of moderate significance. Therefore, the proposed mitigation measures include the following:

- All refueling and maintenance operations shall take place off-site, vehicles should be fueled up before arriving to the road section
- A spill response plan shall be in place and all workers should be trained on its implementation.

- Provision of adequate bins for collection and storage of waste material including litterbins and waste skips
- Preventing the overfilling of the waste containers placed on the road

Also, regarding the control of Storm-water Runoff in the case of maintenance and cleaning activities, it is recommended to maintain the cleaning of the stormwater channels especially before the start of the rainy season and continually collect solid waste in order to prevent the blockage of the drainage system.

### **6.2.2 Air Quality**

The impacts on the air quality were assessed as: direct, moderate, short-term, local, and irreversible, of medium likelihood of occurrence and of medium significance. Therefore, the proposed mitigation measures include the following:

- Ensuring maintenance of all construction equipment regularly, at least once a month.
- Machinery and equipment should be equipped with air pollution control equipment that should be monitored regularly to ensure its effective operation.
- Avoiding idling time of machinery.
- Using dust-suppression methods to reduce emission of particulate matter into the surroundings.
- Prohibit dust-generating activities during excessively windy periods.
- Vehicle maximum speed limit in work zones should be decreased to 25 km/hr.

### **6.2.3 Acoustic Environment**

The impacts on the acoustic environment were assessed as: direct, moderate, short-term, local, and reversible, of high likelihood of occurrence and of medium significance. Therefore, the main proposed mitigation measure includes applying an appropriate schedule for maintenance activities, for instance, from 8 am to 4 pm in order to avoid any works that may cause noise and vibration during nighttime. In addition, nighttime activities should be done using noise reducing means or low-noise technologies.

### **6.2.4 Biodiversity**

Impacts were assessed as direct, moderate, local, long-term, irreversible, of high likelihood of occurrence, and of medium significance.

During the operation of the project, maintenance activities must be conducted properly in order to avoid spillages and natural habitats contamination. Further, road cross-section must be fixed during the rehabilitation phase to reduce the impact on biodiversity when roads are operational, for example, by flattening side slopes. This makes crossing easier for animals that find roads a physical barrier. Also, providing longer sight lines for drivers is recommended as it can reduce collisions with animals by allowing more reaction time.

### **6.2.5 Energy Consumption**



The impacts on energy consumption were assessed as: direct, low, short-term, local, and reversible, of moderate likelihood of occurrence and of medium significance. Therefore, in order to reduce energy consumption, the following should be applied:

- Equipment should be turned off when not in use.
- Vehicles should not be allowed to remain idle for long periods.
- Recording monthly fuel consumption.

### **6.2.6 Public and Workers Health and Safety**

The impacts on health and safety are assessed as: direct, low, local, short-term, reversible, of medium likelihood of occurrence and of medium significance. Thus, in order to reduce the impacts on health and safety, the following mitigation measures should be applied:

- Ensure that during maintenance all employees utilize appropriate personal protective equipment (e.g. hard hats, steel toe boots, respirators) and are well trained on occupational health and safety.
- Ensure public safety by informing local citizens of the maintenance activities to be performed through the use of media, public announcements, and signage.

## **6.3 Social Mitigation Measures during Rehabilitation**

### **6.3.1 Mitigation Measures on Socio-Economic Conditions of Surrounding Communities**

#### **(1) Traffic Disturbance and Nuisance**

In order to reduce the impact of traffic disturbance and nuisance on the surrounding communities, the following measures should be implemented:

- Full coordination with the Municipality before and during the rehabilitation to avoid/minimize any potential impact
- Adequate warning, signing, delineation and channeling at least 500 m down and up-gradient from the rehabilitation site must be provided by the project proponents.
- Movement of delivery vehicles outside the site should be restricted to off-peak traffic hours.
- Speed limitation signs should be installed at the access points.
- Full road closures won't be done as all closures will be of partial nature; detours will comprise of merely temporary diversions. In this context, the contractor has to prepare rehabilitation methods and program of work taking into consideration safety and non-stop traffic along the road (refer to Annex 3)
- Commencement of works should not be allowed prior to placing all the required temporary signs, traffic lights, flagmen, etc... wherever and whenever required. Typical signs used are those that indicate the presence of a diversion ahead, the end of diversion, in addition to signs indicating there are works ahead, among others.
- Clear communication with all PAPs and a robust GRM are essential before commencement of work in order to mitigate traffic nuisance.

- The contractor has to ensure access diversions for traffic at each stage of work and to provide all necessary requirements to facilitate the continuity of traffic circulation.

## **(2) Labor Influx and Labor Induced SEA**

Although SEA risks towards women in the surrounding community is anticipated to be low, implementing measures to avoid the risk is essential to ensure that labor uphold acceptable behavioral manners when interacting with local communities. Therefore, in order to avoid the risk of SEA incidents towards female inhabitants of the surrounding communities, the following measures are highly recommended:

- Providing workers with the necessary training and awareness raising session on issues regarding SEA, prior to signing the CoC (refer Annex 4).
- Obliging employees to attend an induction training course prior to commencing work on site to ensure they are familiar with the company's commitments to address GBV, in specific, SEA and the project's CoC.
- Repeating training and awareness raising on a regular basis as new staff commence work on the project.
- Informing laborers regarding national laws that prosecute perpetrators of SEA
- Providing CoC in a language understood by the workers who will sign the CoC.
- Ensuring requirements in CoCs are clearly understood by those signing it.
- Ensuring that the sanctions embodied in the CoC are be clearly explained.
- Ensuring that workers at the rehabilitation site sign the Code of Conduct (CoC) (refer to Annex 4) that targets GBV risks, specifically SEA induced by labor influx, and penalizes the perpetrators of SEA.
- Verifying that GRM (refer to 8.2.1) is adequately implemented to record complaints from the surrounding communities, to find adequate resolutions and implement corrective actions.

## **(3) Obstruction of Access Routes to Sensitive Receptors**

In order to minimize the temporary obstruction of access routes to residential units, schools, places of worship and hospitals, the contractor should ensure adequate and timely communication with the concerned municipalities, schools and dissemination of project-related work schedule with the surrounding community including owners of restaurants and rafting clubs. In other words, the nearby communities will be informed of the exact timing of activities prior to the commencement of works. Additionally, GRM should be clearly communicated and adequately disseminated.

Further the rehabilitation works should not be performed during peak traffic hours. For instance, works can take place when students are already at school and the activities that are not noisy can be performed at night to ensure that access to surrounding schools and residential areas is not hindered. Moreover, it is preferable to perform the rehabilitation works during the summer season in order to avoid disturbance of the surrounding schools.

Regarding the rehabilitation of long roads, the contractor should work on one small segment at a time, to avoid disturbance of the surrounding sensitive receptors for a long period of time.

### **6.3.2 Mitigation Measures on Socio-Economic Conditions of Labor**

#### **(1) Labor Induced SH**

Although women participation in rehabilitation works is expected to be low, adequate measures should be addressed to avoid the risk for labor induced SH.

Therefore, laborers should be provided with training sessions and awareness campaigns on SH to ensure that they are aware of issues related to women, social norms and the importance of maintaining and respecting gender equality.

The CoC should be enforced to project laborers (in a language understood by all workers). Additionally, the Contractor should ensure that CoC requirements and sanctions to be applied, if breached, are well understood by signatories, prior to signing the CoC. Further, it is important to ensure that a proper GRM is established to address any kind of violations to the signed CoC.

#### **(2) Child labor**

The project should closely monitor the risk of child labor and should have measures in contracts to ensure that those below the working age are not hired and ensure that labor law of Lebanon is followed. In this context, a labor registry and age verification must be maintained during the whole rehabilitation phase. Also, penalty provisions should be available for hiring child labor.

Additionally, during the employment procedure, the contractor or subcontractor should abide by the Lebanese Law No.0 dated 1946.

#### **(3) Inadequate Labor Conditions**

Safety and protection of workers should be ensured within the contracts provided by the contractor and continuous monitoring is required to maintain adequate labor conditions. Further, in order to counter inadequate working circumstances that would make both Syrian and low-skilled Lebanese worker at higher risk of exploitation, appropriate rules and regulations should be implemented in order to ensure the protection of laborers.

Contractors should be forced to abide by the specified Lebanese law determining the minimum wage and minimum working age for children, as per the law, and to comply with, working conditions and hours (as specified in the legal section).

#### **(4) Social tensions and conflict over job-sharing and dissatisfaction with allocation of project-generated jobs.**

Clear criteria for job selection and allocation should be adopted accounting for the ratio of Syrian and Lebanese community workers in Hermel Caza and types of positions available. Moreover, it is important to avoid competition between Syrian workforce willing to accept lower wages and skilled Lebanese labor. Hence, the Contractor should ensure a fair allocation of job opportunities, and most importantly non-discrimination and fair treatment (such as equal wages/benefits and working conditions) should be ensured among workers. Finally, clear

communication with all affected workers and a robust GRM are essential to mitigate the potential risk of social tensions or dissatisfaction among Syrian and Lebanese workers.

#### **(5) Under-participation or underemployment or discrimination of women**

The following measures should be adopted to ensure women employment by the Contractor:

- Setting minimum percentage of women at the employment phase.
- The project should ensure that gender equality is attained when it comes to recruitment, salary levels and others
- Promoting the employment of females in appropriate jobs such as managerial or administrative positions and giving the opportunity to women to decide the suitable operations that they can perform
- Encouraging women through awareness campaigns on the importance of employment in such project in order to enhance their livelihoods.

#### **6.4 Social Mitigation Measures during Operation**

Rehabilitation works under RAP will lead to positive social impacts due to improvement in road conditions such as lighting. This will increase visibility which will contribute to safer environment for women and reduce the probability of SEA. However, some measures are necessary to ensure that positive impacts are maximized. These measures include the following:

- Ensure that workers during the maintenance phase are trained and well understood prior to signing the CoC that targets GBV risks (mainly SEA and SH) and penalizes the perpetrators of GBV.
- Ensure that GRM mechanism is functional to receive any public concerns throughout this phase and to address the received complaints within the set timeframes (specified in section 8.2).

## **7. Environmental and Social Management and Monitoring Plan**

Environmental and social management and monitoring are essential to ensure that the identified impacts are maintained within the allowable levels, unanticipated impacts are mitigated at an early stage, and the expected project benefits are realized. Thus, the main aim is to assist in the systematic and prompt recognition of problems, encouraging effective preventive and mitigation measures and ultimately achieving the goal of good environmental and social performance. A sound understanding of environmental priorities and policies, properly managing the project, acknowledging the regulatory requirements and keeping updated operational information are fundamental to ensure the effective and satisfactory environmental performance.

### **7.1 Institutional Setup and Capacity Building**

The project works will be executed on the main road network which is under the jurisdiction of the MoPWT. In Lebanon, donor-funded road works projects are implemented by CDR upon the request of the Council of Ministers (CoM). Therefore, in the context of REP project, CDR (Road and Transport Department) will execute the project on behalf of the Government/MoPWT.

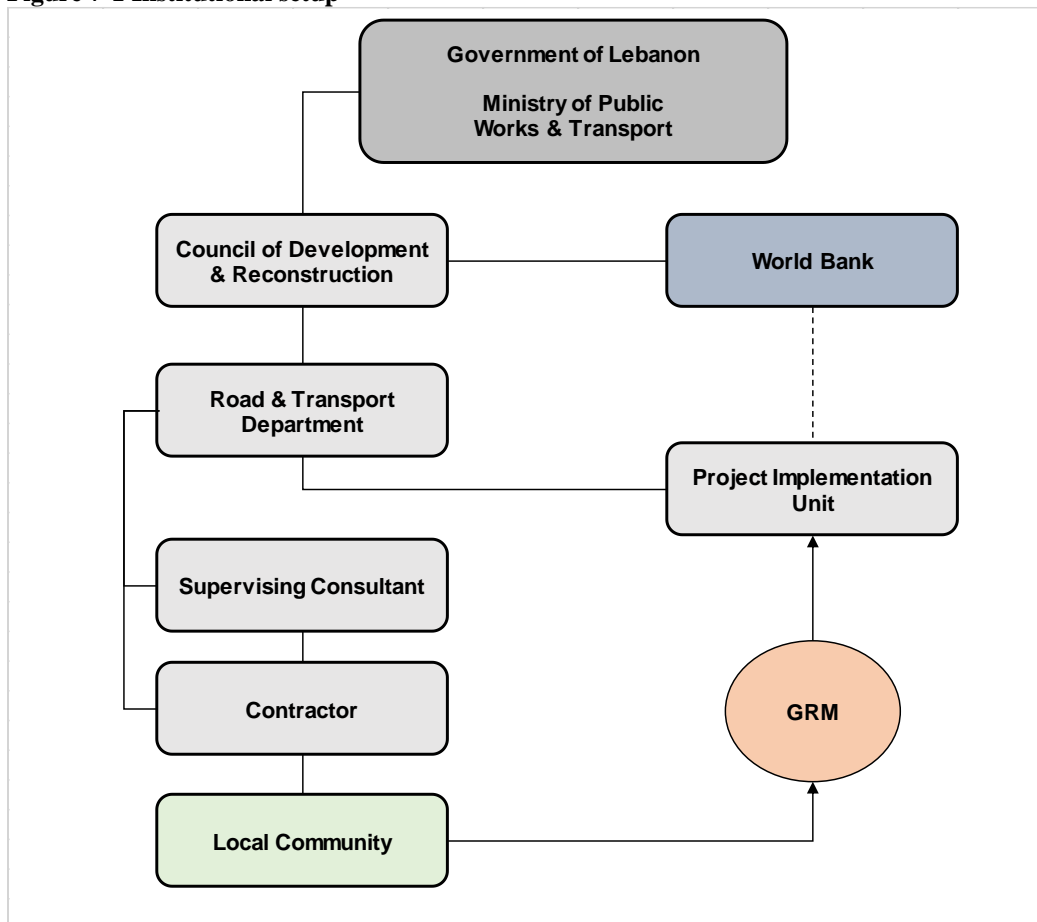
In order to achieve proper environmental management and monitoring, a clear, functional institutional structure was defined (refer to Figure 7-1). During the rehabilitation phase, the contractor would be the primary actor; ensuring compliance of works with the different items specified in the environmental and social management plan. Accordingly, the contractor will be supervised by several entities appointed by CDR. CDR will be responsible for constant monitoring of the rehabilitation works through weekly reports (sent by the contractor) and site visits, ensuring and enforcing mitigation measures.

More specifically, the CDR will develop a Project Implementation Unit (PIU) dedicated to the project, which includes social and environmental specialists to monitor and evaluate the project. Moreover, it will engage a supervising consultant to directly monitor the contractor. In this context, planning, implementation and supervision of environmental safeguards will thus take place at different stages (a) PIU, (b) Supervising Consultant, and (c) Contractor.

PIU will be responsible for providing the overall plan direction, technical support, appraisal and validation of environmental and social management plans, and monitoring of environmental compliance and progress reporting to the World Bank. The responsibility of implementation and management of environmental/social safeguards by the PIU will be coupled with the assignment of supervising consultant (focal point(s) for environmental and social safeguards) who will be in charge of ensuring sound application of the ESMP. Finally, implementation of the ESMPs will mainly be the contractors' duty and consequently the contractor will have to appoint qualified environmental, health and safety consultant and a social development consultant in order to ensure compliance with the ESMPs during the rehabilitation phase of the project.

The main concerned municipalities will be involved in managing and communicating citizens' potential complaints to the CDR (PIU).

**Figure 7-1 Institutional setup**



### **7.1.1 Training**

Despite the institutions' previous experiences in implementing similar projects, institutional capacity development would be beneficial to ensure proper implementation and supervision of the suggested mitigation measures and monitoring program. For instance, human resources can be improved through training and regular follow-up.

In order to ensure safeguard procedure, instruments and monitoring needs of the REP are well understood by the contractor staff, CDR (i.e. the supervising consultant) will provide trainings. Trainings will aim to familiarize the contractor's staff on the following guidelines and instruments:

- World Bank's safeguard policies;
- National environmental regulations (the main social and environmental legal texts listed in the legal section of this ESMP);
- Safeguards planning, management and monitoring requirements of the REP as specified in the ESMP;
- GRM

### **7.2 Mitigation Plans**

### 7.2.1 Environmental and Social Mitigation Plans

**Table 7-1 Environmental and Social Management Plan in Rehabilitation Phase**

Source of Impact	Project Activities	Proposed Mitigation Measures	Responsibility	Cost Estimation (USD)
<b>Emission</b>				
<b>Air Emissions/Odors</b>	Generation of dusts, exhaust gases, and odors from pavement reconstruction and others activities	<ul style="list-style-type: none"> <li>• Ensuring maintenance of all construction equipment regularly, at least once a month.</li> <li>• Machinery and equipment should be equipped with air pollution control equipment that should be monitored regularly to ensure its effective operation.</li> <li>• Avoiding idling time of machinery.</li> <li>• Ensuring regular maintenance of vehicles.</li> </ul>	Project contractor / consultant	Included in the rehabilitation Cost
<b>Acoustic Environment</b>	Construction equipment noise and vibrations, earth manipulating activities from pavement milling and drainage excavations	<ul style="list-style-type: none"> <li>• Applying an appropriate schedule for maintenance activities, for instance, from 8 am to 4 pm in order to avoid any works that may cause noise and vibration during nighttime.</li> <li>• Nighttime activities should be done using noise reducing means or low-noise technologies.</li> <li>• Using vehicles and equipment that meet national standards for noise and vibration.</li> <li>• Regular maintenance of the machinery, equipment and vehicle should be carried out to prevent excessive noise.</li> <li>• Publishing and registering allowed working time of construction machines with local authorities and ensuring strict compliance with set times.</li> <li>• Restricting the use of noisy machines and/or adopting noise-reducing means (silencers) for construction machines, especially near sensitive areas.</li> </ul>	Project contractor / consultant	Included in the rehabilitation Cost
<b>Solid Waste and Wastewater Generation</b>	Generation of rehabilitation wastes and domestic-like wastes and wastewater	<ul style="list-style-type: none"> <li>• Good site practices including the effective disposal of all wastes generated on-site should be adopted.</li> <li>• The generated waste onsite should be properly segregated at source into recyclables and organic waste in appropriately labelled waste bins. Sorting at source of domestic and general waste should be implemented.</li> <li>• Sufficient waste disposal points must be provided and regular collection for disposal must take place near the road.</li> </ul>	Project contractor / consultant	Included in the rehabilitation Cost

		<ul style="list-style-type: none"> <li>• Adequate bins for collection and storage of waste materials should be provided.</li> <li>• Prevent the overfilling of the waste containers.</li> <li>• Domestic-like waste shall be removed daily from the site and should be collected by either the concerned municipality or the waste collection company.</li> <li>• Excavated soil should be stored and transported offsite to a nearest licensed dumpsite due to possible heavy metal contamination.</li> <li>• Any excavated unsuitable material should be removed from site within 24 hours. Reuse of contaminated soil material is prohibited and random disposal of this material in open abandoned areas is never allowed.</li> <li>• In case of linking the port cabin toilet to a polyethylene storage tank, the following should be done:             <ul style="list-style-type: none"> <li>○ A specialized contractor should be selected to periodically collect the wastewater from the polyethylene tank to a nearby wastewater treatment plant.</li> <li>○ The supervising consultant should inspect it regularly to check for any leakages and to ensure that the generated wastewater is properly collected before it's full.</li> </ul> </li> </ul>		
<p><b>Accidental Releases</b></p>	<p>Accidental spills of construction material, and storm water runoff</p>	<p>Control of Accidental Spills</p> <ul style="list-style-type: none"> <li>• All refueling and maintenance operations shall take place off-site, vehicles should be fueled up before arriving to the road section</li> <li>• A spill response plan shall be in place and all workers should be trained on its implementation.</li> </ul> <p>Control of Stormwater Runoff</p> <ul style="list-style-type: none"> <li>• In case of temporary storage of excavated materials, accidental contamination or spills of the removed soil should be avoided to limit contamination of storm water runoff and in turn the surrounding streams.</li> <li>• Any stockpiled construction material should be covered with an impermeable layer to avoid contamination of stormwater</li> </ul>	<p>Project contractor / consultant</p>	<p>Included in the rehabilitation Cost</p>



		runoff.		
<b>Soil Manipulation</b>	Soil erosion and sedimentation from drainage or sidewalks excavations	<ul style="list-style-type: none"> <li>• Installation of retaining walls before starting with drainage ditch excavations to block soil erosion</li> <li>• Excavations for drainage channels should be carried out in complete precision</li> <li>• Placement of geotextile silt traps as appropriate, especially in areas close to water bodies (all roads in Hermel Caza).</li> </ul>	Project contractor / consultant	Included in the rehabilitation Cost
<b>Existing Infrastructure</b>	Interference of pavement drilling and milling with infrastructure	<ul style="list-style-type: none"> <li>• Prepare procedures for rapid notification to the concerned Municipality or public entity and assistance with re-instatement, in the event of any disruption of public utilities.</li> <li>• Splitting works into the road segments will be done to ensure quick progression through road while causing minimal disruption to traffic.</li> </ul>	Project contractor / consultant	Included in the rehabilitation Cost
<b>Resources Consumption</b>	Increase energy demand	<ul style="list-style-type: none"> <li>• Ensuring that equipment that are not in use are turned off.</li> <li>• Conducting regular maintenance and efficient operation of machinery.</li> <li>• Vehicles should not be allowed to remain idle for long periods.</li> <li>• Recording monthly fuel consumption.</li> </ul>	Project contractor / consultant	Included in the rehabilitation Cost
<b>Biological Resources</b>	Changes in natural habitat and biodiversity	<ul style="list-style-type: none"> <li>• A waste management plan must be adopted to avoid contaminating the soil and water and hence affecting the local biota;</li> <li>• Workers should be instructed to protect flora and fauna when feasible as well as their habitats;</li> <li>• Washing of vehicles and machinery should be done offsite and away from particular biotopes (wooded lands, grasslands, and riparian habitats);</li> <li>• Solid waste, rehabilitation debris should not be dumped into the natural habitats (woodlots (namely for Hermel R9) and riparian habitats when roads encounter winter drainage channels (all Hermel roads) and intersect with rivers (El Assi River and Hermel R4 section 1 intersect, Hermel R7a intersects with Sharbin River and Hermel R9 crosses Wadi El Fissane).</li> <li>• Restricting the use of noisy machines and/or adopting noise-reducing means (silencers) for rehabilitation machines, especially near sensitive areas (rivers and water channels);</li> <li>• Water spraying must be done frequently in order to avoid</li> </ul>	Project contractor / consultant	Included in the rehabilitation Cost

		<p>dust accumulation on adjacent vegetation (all Hermel roads).</p> <ul style="list-style-type: none"> <li>Road cross-section must be fixed during the rehabilitation phase to reduce the impact on biodiversity, for example, by flattening side slopes. This makes crossing easier for animals that find roads a physical barrier (WB). Also, providing longer sight lines for drivers is recommended as it can reduce collisions with animals by allowing more reaction time.</li> </ul>		
<b>Visual intrusion</b>	Day time and night time rehabilitation works	<ul style="list-style-type: none"> <li>Covering of temporary stockpiled excavations on the side of the road</li> <li>Ensuring that the light source is the minimum intensity for the required purpose;</li> <li>Ensuring that lights are turned off by timer or manually when they are not needed;</li> <li>Ensuring that fittings are chosen that direct light accurately to where it is needed;</li> <li>Ensuring that the type of light chosen is the least likely to cause light pollution;</li> </ul>	Project contractor / consultant	Included in the rehabilitation Cost
<b>Social Risks</b>	<ul style="list-style-type: none"> <li>Labor influx and Labor-induced SH and SEA</li> <li>Workers tension (Syrian/Lebanese ratio)</li> <li>Child labor</li> <li>Inadequate labor conditions</li> <li>Traffic disturbance</li> <li>Obstruction of Access Routes to Sensitive Receptors</li> </ul>	<p><b>Socio-Economic Conditions of Surrounding Communities</b></p> <p><u>Traffic Disturbance and Nuisance</u></p> <ul style="list-style-type: none"> <li>Full coordination with the Municipality before and during the rehabilitation to avoid/minimize any potential impact</li> <li>Adequate warning, signing, delineation and channeling at least 500 m down and up-gradient from the rehabilitation site must be provided by the project proponents.</li> <li>Movement of delivery vehicles outside the site should be restricted to off-peak traffic hours.</li> <li>Speed limitation signs should be installed at the access points.</li> <li>Full road closures won't be done as all closures will be of partial nature; detours will comprise of merely temporary diversions. In this context, the contractor has to prepare rehabilitation methods and program of work taking into consideration safety and non-stop traffic along the road (refer to Annex 3)</li> <li>Commencement of works should not be allowed prior to</li> </ul>	Project contractor / consultant	Included in the rehabilitation Cost

		<p>placing all the required temporary signs, traffic lights, flagmen, etc... wherever and whenever required. Typical signs used are those that indicate the presence of a diversion ahead, the end of diversion, in addition to signs indicating there are works ahead, among others.</p> <ul style="list-style-type: none"> <li>• Clear communication with all PAPs and robust GRM are essential to mitigate traffic nuisance</li> <li>• The contractor has to ensure access diversions for traffic at each stage of work and to provide all necessary requirements to facilitate the continuity of traffic circulation.</li> </ul> <p><u>Labor Influx and Labor Induced SEA</u></p> <ul style="list-style-type: none"> <li>• Providing workers with the necessary training and awareness raising session on issues regarding SEA, prior to signing the CoC (refer to Annex 4).</li> <li>• Obliging employees to attend an induction training course prior to commencing work on site to ensure they are familiar with the company's commitments to address GBV, in specific, SEA and the project's CoC.</li> <li>• Repeating training and awareness raising on a regular basis as new staff commence work on the project.</li> <li>• Informing laborers regarding national laws that prosecute perpetrators of SEA</li> <li>• Providing CoC in a language understood by the workers who will sign the CoC.</li> <li>• Ensuring requirements in CoCs are clearly understood by those signing it.</li> <li>• Ensuring that sanctions embodied in the CoC are be clearly explained.</li> <li>• Ensuring that workers at the rehabilitation site sign the Code of Conduct (CoC) (refer to Annex 4) that targets GBV risks, specifically SEA induced by labor influx, and penalizes the perpetrators of SEA.</li> <li>• Verifying that GRM is adequately implemented to record complaints from the surrounding communities, to find adequate resolutions and implement corrective actions.</li> </ul>		
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		<p><u>Obstruction of Access Routes to Sensitive Receptors</u></p> <ul style="list-style-type: none"> <li>• In order to minimize the temporary obstruction of access routes to residential units, schools, places of worship and hospitals, the contractor should ensure adequate and timely communication with the concerned municipalities and dissemination of project-related work schedule with the surrounding community.</li> <li>• A clear communication and a robust GRM are needed to mitigate this impact</li> <li>• Nearby communities should be informed of the exact timing of activities prior to the commencement of works.</li> <li>• The rehabilitation works should not be performed during peak traffic hours (e.g. works can take place when students are already at school).</li> <li>• Some of the works that are not noisy should be at night to ensure that access to surrounding schools and residential areas is not hindered.</li> <li>• It is preferable to perform the rehabilitation works during the summer season in order to avoid disturbance of the surrounding schools.</li> <li>• During rehabilitation of long roads, the contractor should work on one small segment at a time, to avoid disturbance of the surrounding sensitive receptors for a long period of time. Clear communication with all PAPs and a robust GRM are essential to mitigate the potential risk of obstruction</li> </ul> <p><b>Socio-Economic Conditions of Labor</b></p> <p><u>Labor Induced SH</u></p> <ul style="list-style-type: none"> <li>• Laborers should be provided with training sessions and awareness campaigns on SH</li> <li>• CoC should be enforced to project laborers (in a language understood by all workers).</li> <li>• The Contractor should ensure that CoC requirements and</li> </ul>		
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		<p>sanctions to be applied, if breached, are well understood by signatories, prior to signing the CoC.</p> <ul style="list-style-type: none"> <li>• The Contractor should ensure that a proper GRM is established to address any kind of violations to the signed CoC.</li> </ul> <p><u>Child Labor</u></p> <ul style="list-style-type: none"> <li>• The project should closely monitor the risk of child labor and should have measures in contracts to ensure that those below the working age are not hired and ensure that labor law of Lebanon is followed.</li> <li>• Labor registry and age verification must be maintained during the whole rehabilitation phase.</li> <li>• Penalty provisions should be available for hiring child labor.</li> <li>• During the employment procedure, the contractor or subcontractor should abide by the Lebanese Law No.0 dated 1946.</li> </ul> <p><u>Inadequate Labor Conditions</u></p> <ul style="list-style-type: none"> <li>• Safety and protection of workers should be ensured within the contracts provided by the contractor</li> <li>• Continuous monitoring is required to maintain adequate labor conditions.</li> <li>• Appropriate rules and regulations should be implemented in order to ensure the protection of laborers.</li> <li>• Contractors should be forced to abide by the specified Lebanese law determining the minimum wage and minimum working age for children.</li> <li>• Contractor must comply with Decision 29/1 dated 2018 which restricts significant number of jobs to Lebanese only and allows Syrians to occupy jobs that are not restricted to Lebanese.</li> </ul> <p><u>Social tensions and conflict over job-sharing and dissatisfaction</u></p>		
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		<p><u>with allocation of project-generated jobs.</u></p> <ul style="list-style-type: none"> <li>• Clear criteria for job selection and allocation should be adopted accounting for the ratio of Syrian and Lebanese community workers in Hermel Caza and types of positions available.</li> <li>• It is important to avoid competition between Syrian workforce willing to accept lower wages and skilled Lebanese labor.</li> <li>• The Contractor should ensure a fair allocation of job opportunities, and most importantly non-discrimination and fair treatment should be ensured among workers. (such as equal contractual wages/benefits and working conditions) should be also ensured among workers.</li> <li>• Clear communication with all affected workers and a robust GRM are essential to mitigate the potential risk of social tensions or dissatisfaction among Syrian and Lebanese workers.</li> </ul> <p><u>Under-participation or underemployment or discrimination of women</u></p> <ul style="list-style-type: none"> <li>• Setting minimum percentage of women at the employment phase.</li> <li>• The project should ensure that gender equality is attained when it comes to recruitment, salary levels and others</li> <li>• Promoting the employment of females in appropriate jobs such as managerial or administrative positions and giving the opportunity to women to decide the suitable operations that they can perform</li> <li>• Encouraging women through awareness campaigns on the importance of employment in such project in order to enhance their livelihoods.</li> </ul>		
<b>Occupational Health and Safety Hazards</b>	Rehabilitation activities	Specific measures according to WBG (2007) to limit impacts due to the open nature of rehabilitation sites and their proximity to the community include:	Project contractor / consultant	Included in the rehabilitation Cost

		<ul style="list-style-type: none"> <li>• Measures to prevent unauthorized access to dangerous areas should be in place</li> <li>• Openings should be sealed by gates or removable chains</li> <li>• Fall prevention and protection measures should be implemented, such as the installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area</li> <li>• Signage should be in accordance with international standards and be well known to, and easily understood by workers, visitors and the general public as appropriate</li> <li>• Marking all energized electrical devices and lines with warning signs</li> <li>• Establishing rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures, and control of traffic patterns or direction</li> </ul> <p><i>Training of Personnel</i></p> <p>The following trainings should be implemented (Muiruri &amp; Mulinge, 2014):</p> <ul style="list-style-type: none"> <li>• Ensure that all workers are given proper site-specific instructions on occupational health and safety prior to commencing work.</li> <li>• The Occupational Health and Safety training should consist of hazard awareness and control measures.</li> <li>• The training should ensure proper usage of personal protective equipment (PPE).</li> <li>• The trainees should acquire knowledge of emergency procedures and preventive actions.</li> <li>• Refresher training should be provided periodically, if skills are not frequently used.</li> </ul> <p><i>Noise Emissions</i></p> <p>According to WBG (2007), the following should be implemented:</p> <ul style="list-style-type: none"> <li>• Employees should not be exposed to a noise level greater than</li> </ul>		
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		<p>85 dB (A) for a duration of more than 8 hours per day without hearing protection.</p> <ul style="list-style-type: none"> <li>• Another way of protection can be achieved through limiting the duration of noise exposure. For instance, for every 3 dB (A) increase in sound levels, the allowed exposure period should be reduced by 50 percent.</li> <li>• Periodic medical hearing checks should be performed on employees who are exposed to high noise levels.</li> </ul> <p><i>Health and Safety Signs</i></p> <p>Examples of signs that must be present at the rehabilitation site include but are not limited to the following (DOLIDAR, 2017):</p> <ul style="list-style-type: none"> <li>• Wear safety helmets and reflective jackets</li> <li>• Permit to work areas</li> <li>• Falling Hazard, Use safety belt</li> <li>• Watch for moving equipment</li> <li>• Wear safety footwear</li> <li>• Wear hearing protection</li> <li>• Wear eye protection</li> <li>• First aid</li> <li>• Danger of electricity</li> <li>• No smoking</li> <li>• Work in progress</li> <li>• Stop and go</li> </ul> <p><i>First Aid and Injuries</i></p> <p>The availability of first aid kits and the adoption of the following recommendations is essential in order to respond quickly and efficiently to any accident or injury:</p> <ul style="list-style-type: none"> <li>• At least one laborer per each group of workers onsite should be appointed to respond to emergency cases, on condition that adequate first aid training is provided.</li> <li>• One employee for every 25 employees on site should be trained</li> </ul>		
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		<p>in first aid. The assigned personnel should be provided with appropriate identification, including a red hard hat with a white "red cross" symbol and an identification badge (CDR, 2007).</p> <ul style="list-style-type: none"> <li>• All workers onsite should know where the first aid facilities are located and how to adequately use first aid kits.</li> <li>• A full list of nearby hospitals, medical centers and emergency contact numbers should be provided to workers onsite.</li> <li>• All injuries or accidents at the rehabilitation site should be reported immediately and the contractor should maintain and keep a record of accidents or illnesses.</li> <li>• Turning off or disconnecting machinery with exposed moving parts.</li> <li>• Marking all energized electrical devices and lines with warning signs.</li> <li>• Checking all electrical cords, cables and hand power tools for frayed and exposed cords and following manufacture recommendations for maximum permitted operational voltage.</li> <li>• Use mechanical assists to eliminate or reduce exertions required to lift heavy material, hold tools and work objects.</li> </ul> <p><i>Personal Protective Equipment (PPE)</i></p> <p>Proper use of PPEs is essential to limit the occurrence of occupational hazards. Accordingly, the following should be implemented (DOLIDAR, 2017):</p> <ul style="list-style-type: none"> <li>• An adequate supply of suitable personnel protective equipment (PPE) such as hard hats, safety boots, reflective jackets, and others should be maintained.</li> <li>• The PPEs (specifically hard hat and reflective jacket) provided to managers and safety officers should have a different color than the PPEs of the rehabilitation workers onsite.</li> <li>• Ensure that workers wear PPEs all the time during working hours.</li> </ul> <p>The following PPE should be used when handling and working with asphalt (NIOSH, 2003):</p>		
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		<ul style="list-style-type: none"> <li>• Wearing thermally-insulated gloves to keep asphalt from burning or irritating the skin.</li> <li>• Wearing long-sleeve shirts and long pants without cuffs and keeping the sleeves rolled down and close to the collar.</li> <li>• Wearing Steel-toed safety shoes.</li> <li>• Wearing a face shield, not just safety glasses.</li> </ul> <p>The following mitigation measures should be adopted by labor when handling and working with asphalt (NIOSH, 2003):</p> <ul style="list-style-type: none"> <li>• Never stick your head in an asphalt tank or mixing container.</li> <li>• Never lean over a kettle. Stay upwind from asphalt if possible.</li> <li>• Enclosing mixing and stirring operations.</li> <li>• Stop what you're doing if you notice symptoms. Ask your foreman for advice.</li> <li>• Keep asphalt off your skin and out of your eyes.</li> <li>• If you do get asphalt in your eyes, flush with water for 15 minutes.</li> <li>• Eating, drinking and smoking are prohibited during any asphalt activity.</li> </ul>		
<b>Public Health and Safety</b>	Rehabilitation activities	<p><b>Site Layout and Planning</b></p> <ul style="list-style-type: none"> <li>• Designing carefully the rehabilitation site in order to avoid or reduce accidents due to trips, slips, and collisions</li> <li>• Providing roads within the zones being rehabilitated with speed limits signs of 25 km/hr to decrease risks of collisions and accidents.</li> <li>• Restricting access to the zones of unfinished works and providing guards to control entrances and exits.</li> <li>• No work activities are to be conducted without the presence of barriers, temporary traffic lights, and flagmen if necessary, which are required to warn the public of the existing rehabilitation site and its activities</li> </ul> <p><b>Traffic Diversion</b></p>	Project contractor / consultant	Included in the rehabilitation Cost

		<p>Exact locations and distances of detours are to be set by the site engineer. These points are set according to work progress, location and traffic. As such, general precautionary measures are provided to be considered when selecting the detour. It is important to note that the project will not use or rent land for the purpose of diversions. Moreover, illustrated detour signage should be displayed around the site as necessary. In addition, the approximate location of signs is shown on the drawings (Annex 3). Exact locations are to be determined on site upon engineer's approval.</p> <ul style="list-style-type: none"> <li>• The contractor has to ensure access diversions for traffic at each stage of work and to provide all necessary requirements to facilitate the continuity of traffic circulation.</li> <li>• Prior to any works, the contractor shall submit to the engineer a detailed method statement showing and describing the following:             <ul style="list-style-type: none"> <li>○ The division of the works into phases and sections</li> <li>○ The various traffic diversions related to each phase of the works.</li> <li>○ The temporary diversion of the different services and utilities (avoid continuous disturbance).</li> </ul> </li> <li>• Adequate warning signs and security of the site, namely through barriers, should be provided during non-working hours.</li> <li>• Where the pavement crosses service entrance (houses or shops) which are higher or lower than the pavement edge level, the contractor has to construct concrete steps as directed by the engineer on site. Steps are constructed wherever the difference in elevation between the entrance and pavement levels are more than 250 mm.</li> <li>• In case where the pavement edge limit crosses a parking or a pedestrian footpath, depressed sidewalk curb shall be applied as shown on drawings (Annex 3) and directed by the engineer.</li> </ul> <p><b>Noise Emissions</b></p>		
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		<ul style="list-style-type: none"> <li>Noise levels should be maintained within the national permissible limits (presented in Table 2-4) and limited to working hours as allowed by obtained permits.</li> <li>Transportation of construction material during regular working hours should be minimized, when possible.</li> </ul>		
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**Table 7-2 Environmental and Social Management Plan in Operation Phase**

Source of Impact	Project Activities	Mitigation Measures	Responsibility	Cost Estimation (USD)
<b>Emission</b>				
<b>Air Emissions</b>	Dust and exhaust emissions	<ul style="list-style-type: none"> <li>Ensuring maintenance of equipment used in road maintenance activities (e.g. shovel, steel roller, excavator...) regularly, at least once a month.</li> <li>Machinery and equipment should be equipped with air pollution control equipment that should be monitored regularly to ensure its effective operation.</li> <li>Avoiding idling time of machinery.</li> <li>Using dust-suppression methods to reduce emission of particulate matter into the surroundings.</li> <li>Prohibit dust-generating activities during excessively windy periods.</li> <li>Vehicle maximum speed limit in work zones should be decreased to 25 km/hr.</li> </ul>	Project contractor / consultant	Included in the rehabilitation Cost
<b>Acoustic pollution</b>	Vehicle and equipment noise from maintenance activity	<ul style="list-style-type: none"> <li>Applying an appropriate schedule for maintenance activities, for instance, from 8 am to 4 pm in order to avoid any works that may cause noise and vibration during nighttime.</li> <li>Nighttime activities should be done using noise reducing means or low-noise technologies.</li> </ul>	<ul style="list-style-type: none"> <li>Contractor during the first year</li> <li>Municipalities and MoPWT after the one-year period</li> </ul>	Secured by responsible party

<p><b>Solid waste and Wastewater Generation</b></p>	<p>Accidental spills and Generated domestic solid waste and wastewater during maintenance</p>	<ul style="list-style-type: none"> <li>• All refueling and maintenance operations shall take place off-site, vehicles should be fueled up before arriving to the road section</li> <li>• A spill response plan shall be in place and all workers should be trained on its implementation.</li> <li>• Provision of adequate bins for collection and storage of waste material including litterbins and waste skips</li> <li>• Preventing the overfilling of the waste containers placed on the road</li> <li>• Proper disposal of any generated wastewater during maintenance activities</li> <li>• Maintain the cleaning of the stormwater channels especially before the start of the rainy season and continually remove debris and solid waste in order to prevent the blockage of the drainage system.</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor during the first year</li> <li>• Municipalities and MoPWT after the one-year period</li> </ul>	<p>Secured by responsible party</p>
<p><b>Depletion of Resources</b></p>				
<p><b>Biological Resources</b></p>	<p>Light and noise pollution – negative effect on biodiversity (fauna and flora)</p>	<ul style="list-style-type: none"> <li>• When conducting maintenance activities, a waste management plan must be set to avoid contaminating the nearby rivers and affecting the local biodiversity. Moreover, restricting the use of noisy machines, especially near sensitive areas (woodlots (namely for Hermel R9) and riparian habitats when roads encounter winter drainage channels (all Hermel roads) and intersect with rivers (El Assi River and Hermel R4 section 1 intersect, Hermel R7a intersects with Sharbin River and Hermel R9 crosses Wadi El Fissane).</li> <li>• Install silencers to the maintenance machines</li> <li>• Road cross-section must be fixed during the rehabilitation phase to reduce the impact on biodiversity when roads are operational, for example, by flattening side slopes. This makes crossing easier for animals that find roads a physical barrier (WB). Also, providing longer sight lines for drivers is recommended as it can reduce collisions with animals by allowing more reaction time.</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor during the first year</li> <li>• Municipalities and MoPWT after the one-year period</li> </ul>	<p>Secured by responsible party</p>
<p><b>Resources Consumption</b></p>	<p>Energy Consumption</p>	<ul style="list-style-type: none"> <li>• Equipment should be turned off when not in use.</li> <li>• Vehicles should not be allowed to remain idle for long periods.</li> <li>• Recording monthly fuel consumption.</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor during the first year</li> <li>• Municipalities and MoPWT after the one-year period</li> </ul>	<p>Included in the Construction Cost</p>
<p><b>Other Impacts</b></p>				

<p><b>Health and Safety Hazards</b></p>	<p>Maintenance related accidents</p>	<ul style="list-style-type: none"> <li>• Ensure that during maintenance all employees utilize appropriate personal protective equipment (e.g. hard hats, steel toe boots, respirators) and are well trained on occupational health and safety.</li> <li>• Ensure public safety by informing local citizens of the maintenance activities to be performed provided through the use of media, public announcements, and signage</li> <li>• Signage should be in accordance with international standards and be well known to, and easily understood by workers, visitors and the general public as appropriate</li> <li>• Marking all energized electrical devices and lines with warning signs</li> <li>• Establishing rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures, and control of traffic patterns or direction</li> <li>• Ensure that all workers are given proper site-specific instructions on occupational health and safety prior to commencing work.</li> <li>• The Occupational Health and Safety training should consist of hazard awareness and control measures.</li> <li>• The training should ensure proper usage of personal protective equipment (PPE).</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor during the first year</li> <li>• Municipalities and MoPWT after the one-year period</li> </ul>	<p>Secured by responsible party</p>
<p><b>Social</b></p>	<p>GBV risks and public complaints</p>	<ul style="list-style-type: none"> <li>• Ensure that workers during the maintenance phase sign the CoC that targets GBV risks and penalizes the perpetrators of GBV.</li> <li>• Ensure that GRM mechanism is functional to receive any public concerns throughout this phase and to address the received complaints within the set timeframe (specified in section 8.2)</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor during the first year</li> <li>• Municipalities and MoPWT after the one-year period</li> </ul>	<p>Secured by responsible party</p>

### 7.3 Monitoring Plan

Environmental and social monitoring is one of the most important parts of an efficient and coherent operation of a project. All environmental and social requirements and restrictions from authorities, project owners and local communities are interlinked and form the primary reference for monitoring and evaluation. In other words, monitoring aims to ensure that all project activities undertaken are environmentally and socially sound, while considering the mitigation measures discussed in the previous section.

It does so by defining a clear set of measurable indicators in an attempt to properly evaluate the project's performance from both an environmental and a social aspect. These indicators, also known as Key Performance Indicators (KPIs), can then be used to assess the project's implementation in a timely manner. Consequently, they assist in the early detection of any deviations from the project's goals. It is important to note that the assessment of all proposed measures is vital to ensure their proper implementation and the optimal operation of the project.

This allows the involved parties to take any corrective measures and limit any unsatisfactory performance if such a case arises. It also allows them to accurately communicate the performance of the project with regulators, the public, or other stakeholders.

Monitoring involves the observation, review, and assessment of onsite activities (including parameters) to ensure adherence to regulatory standards and the suggestions made to lessen negative impacts.

#### 7.3.1 Monitoring Plan Implementation

Contractors shall employ qualified environmental and health officers/inspectors responsible for monitoring project activities. Their aim is to ensure that the proposed activities, including the suggested mitigation measures, are properly implemented during the rehabilitation phase. The relevant ministries would also be expected to follow up, if deemed necessary, on the proper implementation and abidance by the relevant laws and regulations.

Monitoring during the operational phase is mainly the responsibility of CDR and any concerned local authorities, namely the relevant municipalities. The KPIs for this project are listed in Table 7-3.

**Table 7-3 Key performance indicators for the monitoring plan**

Parameter	Standard/Indicator	Phase
Air quality	Lebanese Stack Emission Standards Lebanese Exhaust Emissions Standards for Vehicles	Rehabilitation and post rehabilitation phase
Occupational health and safety	Number of accidents and working days lost Health and Safety Guidelines Compliance with Lebanese Labor Law	
Public safety	Number of accidents involving public safety	
Noise levels	Lebanese Noise Emission Limits for Outdoor Areas	
Soil and water quality	Compliance with Lebanese Standards for the Discharge of wastewater to sewage network/ surface water	
Others	Labor age, labor wage, percentage of women in labor, work injuries, code of conduct trainings, number of grievances (internal and/or external)	

The monitoring requirements associated with the management strategies which should be implemented during rehabilitation and operation are outlined in Table 7-4 and Table 7-5.



**Table 7-4 Environmental and Social Monitoring Plan in Rehabilitation Phase**

Impact	Parameters to Monitor	Frequency	Monitoring Location	Monitoring Method	Standard/Guidelines National/International	Monitoring Responsibility	Institutional Follow-up	Approximate Cost (USD/year)
Emissions								
Air Emissions/G HG/Dust	PM2.5-10, SO <sub>x</sub> , NO <sub>x</sub> , O <sub>3</sub> , CO, Total Suspended Particles (TSP)	Testing once during the project life and weekly inspection	Construction vehicles exhaust Around rehabilitation site for dust	Single point sampling (at one quarter the diameter across the stack/source) Visual opacity measurement (smoke inspection)	Particulate Matter (PM <sub>&lt;10</sub> ) 80 µg/m <sup>3</sup> Sulfur dioxide (SO <sub>2</sub> ) 120 µg/m <sup>3</sup> Nitrogen dioxide (NO <sub>2</sub> ) 150 µg/m <sup>3</sup>	Supervising Consultant	CDR (PIU)	400 per test
Noise	Noise Levels (Lmin, Lmax, and Leq)	Monthly during noisy operation	Around the rehabilitation site, especially near loud machinery and major rehabilitation activities	One sample per location (near sensitive receptors)	Refer to Table 2-7	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
WW Generation	pH, Temperature: max, BOD, COD, Sulfate, Fecal Coliform, Total Coliform, Suspended solids, Oil and grease	Before commencement of work and bi-annually	Sediment trap at downstream assigned for contaminated stormwater runoff	Two samples at effluent of chosen sediment trap	pH: 6-9 Temperature: max 30 °C BOD: 25 mg/L COD: 125 mg/L Sulfate: 1 mg/L Fecal Coliform: 0 CFU/100ml Total Coliform: 0CFU/100ml at 37°C Suspended solids: 60 mg/L Oil and grease: 50 mg/L	Supervising Consultant	CDR (PIU)	600
	Domestic-like wastewater	Daily	Polyethylene storage tank (in case portacabin toilet is not linked to WW network)	Visual inspection	Prohibit leaks from tank Prohibit overfilling of tank	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost

Impact	Parameters to Monitor	Frequency	Monitoring Location	Monitoring Method	Standard/Guidelines National/International	Monitoring Responsibility	Institutional Follow-up	Approximate Cost (USD/year)
Accidental Releases	Number of spills/leaks (of lubricants, oil, fuel, or other chemicals)	Weekly	Around the rehabilitation site, especially near equipment, material, and storage tanks	Visual inspection	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
<b>Depletion of Resources</b>								
Energy Resources	Fuel consumption rates	Monthly	At fuel storage tanks area	Respective to fuel consumed	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Biological Resources	Ecological audit for particular biotopes	Weekly	Riparian habitats near water channels and rivers	Samples and photos per location and GPS point	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
<b>Socio-Economic</b>								
GBV	Code of conduct trainings Signed forms Dates of training	Bi-annually	At training locations	Respective to the amounts of trainings conducted	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
	GBV-related internal grievances	Monthly	At each rehabilitation zone	Received complaints and GRM records	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
OHS	Total number of work injuries OHS-related internal grievances OHS-related trainings	Continuously	At each rehabilitation zone	Visual inspection Employee records	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
	Visual field inspections Verbal complaints by workers Ensure use of PPE	Continuously	Around rehabilitation site and used roads	Continuous visual inspection	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Social Tensions and	Number of related grievances	Monthly	Around the rehabilitation sites Employee records	Received complaints and records	N.A.	Supervising Consultant	CDR (PIU)	-

Impact	Parameters to Monitor	Frequency	Monitoring Location	Monitoring Method	Standard/Guidelines National/International	Monitoring Responsibility	Institutional Follow-up	Approximate Cost (USD/year)
Conflicts over Job-Sharing	Percentage of workers (based on gender, nationality)							
Obstructing Access to Amenities	Type, location, and duration of amenity to which access was obstructed	Daily	At rehabilitation sites	Visual inspection	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Working conditions	Labor's wages	Monthly	Laborers' contracts	Workers complaints records Labor law verification	N.A.	Supervising Consultant	CDR (PIU)	-
Child labor	Labor's age	Monthly	Laborers' records/ files	Labor registry and age verification Labor law verification	N.A.	Supervising Consultant	CDR (PIU)	-
Underemployment of Women	Percentage of female employees in workforce	Bi-annually	Laborers' records/ files	Labor registry	N.A.	Supervising Consultant	CDR (PIU)	-
Other Grievances	Internal and external grievance reports	Weekly or upon grievance occurrence	At each rehabilitation zone	Complaints records	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
<b>Other Impacts</b>								
Visual intrusion	Dust pollution (opacity)	Daily	At dust generating activities	Several photographs per location + opacity measurement	N.A.	Supervising Consultant	CDR (PIU)	Included in rehabilitation Cost
Damage to existing infrastructure	Type, size, and number of damaged infrastructure entities	Daily	Around the rehabilitation site.	Visual inspection	N.A.	Supervising Consultant	CDR (PIU)	

**Table 7-5 Environmental and Social Monitoring Plan in Operation Phase**

Impacts	Parameters to Monitor	Frequency	Monitoring Location	Monitoring Method	Standard/Guidelines National/International	Monitoring Responsibility	Approximate Cost (USD/year)
<b>Emissions</b>							
Noise	Noise Levels (Lmin, Lmax, and Leq)	Bi-annually or upon complaints	Along the two concerned roads near sensitive receptors and complainers	One sample per location	Refer to Table 2-7	Supervising Consultant	Included in rehabilitation Cost
WW Generation	Leakages, spillages, improper discharges, etc.	Annually	Upon maintenance routine, at wastewater piping system	Visual Inspection	N.A.	Supervising Consultant	Included in rehabilitation Cost
<b>Other Impacts</b>							
Social Satisfaction	External complaints or grievances	Bi-annually or upon complaints	Along the two concerned roads	Received complaints and records	N.A.	Supervising Consultant	Included in rehabilitation Cost
Road Safety	Accidents: number, dates, frequency, and causes	Annually	Along the two concerned roads	Visual inspection (of accident logs containing the mentioned data)	N.A.	Supervising Consultant	Included in rehabilitation Cost

### **7.3.2 Documentation and Reporting**

Monitoring yields lots of data regarding project performance. As a result, proper documentation is necessary for two reasons: first to prepare and send performance reports to the concerned parties and second to analyze the acquired data and implement changes when necessary. In this context, monitoring reports will take place as described below.

Contractor's Health and Safety officers submit compliance reports to the Environmental Supervision Consultants on a monthly basis.

The Environmental Supervision Consultants review and approve contractor reports and submit them to PIU on a monthly basis.

PIU submits environmental/social progress as part of their quarterly project progress reports to the WB on a quarterly basis.

In case of severe incidents (e.g. fatality on site) immediate reporting within 24 hours to CDR and within 48 hours to the WB must be done.

### **7.3.3 Guidelines for Health and Safety Plan during Rehabilitation**

An effective Occupational Health and Safety Plan, in line with World Bank guidelines, for rehabilitation be submitted by the Contractor and approved by the appointed supervising Consultant prior commencement of works. The plan should include at least the following components:

- Proper signage in and around the sites (local language to be understood by all);
- Fire response and spill response measures;
- Proper storage and signage of materials including Material Safety Data Sheets;
- Safety measures according to type of equipment;
- Train workers on lifting and material handling techniques;
- Plan work site layout to reduce the need for manual transfer of heavy objects,
- Personal safety equipment;
- Medical services which includes first aid kits;
- Mobile sanitary facilities;
- Safe drinking water in accordance with regulations.

In addition, the plan should also incorporate all of the previously mentioned measures stated in section 6.1.8 which address in great detail OHS and PHS measures. All rehabilitation staff should be trained on the Health & Safety Plan and the specific safety measures related to their own activities.

## 8. Consultation, Disclosure, and GRM

### 8.1 Public Consultation

Project-affected groups, mainly citizens, municipalities and local NGOs were consulted on the project's environmental and social aspects.

Invitations were sent by the consultant on behalf of CDR to concerned municipalities and NGOs through official letters, emails and direct phone calls. The invitation letter is attached in Annex 5. Invitations were sent to the concerned parties at least one week before the meeting date.

The main attendees of the meeting were namely the heads of concerned municipalities, women, citizens and relevant local and international NGOs (refer to the lists of attendees in Annex 5).

More specifically, for NGOs Consultation, this ESMP has targeted them according to their position in Lebanon. They consist of two levels as follows:

- a) Local NGOs: they are specific to each Caza. Their mission is to address different concerns and issues among the local society including social, economic, gender equality, environment, poverty, women empowerment, etc. Local NGOs were invited to the public hearings. Table 8 1 represents the name of the invited NGOs and their field of activity. Those local NGOs may play a role of advocates to reduce projects' social and environmental risks.

**Table 8-1 List of Contacted Local NGOs**

Organization	Contacts	Activities
Kafa	Maya Haddad maya.haddad@kafa.org.lb kafa@kafa.org.lb	KAFA (enough) Violence & Exploitation is a feminist, secular, Lebanese, non-profit, non-governmental civil society organization seeking to create a society that is free of social, economic and legal patriarchal structures that discriminate against women. KAFA has been aiming to eliminate all forms of gender-based violence and exploitation since its establishment in 2005.
Himaya	Lama Yazbek himaya@himaya.org 01 395 315	Himaya was founded in 2008 with the notification number 748/2009. The organization has continued to grow, responding to child protection needs on a national level. The dedicated & multidisciplinary team of professionals covers all Lebanese territory with offices in Mount Lebanon, South Lebanon, North Lebanon and the Bekaa; ensuring accessible services to children across Lebanon. In order to achieve its mission, Himaya works with children as well as their families and environment as a whole. Himaya strives for a radical change on a national level in order to improve the lives of children in Lebanon.
Lost	Rabih Allam rallam@lostlb.org	Lebanese NGO that works with people, particularly women and youth to create a more developed and equitable society through reducing poverty, eliminating exclusion, and fostering a culture of peace.

- b) International NGOs: they are covering the whole country and their consultation will be applied to all the ESMPs of the REP. They provide relief and developmental aid to

many developing countries. They support the society in responding to crises and helps people whose lives and livelihoods are shattered by conflict and disaster to survive, recover and gain control of their future. When the crisis in Syria erupted in early 2011, numerous International NGOs responded to the humanitarian crisis and worked directly with the Syrian in Lebanon by providing aid and responding to their critical situation.

This ESMP consulted International NGOs (see Table 8-2) to inform them about the Project, disseminate it, ask them to circulate its impacts and activities among Syrian and tell them that they can inquire about additional information and/or submit a complaint (if any) by contacting the Grievance Redress Mechanism (GRM) Unit on 01980096 ext: 317 or send an Email to [rstephan@cdr.gov.lb](mailto:rstephan@cdr.gov.lb) or register by hand an official letter at the CDR.

In Hermel Caza, the total number of registered Syrian is 6,632 individuals (UNHCR, 2019). They were contacted through the International NGOs to seek their feedback about the Project. Accordingly, this ESMP did not receive any concern about the Project.

**Table 8-2: Consulted International NGOs and their Activities**

NGO Name	Contacts	Intervention Sector(s)	Comments
ANERA Lebanon	Mrs. Dima Zayat Deputy Country Director T: 01382590 (ext: 105) M: 70051813 E: dzayat@aneralebanon.org	<ul style="list-style-type: none"> <li>• Children &amp; Youth</li> <li>• Development</li> <li>• Education</li> <li>• Relief Services</li> <li>• Water sanitation and hygiene</li> </ul>	Mrs. Zayat received the Project information sheet and explained that recently Anera operations in Lebanon have grown substantially to cope with the Syrian crisis. They have six offices throughout Lebanon. She welcomed the idea of the Project and will disseminate it across her organization.
ACTED	Mr. Jack French Deputy Country Director T: 01324331 M: 79160375 E: jack.french@acted.org	<ul style="list-style-type: none"> <li>• Development</li> <li>• Infrastructure &amp; Services Rehabilitation</li> <li>• Labor &amp; Livelihoods</li> <li>• Shelter</li> <li>• Water sanitation and hygiene</li> </ul>	Mr. French received the Project information sheet and explained that ACTED is working with Syrian in Beirut and northern districts of Mount Lebanon (Baabda, Hermel, Keserwane and Jbeil), as well as in Akkar District. He welcomed the idea of the Project and will disseminate it across his organization.
Danish Refugee Council (DRC)	Mr. Rickard Hartmann Country Director T: 01339052 (ext: 201) E: rickard.hartmann@drc.ngo	<ul style="list-style-type: none"> <li>• Direct Assistance</li> <li>• Protection</li> <li>• Shelter</li> <li>• Community Empowerment and Livelihoods</li> </ul>	Mr. Hartmann received the Project information sheet and explained that DRC is working with Syrian on many sectors in different locations across Lebanon including Beirut, Tripoli, Kobayat and Zahle. He welcomed the idea of the Project and

			will disseminate it across his organization.
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This ESMP was publicly consulted where a public participation meeting was arranged for Hermel Caza. The public meeting was held at the Union of Hermel Municipalities on Thursday February 27. The number of attendees was 16 of which two were women. Out of the invited NGOs, only Lost (a local NGO attended the meeting).

During the public participation, project details and design, impacts and mitigation measures were presented in a 35-minute presentation (see more details in Annex 5), which has followed by an open discussion with the attendees. In particular, the consultant informed the attendees about the project objectives, the identified natural, economic, and social resources of importance in the area, the project’s possible environmental and social risks, the project GRM mechanism and the planned mitigation measures. The GRM was communicated to all attendees. Potential complaints from work activities can be sent to CDR in the context of the project GRM mechanism.

In summary, local authorities were not satisfied about the selection of roads within the scope of REP. According to them, there are roads that are in greater need for rehabilitation. They asked about the selection process as they were not consulted at the beginning of the project. In this context, the consultant explained that the Government prioritized roads in Hermel Caza based on municipalities’ official requests beside several technical criteria.

The second main concern was the coordination with relevant authorities, especially with respect to public works (i.e. wastewater and water infrastructure, etc.). The head of municipalities were worried whether there would be coordination among ministries and infrastructural institutions before the project implementation to avoid re-excavations of roads and further disturbances and pressures. In this context, the public was informed that CDR will ensure that a full coordination among municipalities and authorities prior to project execution.

Further, technical concerns were revealed during the meeting including whether the scope of work encompasses installing new drainage systems when needed and rehabilitating existing wastewater channels that are in bad conditions. In this context, the consultant explained that, when needed, proper drainage systems will be installed, however, wastewater channels are not included in the project scope. Women shared the same concern as the rest of attendees (road selection, coordination between relevant authorities, and works included within the project scope). Finally, LOST (the local NGO) suggested to offer guidelines and training for onsite workers once project implementation begins. The consultant suggested that they communicate with CDR in this respect.

## **8.2 Grievance Redress Mechanism (GRM)**

The project will include a project-wide GRM that will register and address grievances and complaints from individuals and households who are affected by the project. Anonymous grievances will be addressed in both GRMs for communities and workers. The maximum anticipated time needed to close a GRM case is 45 days.

### **8.2.1 GRM for Surrounding Communities**



The primary purpose of the GRM will be to provide clear and accountable means for project beneficiaries and affected persons to raise concerns of possible tensions and feelings of exclusion and complaints and seek solutions when they believe they have been harmed by the project. As such, the GRM will allow citizens to directly voice concerns or grievances to the implementing agency and ensure that these concerns are responded to and addressed in a timely manner.

The key objectives of the GRM are:

- Record, categorize and prioritize the grievances;
- Resolve the grievances via consultation with all stakeholders (and notify those stakeholders of the resolutions)
- Relay any unresolved cases to the relevant authority.

The GRM will be accessible to all relevant stakeholders who can use this mechanism to send their suggestions, concerns and complaints related to the project. The complaints, suggestions and concerns can be sent by email, mail, phone (through a hotline), in person and other means such as a grievance complaint logging sheet where grievances are registered in writing and maintained as a database. The phone number, e-mail address, and address for receiving complaints will be disclosed among the population and will be posted at the rehabilitation sites in Hermel Caza, before commencement of project implementation. Moreover, the information on how to access the GRM should be available through the CDR's website, etc.

The GRM levels of the project are the following (see Figure 8-1):

- Level 1: If any person has any complaint, concern or suggestion regarding the project implementation, he or she can lodge an oral or written grievance through e-mail (GRM.REP@cdr.gov.lb), phone call or text message (01980096 ext:317), or website link (<http://www.cdr.gov.lb/study/RoadsEmp/RoadsEmp.htm>) to the site engineer or manager of the roads to be rehabilitated in Baalbek Caza. In case an oral complaint is made, it should be written on paper by the receiving unit. The above issue will be resolved within a maximum duration of one week.
- Level 2: If the person is not satisfied with the action of the site manager's Office, he or she can bring the complaint to the attention of the Environmental and Social Specialist of the PIU for the project through e-mail (rstephan@cdr.gov.lb), phone call or text message (01980096 ext: 317), or website link (<http://www.cdr.gov.lb/study/RoadsEmp/RoadsEmp.htm>). The issue shall be resolved within a maximum of two weeks.
- Level 3: If the person is not satisfied with the decision of the Environmental and Social Specialist of PMU, he or she can bring the complaint to the attention of the PMU Director's Office through e-mail (elieh@cdr.gov.lb), phone call or text message (01980096 ext:159), or website link (<http://www.cdr.gov.lb/study/RoadsEmp/RoadsEmp.htm>). Once the PIU Director receives the complaint, it needs to be resolved within a maximum of two weeks.

Meanwhile, it is recommended that the aggrieved party is consulted and be informed of the course of action being taken, and when a result may be expected.

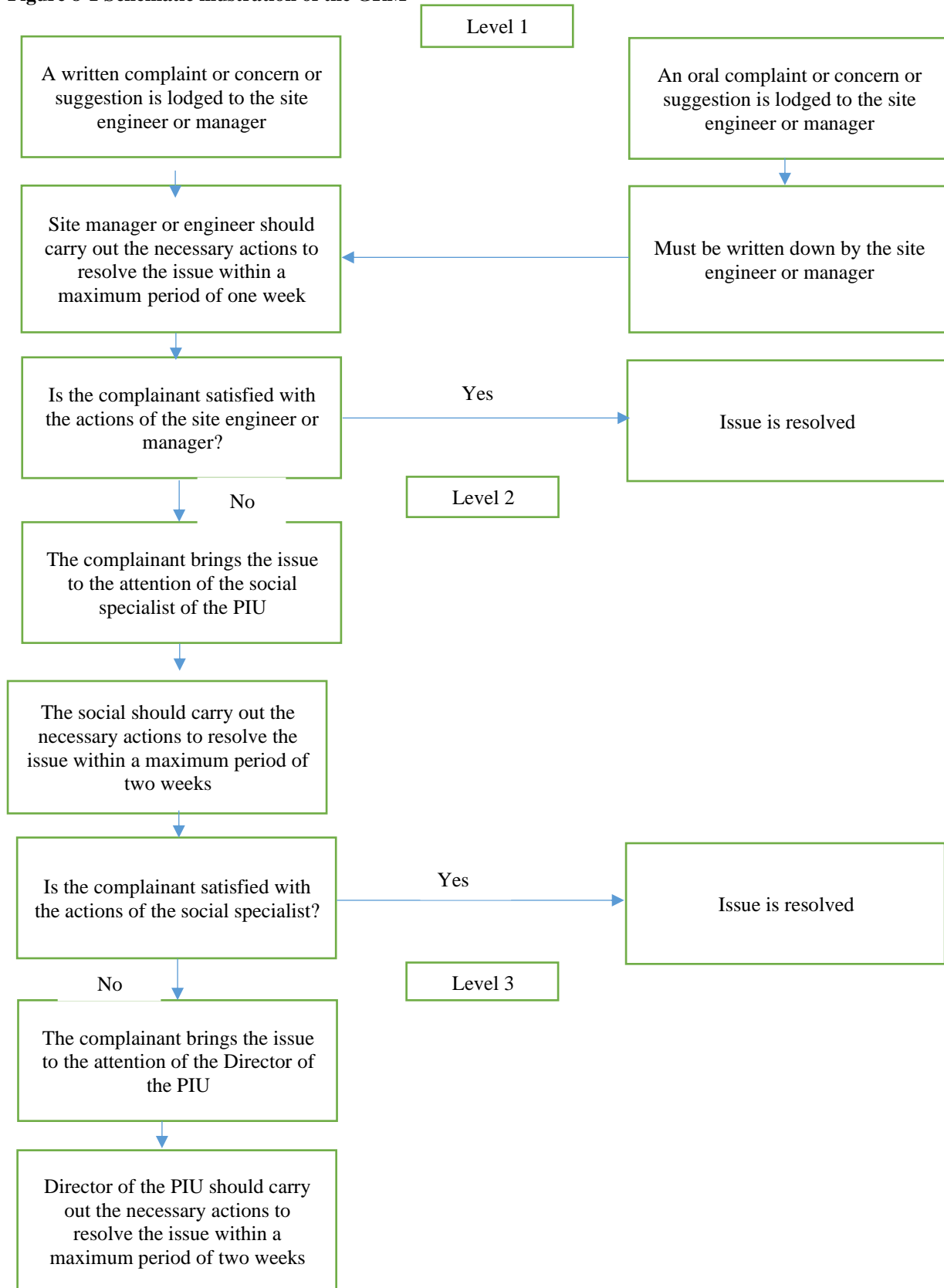
Moreover, reporting of the complaints to the PIU should be done regularly. The designated person at each level should report to the PIU on the number and subject of new complaints received, and the status of the already existing complaints, if any. The report should also inform the PIU of complaints that could not be resolved at the lower levels and are being elevated to the PIU Director's attention. The PIU aggregates information received into a status report each quarter, indicating the number and subject of complaints. The quarterly status report also provides up-to-date information on the number and subject of complaints that have been resolved, and the manner in which they have been resolved. This information will be shared with the Bank.

The Complaints Register form (refer to Annex 6) includes the following:

- i) details and nature of the complaint
- ii) the complainant name and their contact details
- iii) date
- iv) Corrective actions taken in response to the complaint.

The GRM does not exclude the formal legal process of the national law. If a grievance remains unresolved following application of the project GRM process, the affected person can initiate legal proceedings in accordance with national law and may have recourse to the Appeals Court as warranted.

**Figure 8-1 Schematic illustration of the GRM**



### **8.2.2 GRM for Workers**

Similar to the GRM for surrounding communities, a GRM for internal employees is necessary, namely the labors onsite. It aims to allow labors to report any wrongdoings in their favor or important concerns they might have. This internal GRM is similar in nature to the one previously discussed (in terms of accessibility, reporting means, etc...). The only main difference is the contact people for each level. In this context, the first level involves reporting to the health and safety officer and has a duration of one week. The second level involves reporting to the PIU Director and should be resolved within one week. It also follows the Complaints Register form (refer to Annex 6).

## 9. Conclusion

The ESMP identified and assessed the potential environmental and social impacts of REP and consulted relevant stakeholders when preparing the management plan.

In specific, this ESMP report addresses five selected roads for rehabilitation in Hermel caza (R4, R6, R7a, R8 and R9) with a total length of 38.9 km. The rehabilitation activities include: pavement works, improvement and installation of road surface drainage, construction of retaining walls and installation of safety barriers, marking and signing, and installation and maintenance of lighting poles. Works will involve around 175 workers and extend for a total of 18 months.

Road rehabilitation activities are expected to incur environmental impacts that are similar among all Hermel Caza roads. Common environmental impacts include fugitive dust emissions, increase in noise, contamination of water quality, disruption to traffic movement, potential damages to existing utilities, and disturbance of local biodiversity. Once roads are rehabilitated, the project is expected to improve drainage systems (less runoff water), road safety conditions, reduce traffic accidents and traffic congestion, and ultimately enhance livelihood opportunities. On the other hand, the main expected environmental impacts on water and soil could result from maintenance activities if not managed properly during the “**Defects Liability Period**’ during which the Contractor is responsible for maintenance activities.

In this context the contractor must implement proper waste and safety plans and all the environmental mitigation measures provided in this ESMP.

A proper management plan was provided for specific concerns regarding the roads in Hermel. The plan includes measures to control exhaust emissions, dust and odor emissions, and soil manipulation activities during the rehabilitation phase. Moreover, proper measures and guidelines on the control of accidental spills of construction materials were provided to prevent soil contamination were provided. Regarding biodiversity, although the concerned roads are mainly under anthropogenic influences, contractors must be careful during the rehabilitation work so that the direct impacts (direct destruction) on ecosystems and associated fauna would be minimal. Waste management plan must be adopted to avoid soil and water contamination that could have irreversible impacts on biodiversity. In other words, rehabilitation debris should not be dumped into the natural habitat (e.g. rivers, streams and water channels encountered in Hermel Caza along the studied roads).

The potential social risks of the project include labor influx, potential risk of labor induced SH towards female workers and SEA towards women in the surrounding community, potential risk of child labor and poor labor conditions; unfair job allocation; underemployment of women; traffic disturbance; and provisional obstruction of access routes to sensitive receptors which is expected to be high specifically for Hermel R4 section 2, the road segments between stations [1+900 - 4+600] of Hermel R4 section 1 and [0+000 - 1+200] of Hermel R7a. For instance, Hermel School and a Cemetery (ضريح الرئيس صبري حمادة) along Hermel R4 section 1 will be highly impacted by the temporary obstruction of routes. In this context, the ESMP provided measures to mitigate these risks through periodic monitoring of labor conditions, specific required clauses within contracts that aim to protect workers, and the CoC for GBV issues. In

addition, a robust GRM must be clearly communicated to all project-affected persons before and during project implementation.

Moreover, a monitoring plan was set along with defined responsibilities for the operationalization of the ESMP. In other words, the ESMP generated key project environmental and social indicators to monitor project implementation success. It is designed to guarantee effectiveness in the measurement of major project outcomes and outputs based on measurable indicators.

Lastly, a Construction Environmental and Social Management Plan must be prepared once the contractors are appointed. This CESMP must account as well for the recommendations and guidelines provided within this ESMP to ensure protection of the surrounding environment and the society.

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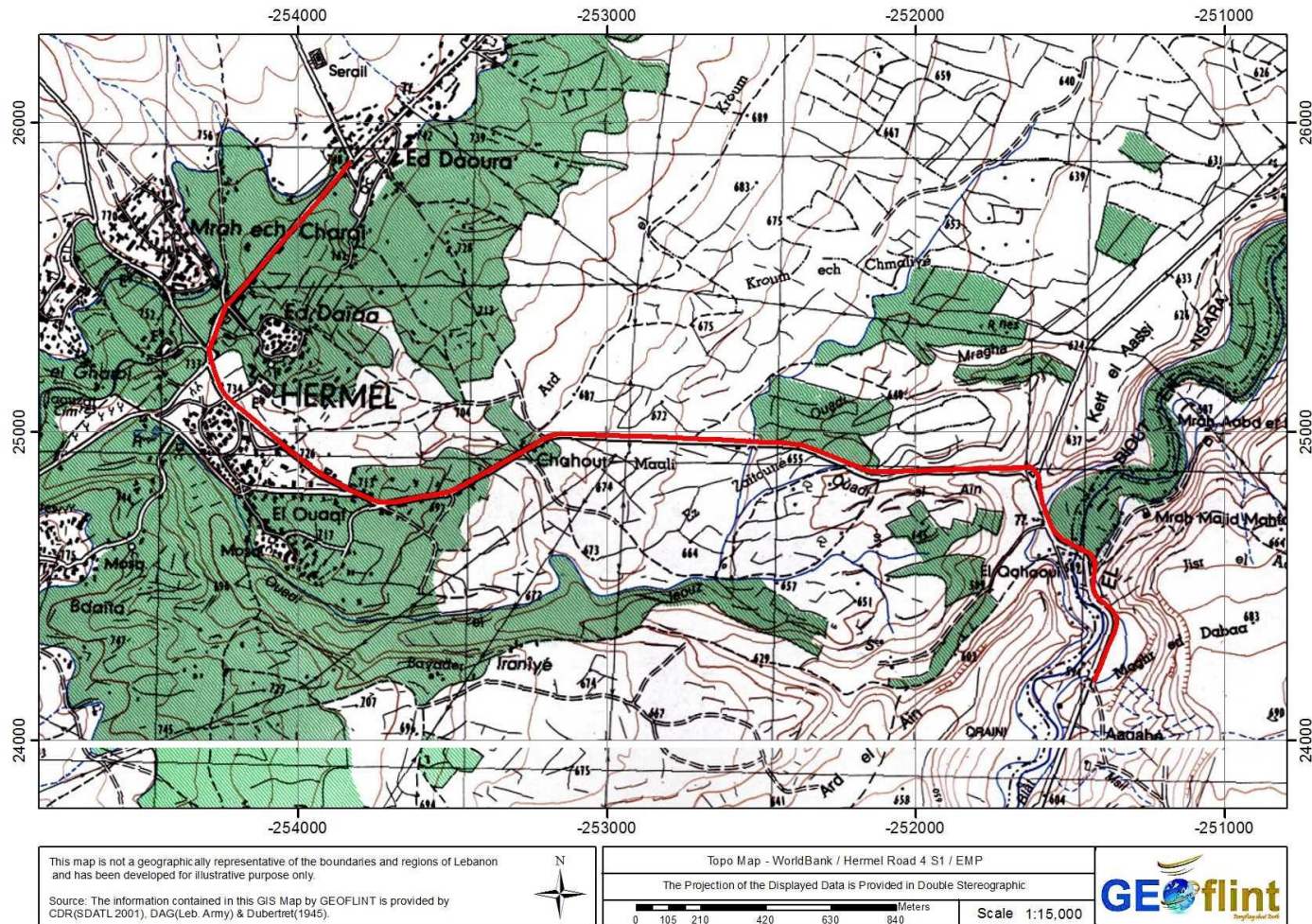
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GENERAL EHS GUIDELINES: OCCUPATIONAL HEALTH AND SAFETY.



## **Annex**

### **Annex 1: Figures and Tables Related to Chapter 4**

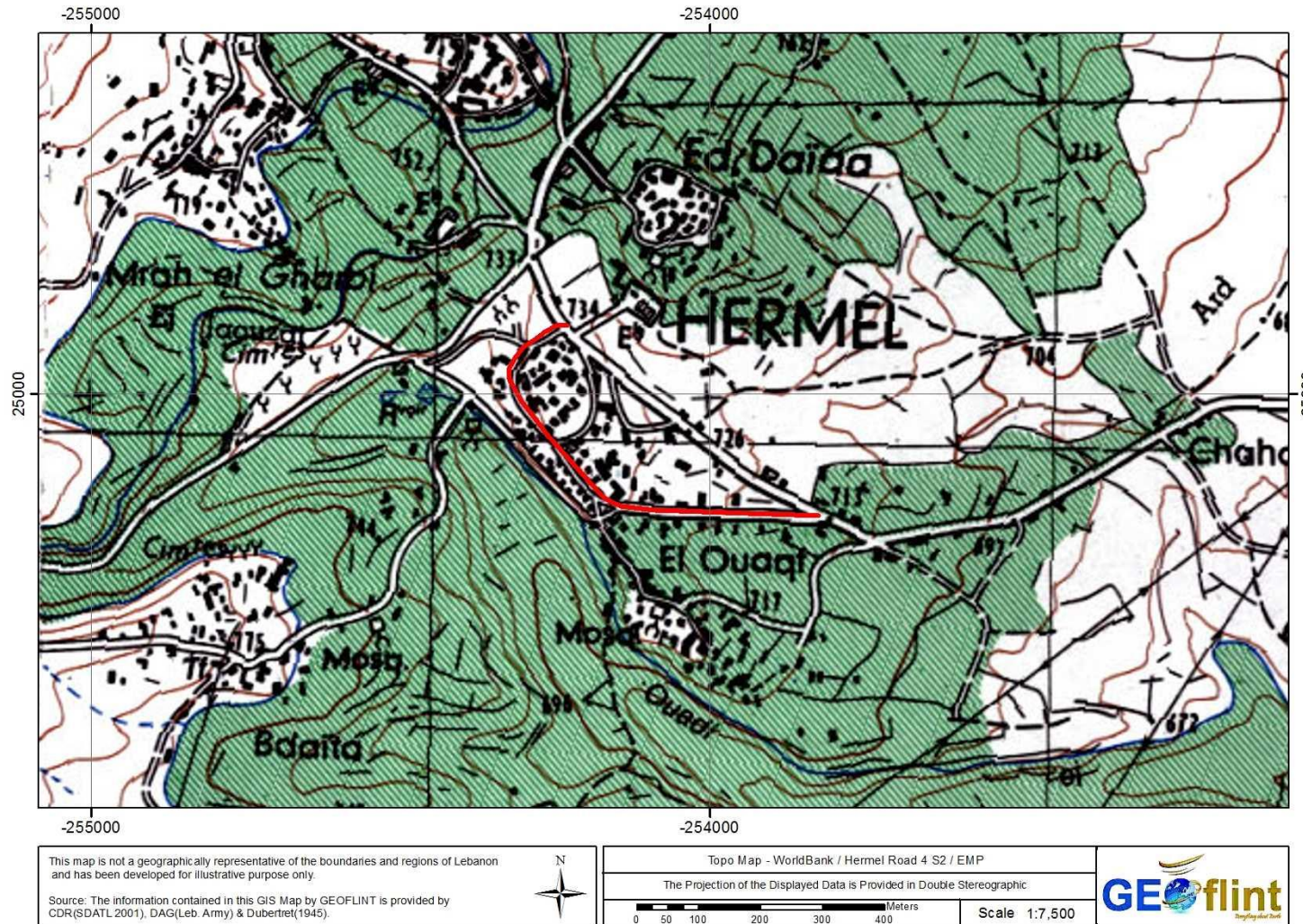
Figure A Elevation contour lines for Hermel R4 section 1 and its surrounding



Source: CDR, DAG, & Dubertret; processed by Geoflint



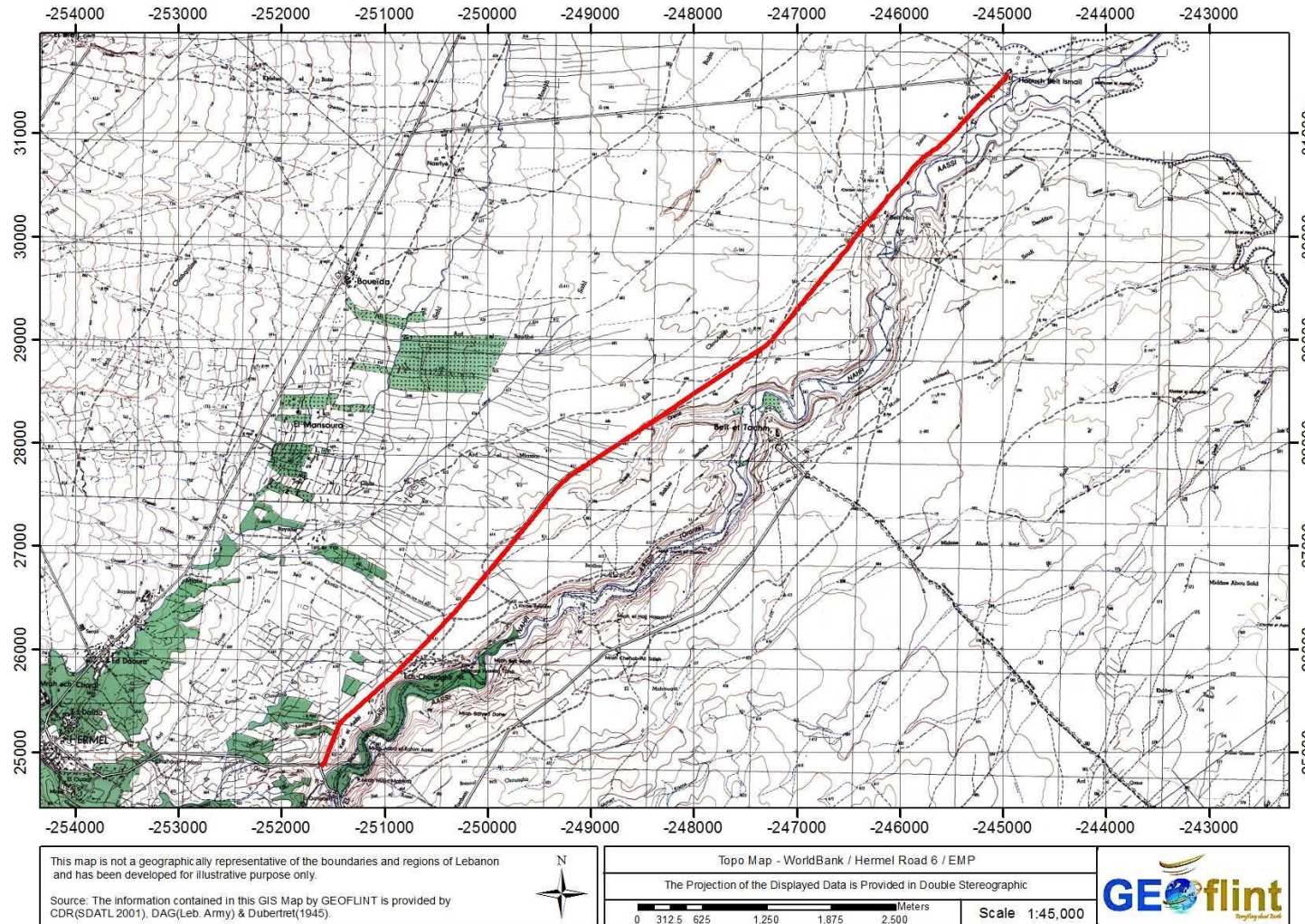
**Figure B Elevation contour lines for Hermel R4 section 2 and its surrounding**



Source: CDR, DAG, & Dubertret; processed by Geoflint



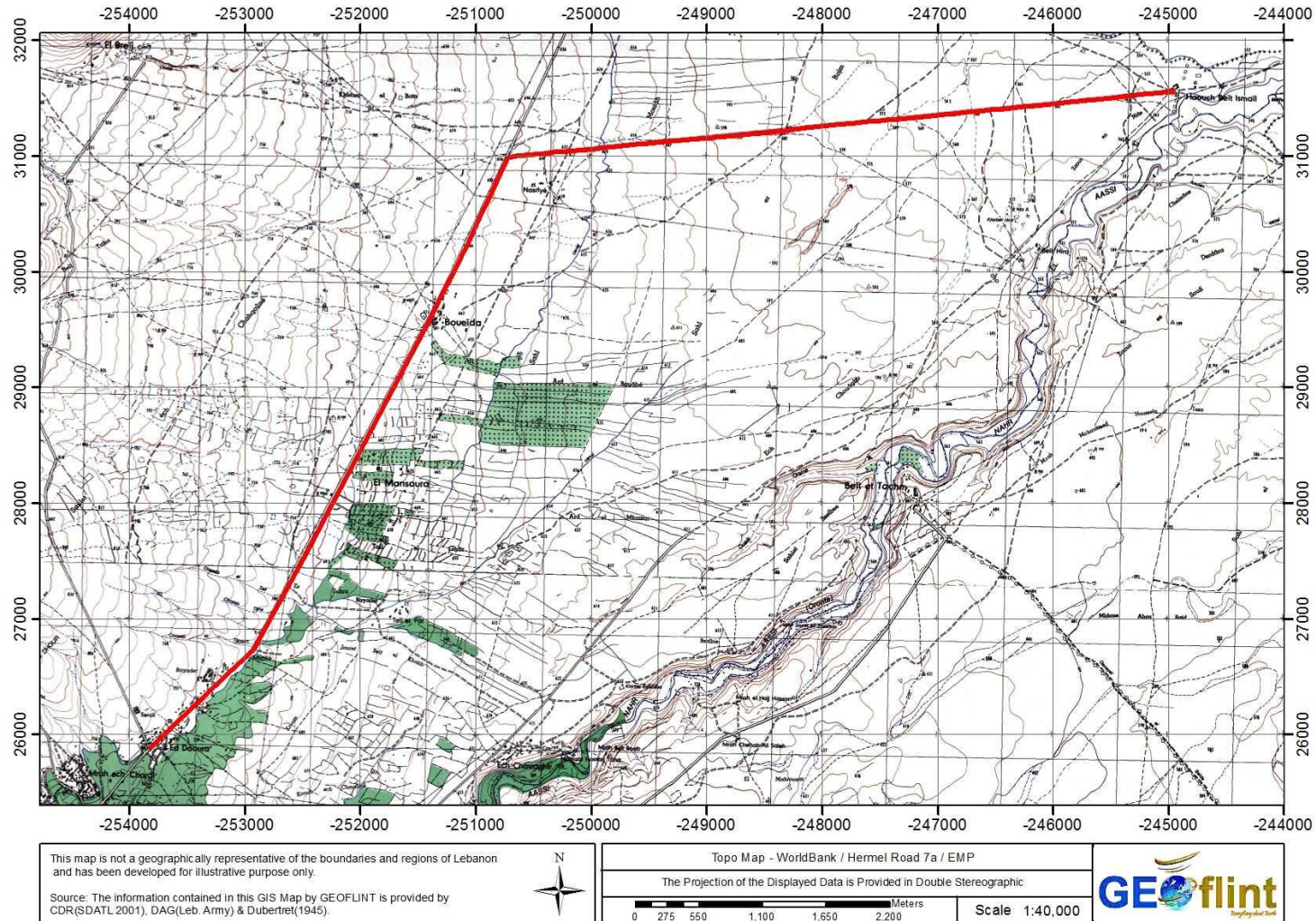
**Figure C Elevation contour lines for Hermel R6 and its surrounding**



Source: CDR, DAG, & Dubertret; processed by Geoflint

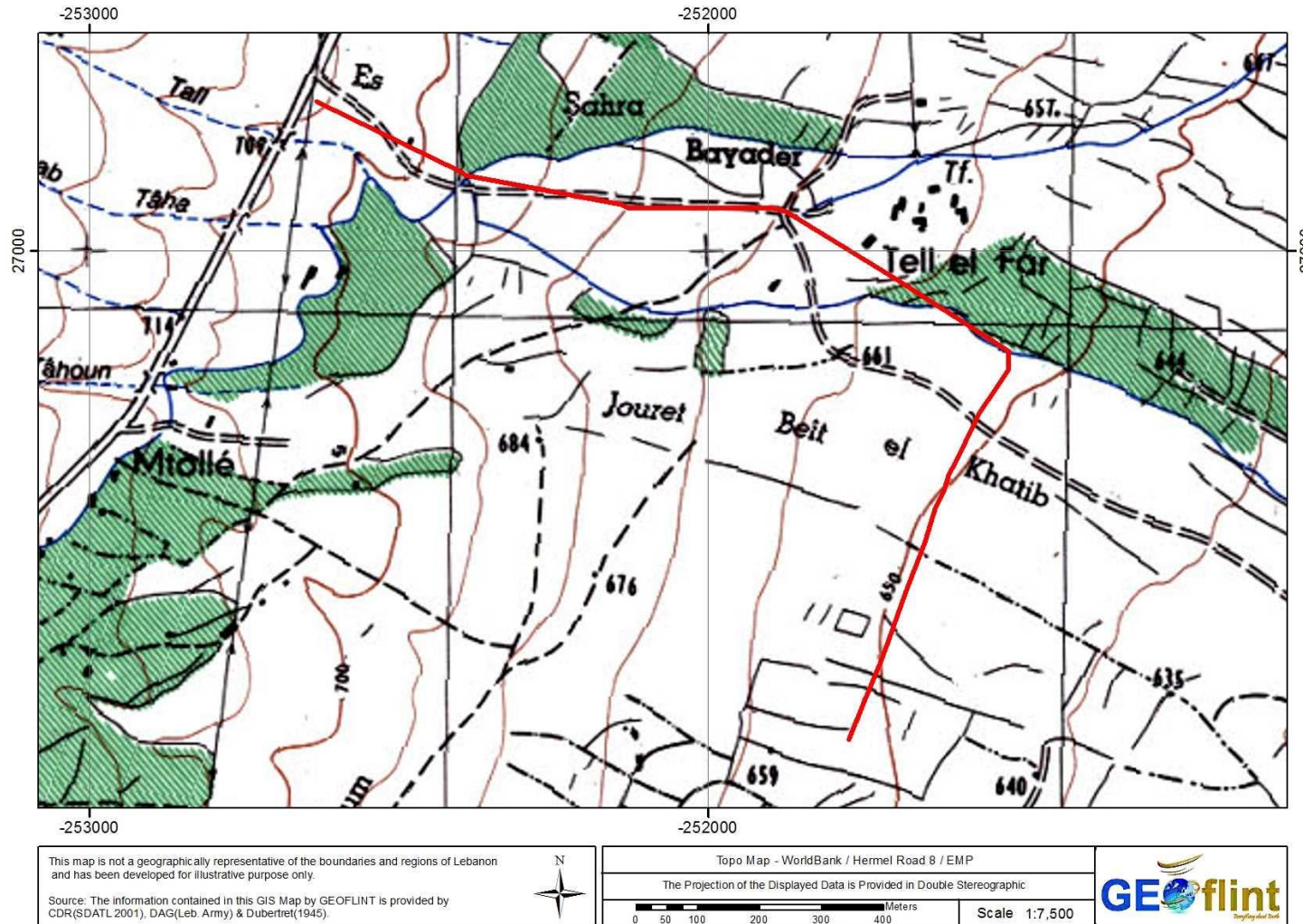


**Figure D Elevation contour lines for Hermel R7a and its surrounding**



Source: CDR, DAG, & Dubertret; processed by Geoflint

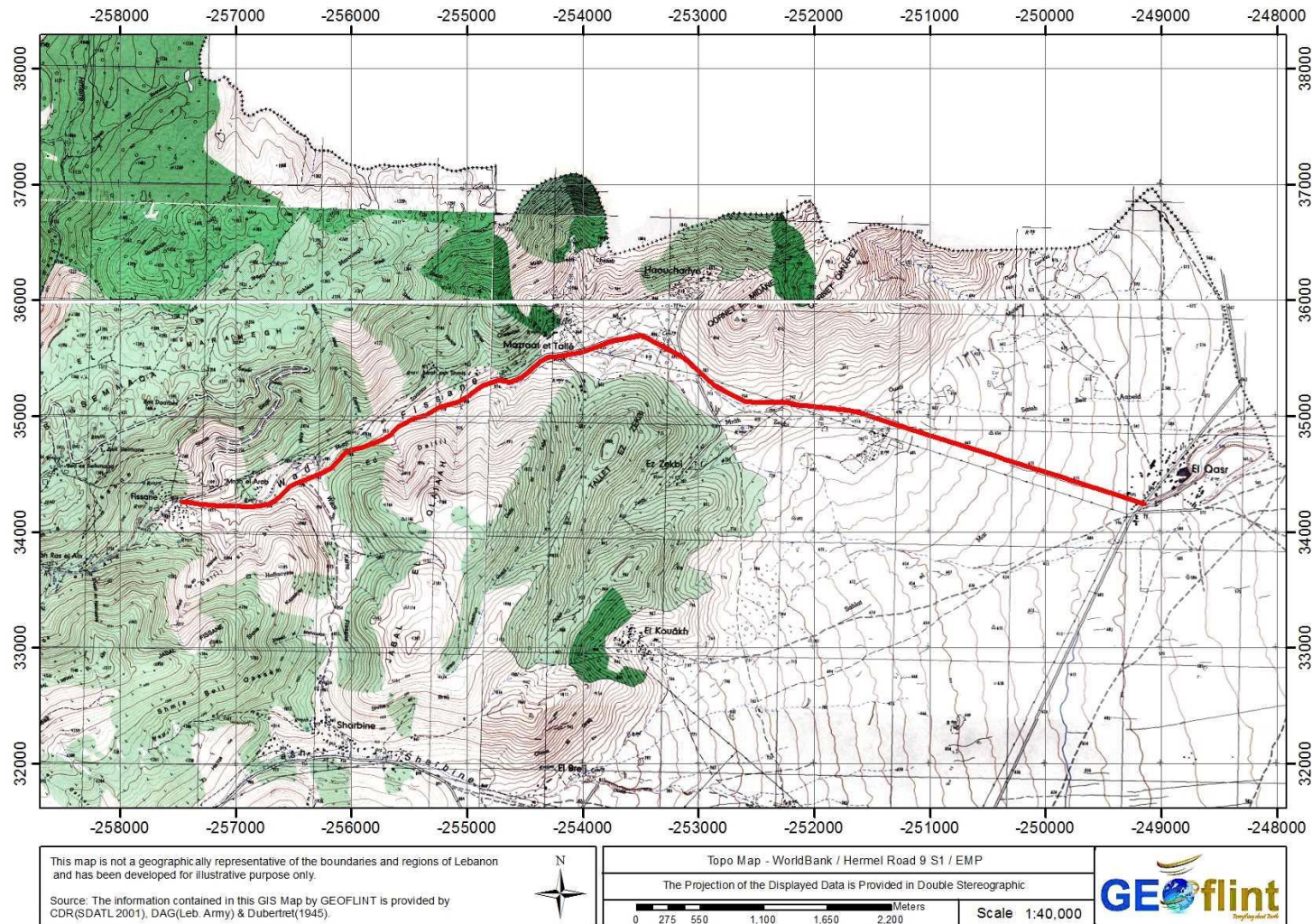
**Figure E Elevation contour lines for Hermel R8 and its surrounding**



Source: CDR, DAG, & Dubertret; processed by Geoflint



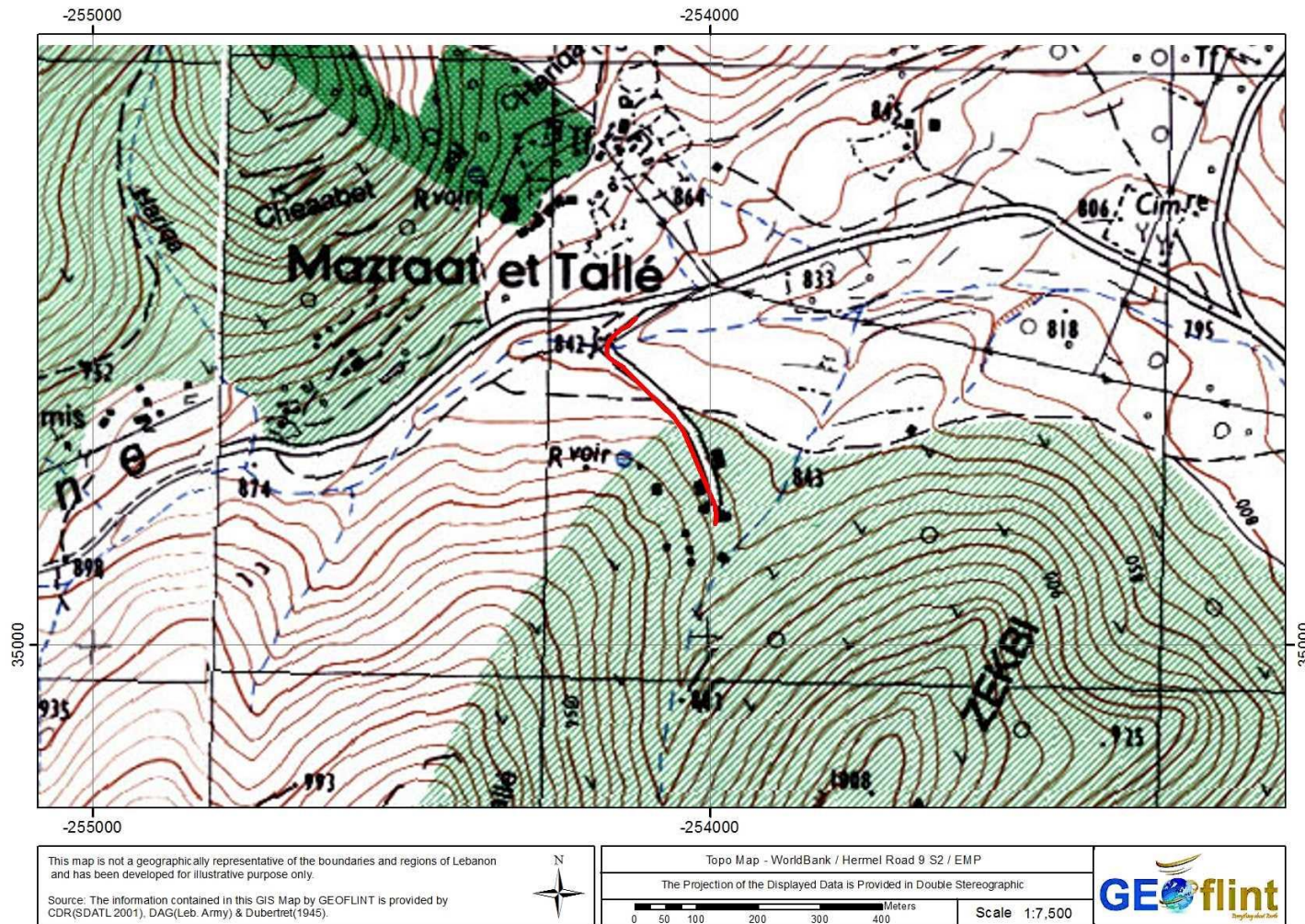
**Figure F Elevation contour lines for Hermel R9 section 1 and its surrounding**



Source: CDR, DAG, & Dubertret; processed by Geoflint



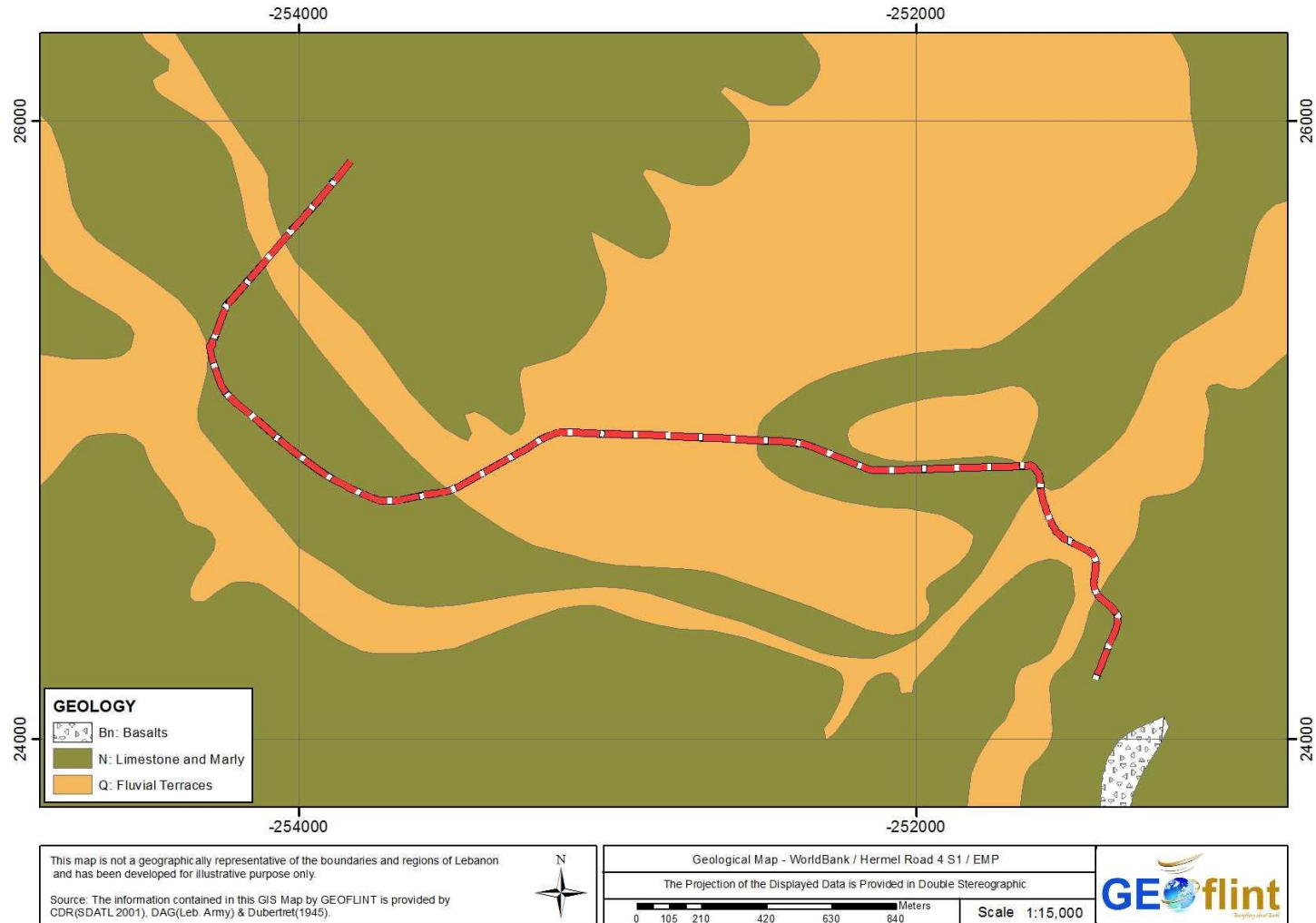
**Figure G Elevation contour lines for Hermel R9 section 2 and its surrounding**



Source: CDR, DAG, & Dubertret; processed by Geoflint

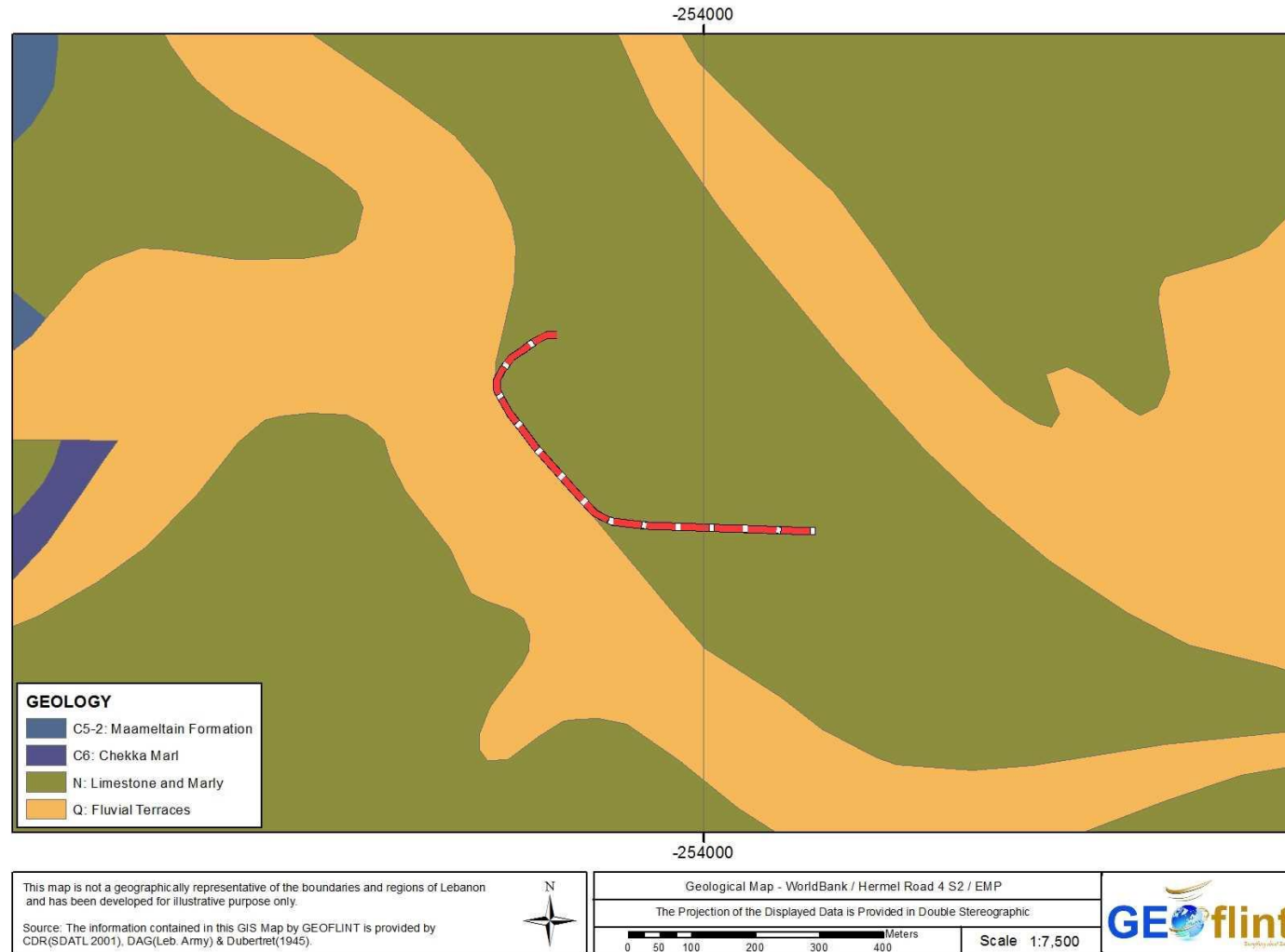


**Figure H General Geological map of Hermel R4 section 1 and its surrounding (surface outcrops)**



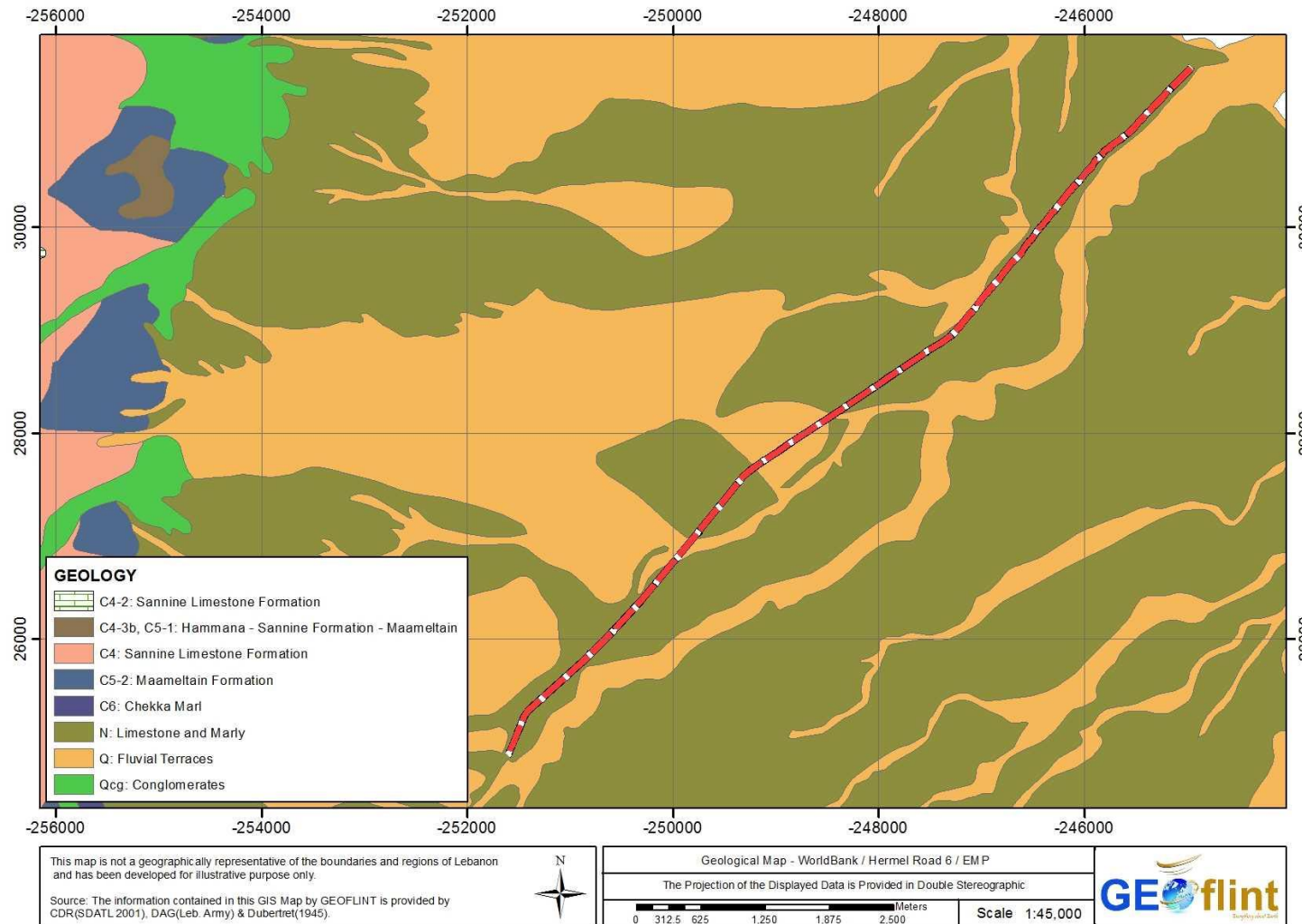
Source: CDR, DAG, & Dubertret; processed by Geoflint

**Figure I General Geological map of Hermel R4 section 2 and its surrounding (surface outcrops)**



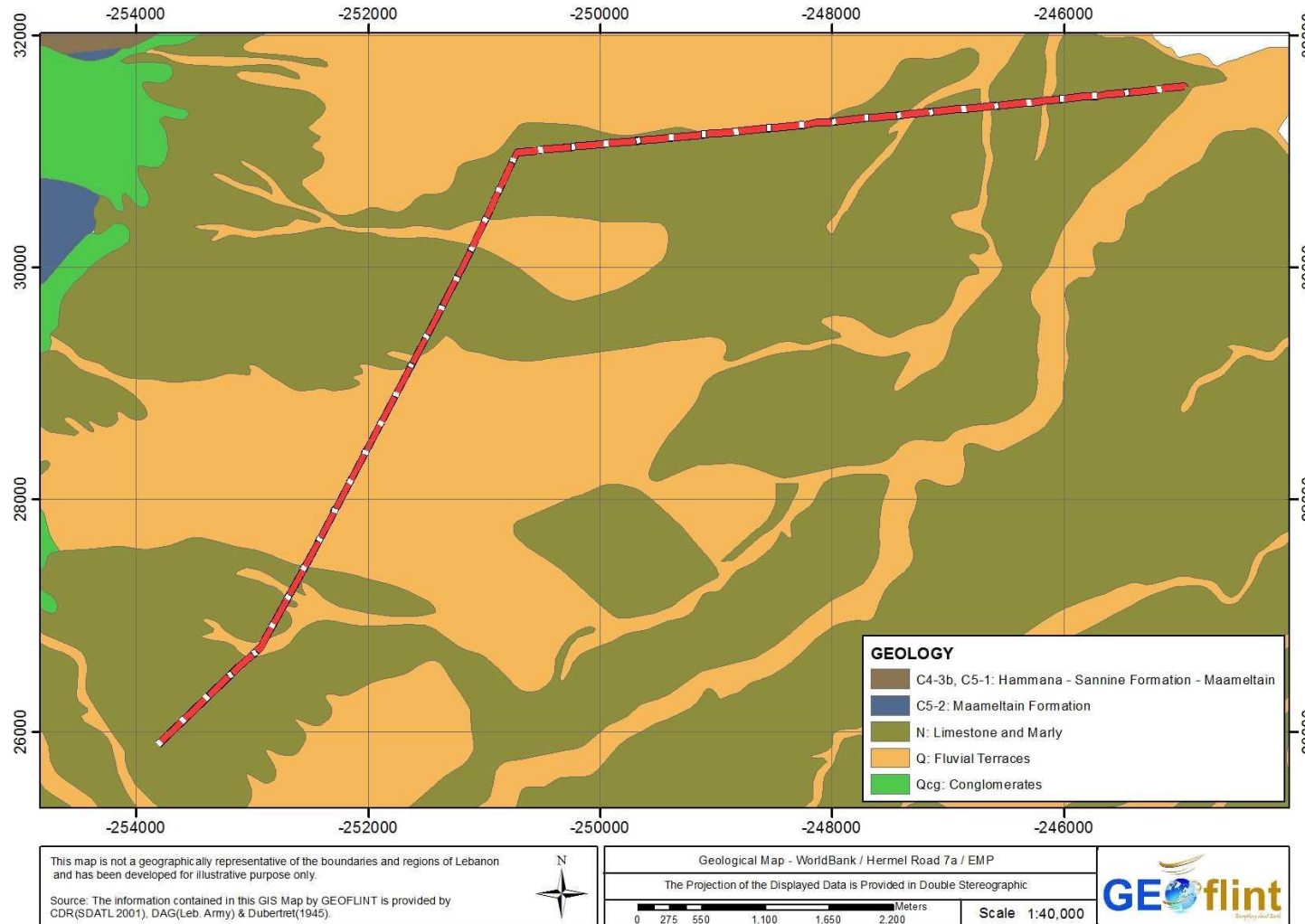
Source: CDR, DAG, & Dubertret; processed by Geoflint

**Figure J General Geological map of Hermel R6 and its surrounding (surface outcrops)**



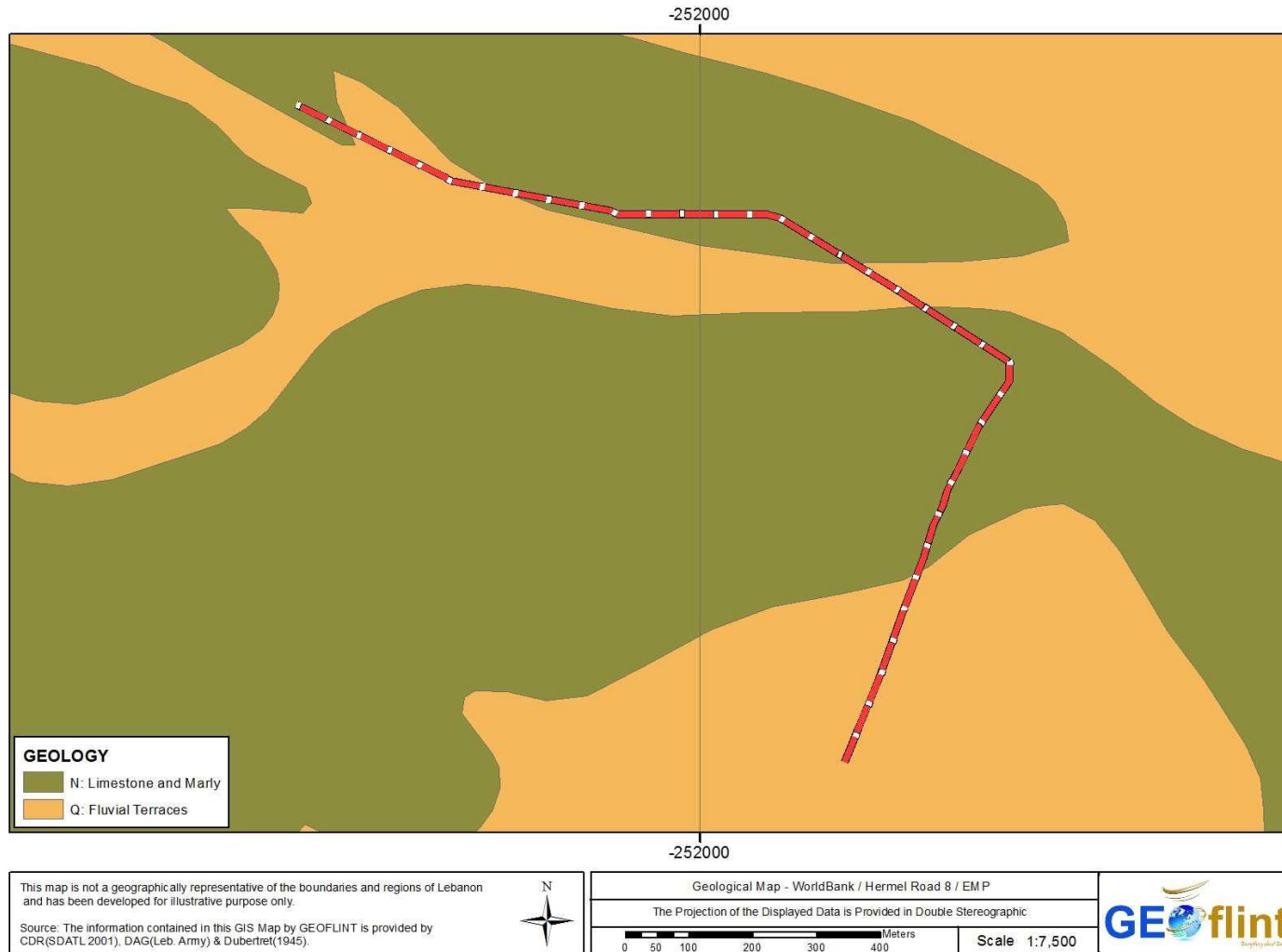
Source: CDR, DAG, & Dubertret; processed by Geoflint

**Figure K General Geological map of Hermel R7a and its surrounding (surface outcrops)**



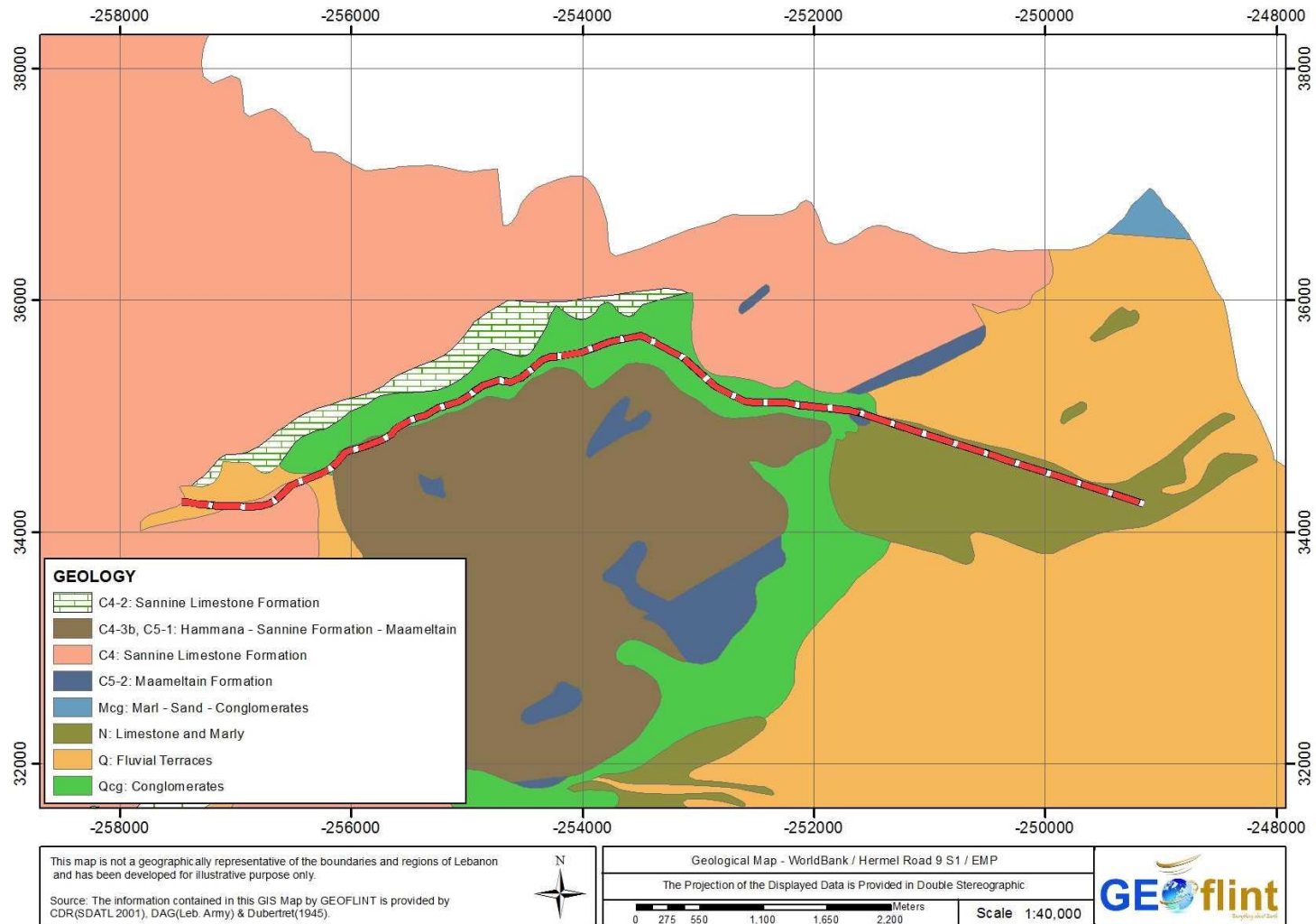
Source: CDR, DAG, & Dubertret; processed by Geoflint

**Figure L General Geological map of Hermel R8 and its surrounding (surface outcrops)**



Source: CDR, DAG, & Dubertret; processed by Geoflint

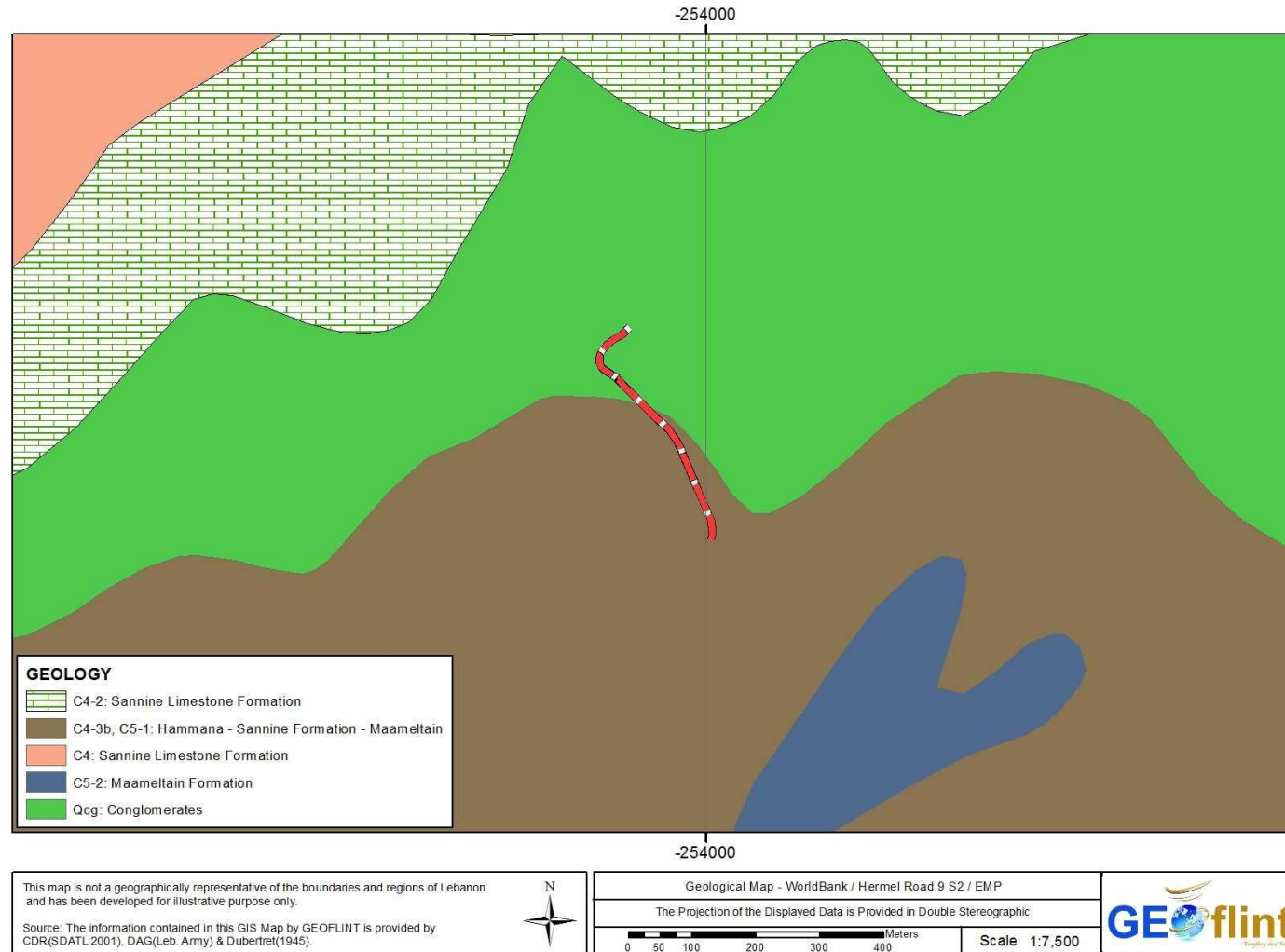
**Figure M General Geological map of Hermel R9 section 1 and its surrounding (surface outcrops)**



Source: CDR, DAG, & Dubertret; processed by Geoflint

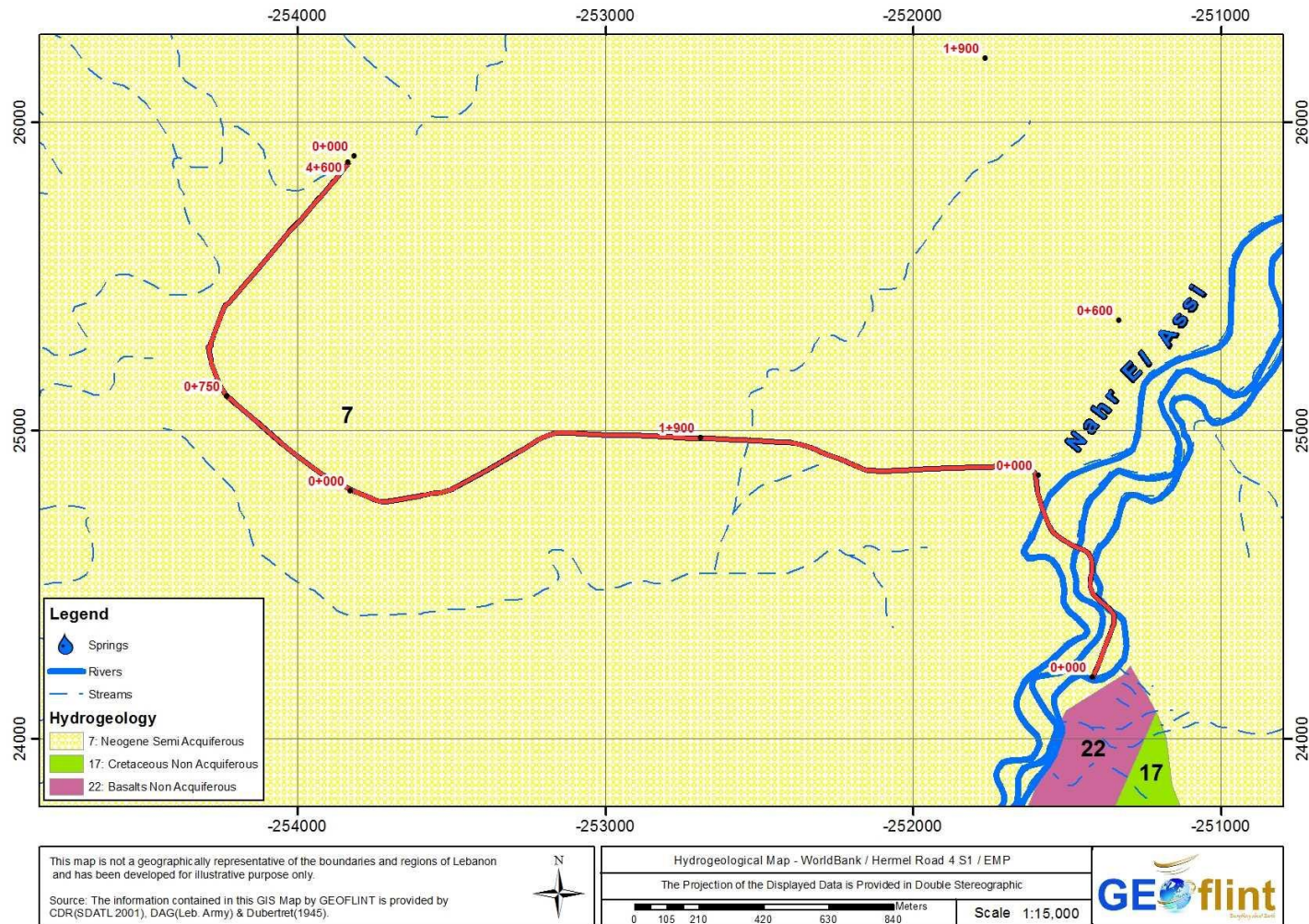


**Figure N General Geological map of Hermel R9 section 2 and its surrounding (surface outcrops)**



Source: CDR, DAG, & Dubertret; processed by Geoflint

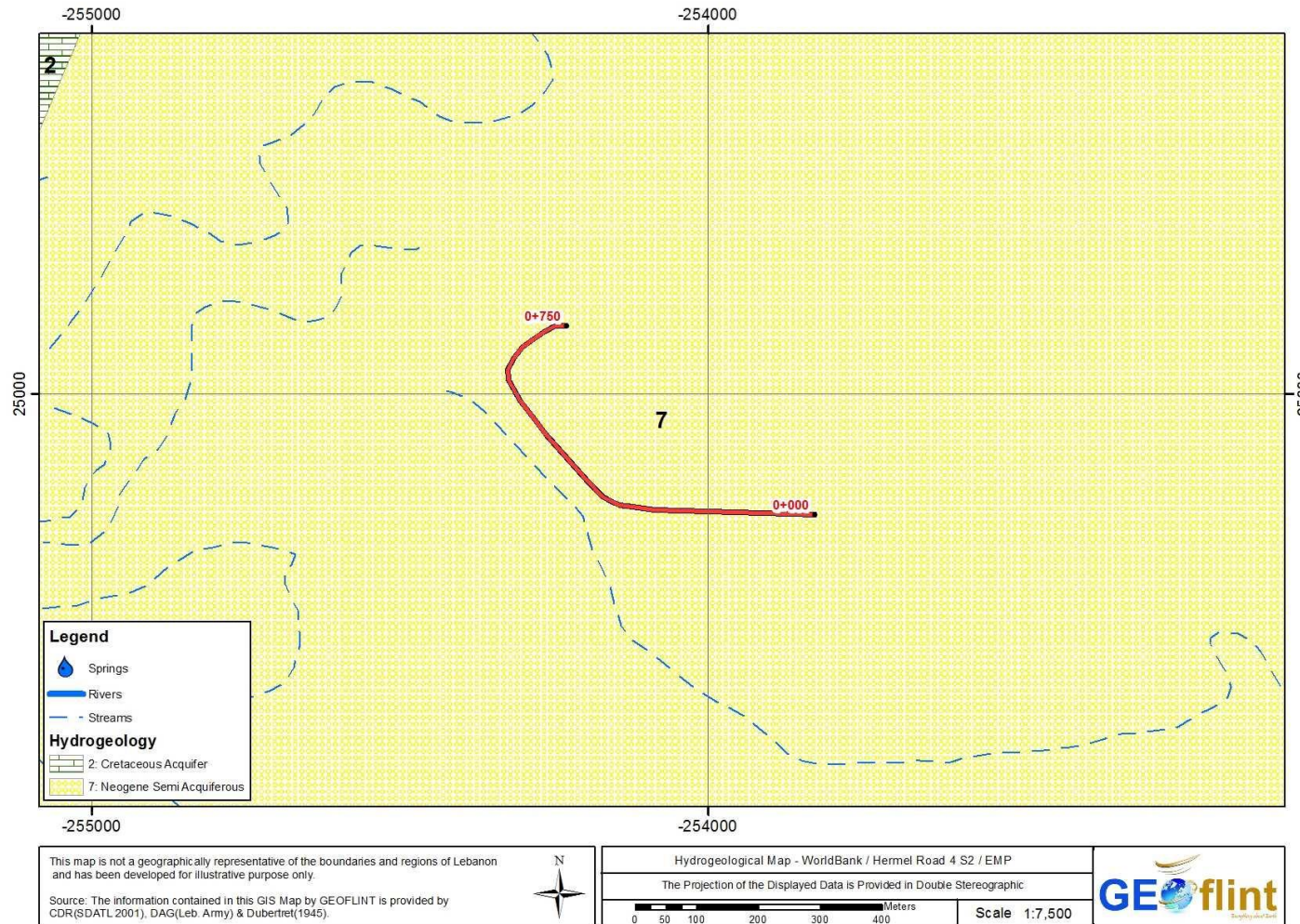
**Figure O Hydrogeological map of Hermel R4 section 1 and its surrounding (map showing water potential of the subsurface). Refer to Table 4-3 for description of hydrogeology classes.**



Source: CDR, DAG, & Dubertret; processed by Geoflint



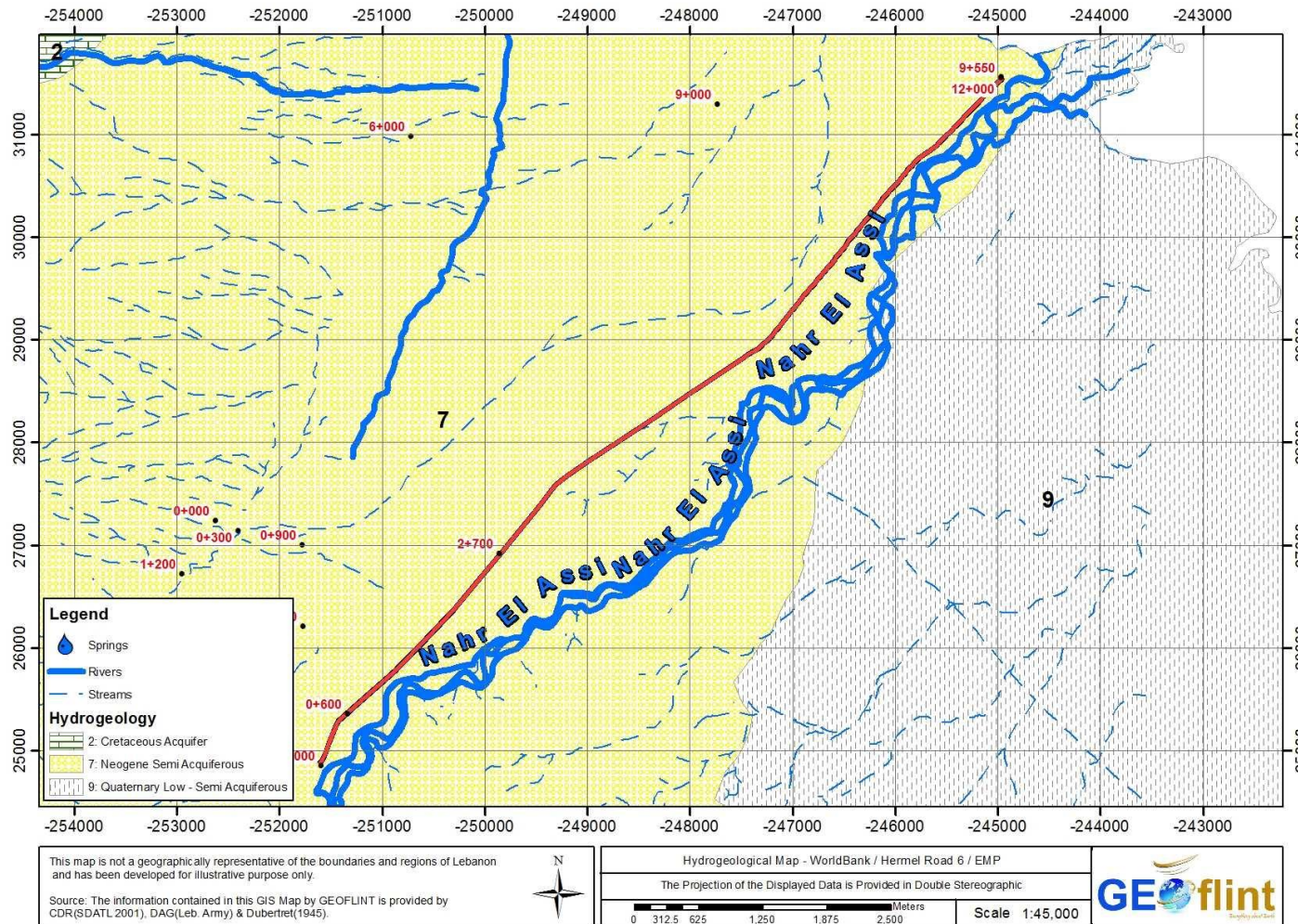
**Figure P Hydrogeological map of Hermel R4 section 2 and its surrounding (map showing water potential of the subsurface). Refer to Table 4-3 for description of hydrogeology classes.**



Source: CDR, DAG, & Dubertret; processed by Geoflint



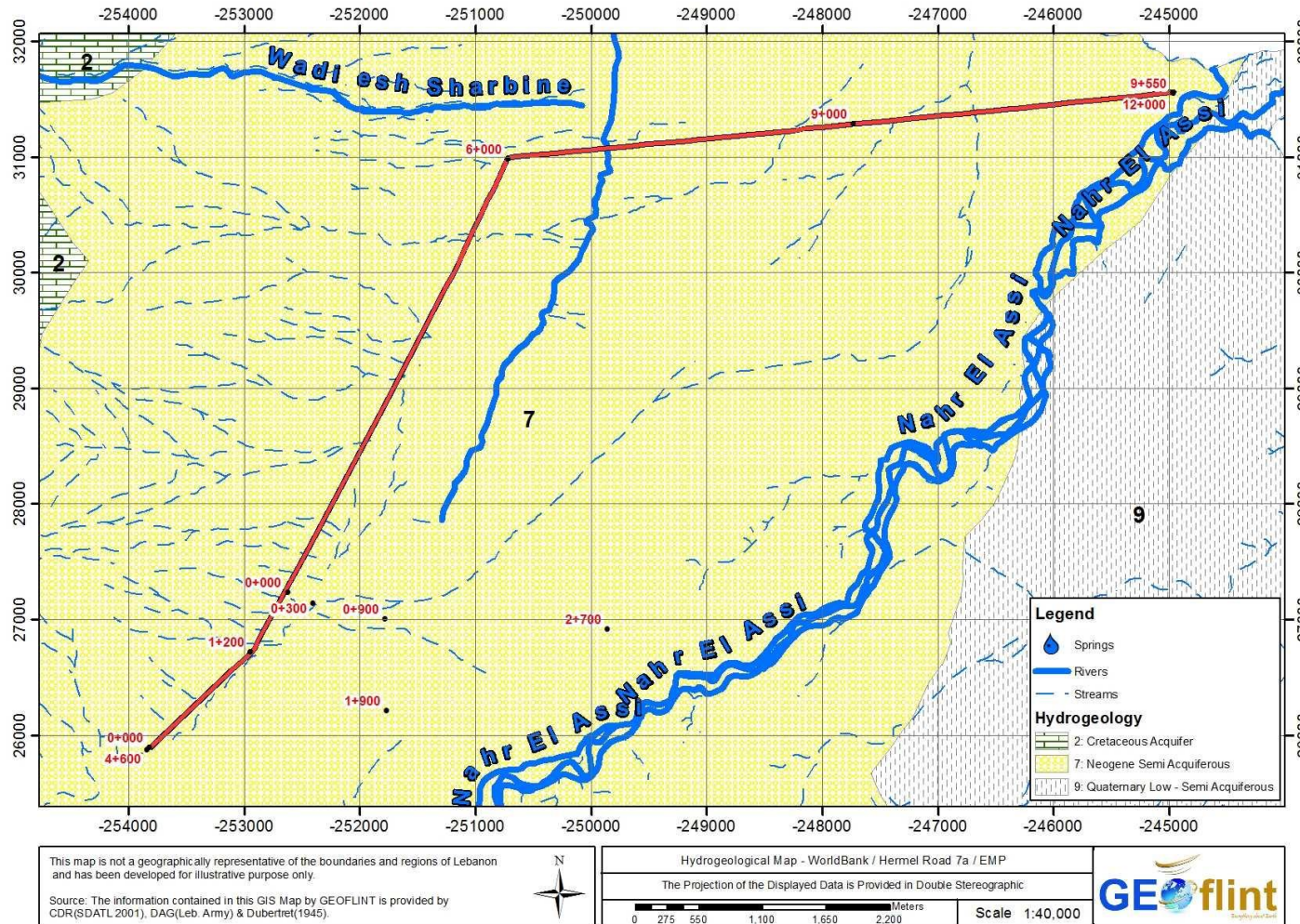
**Figure Q Hydrogeological map of Hermel R6 and its surrounding (map showing water potential of the subsurface). Refer to Table 4-3 for description of hydrogeology classes.**



Source: CDR, DAG, & Dubertret; processed by Geoflint



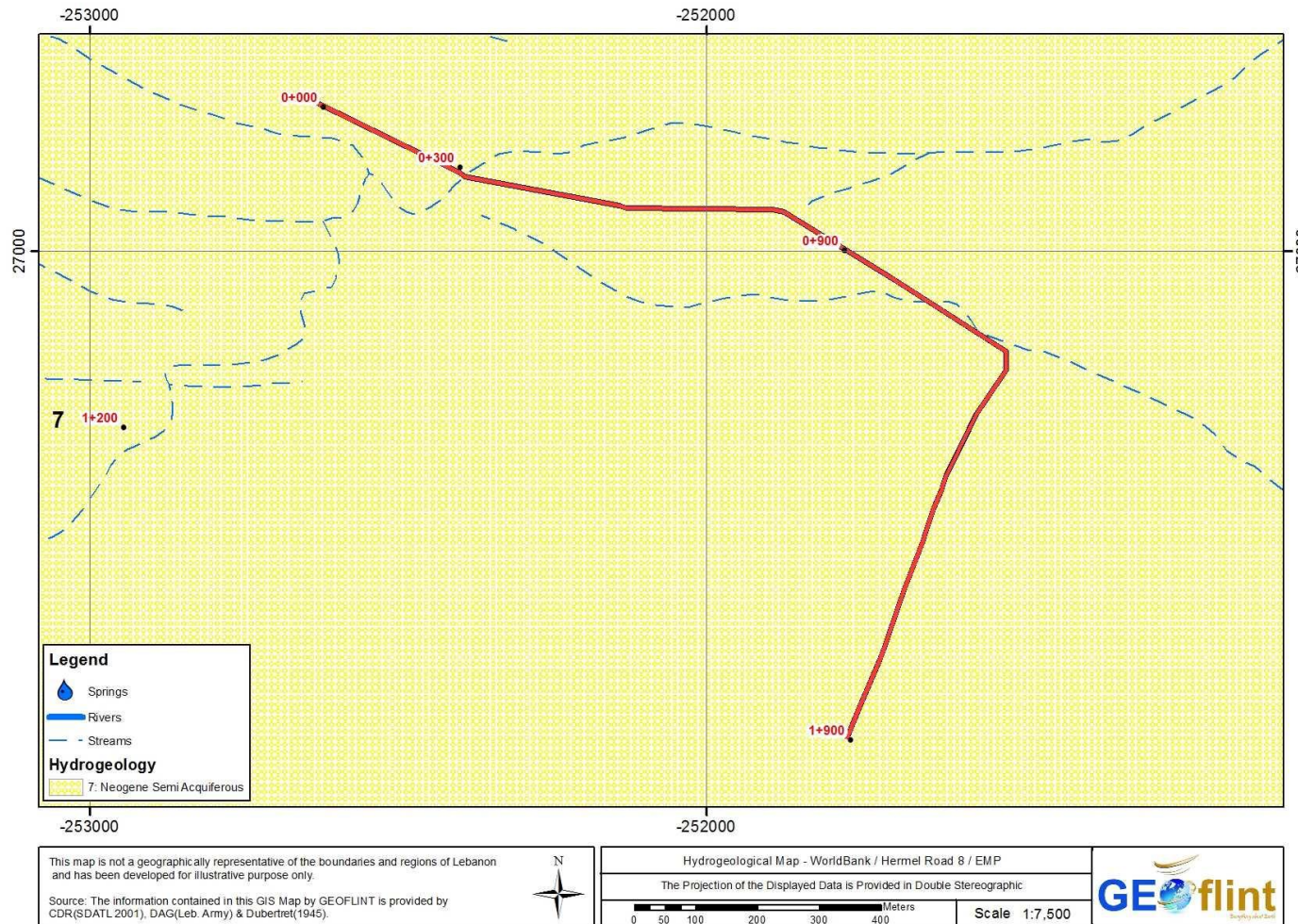
**Figure R Hydrogeological map of Hermel R7a and its surrounding (map showing water potential of the subsurface). Refer to Table 4-3 for description of hydrogeology classes. Work stations are shown along the road alignment.**



Source: CDR, DAG, & Dubertret; processed by Geoflint

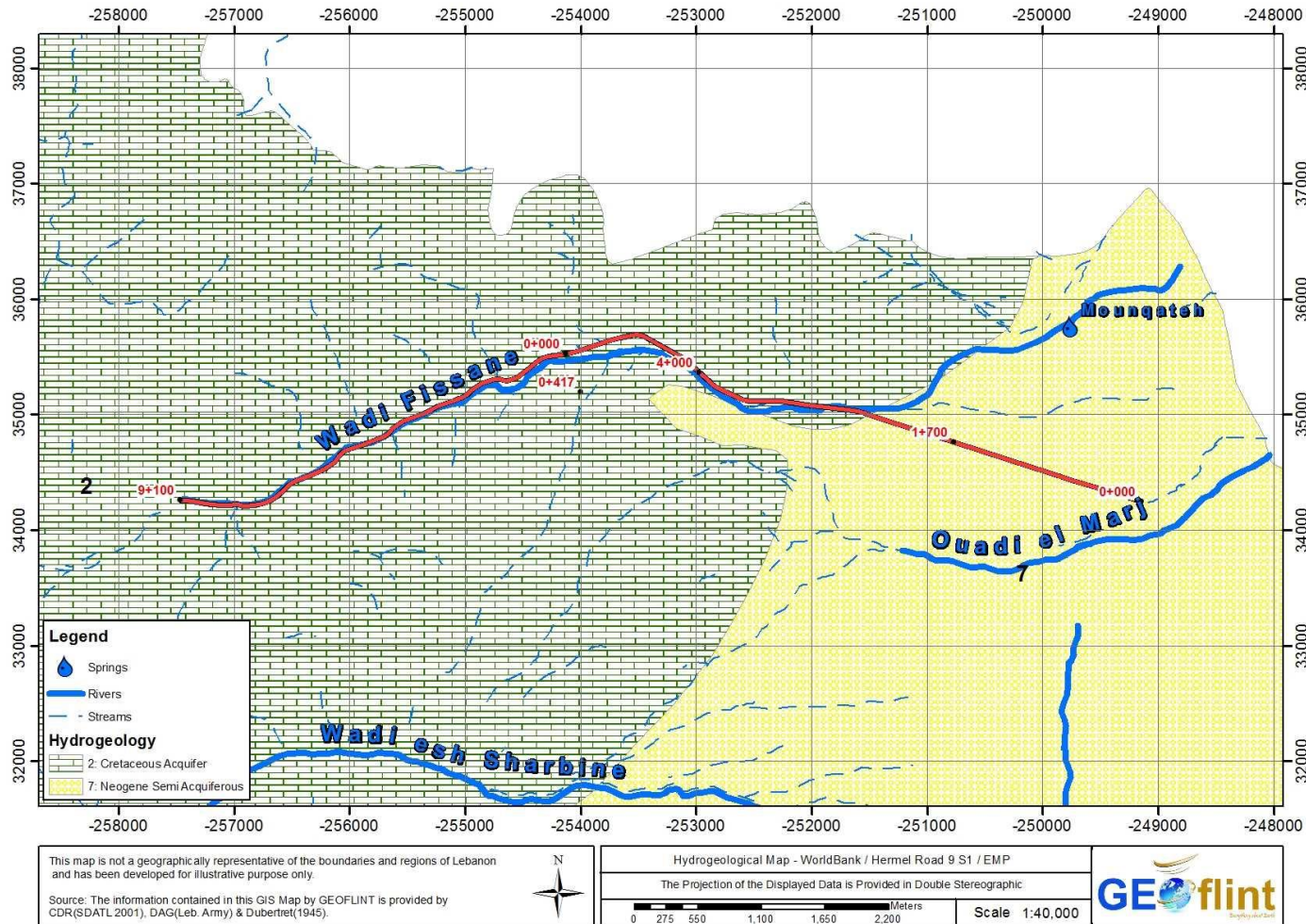


**Figure S Hydrogeological map of Hermel R8 and its surrounding (map showing water potential of the subsurface). Refer to Table 4-3 for description of hydrogeology classes. Work stations are shown along the road alignment.**



Source: CDR, DAG, & Dubertret; processed by Geoflint

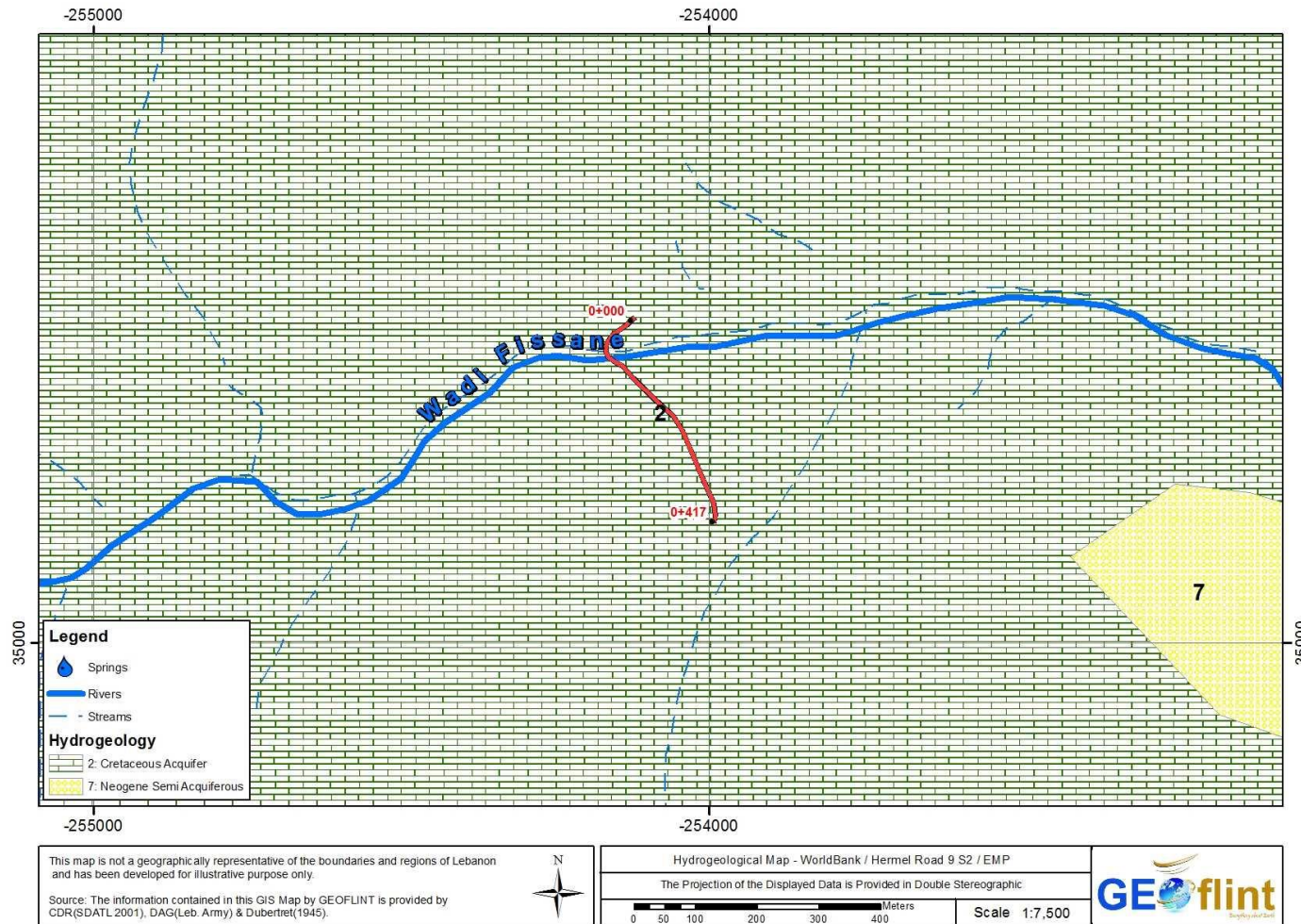
**Figure T Hydrogeological map of Hermel R9 section 1 and its surrounding (map showing water potential of the subsurface). Refer to Table 4-3 for description of hydrogeology classes. Work stations are shown along the road alignment.**



Source: CDR, DAG, & Dubertret; processed by Geoflint

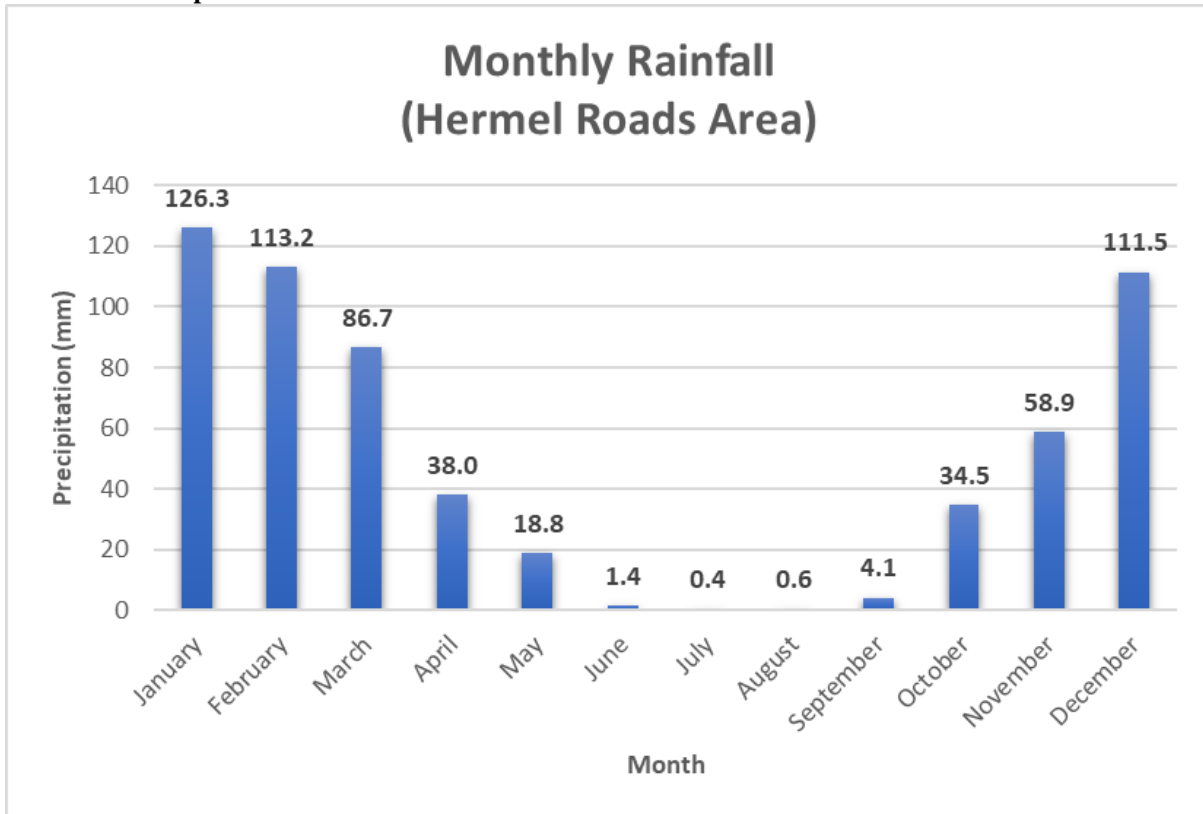


**Figure U Hydrogeological map of Hermel R9 section 2 and its surrounding (map showing water potential of the subsurface). Refer to Table 4-3 for description of hydrogeology classes. Work stations are shown along the road alignment.**



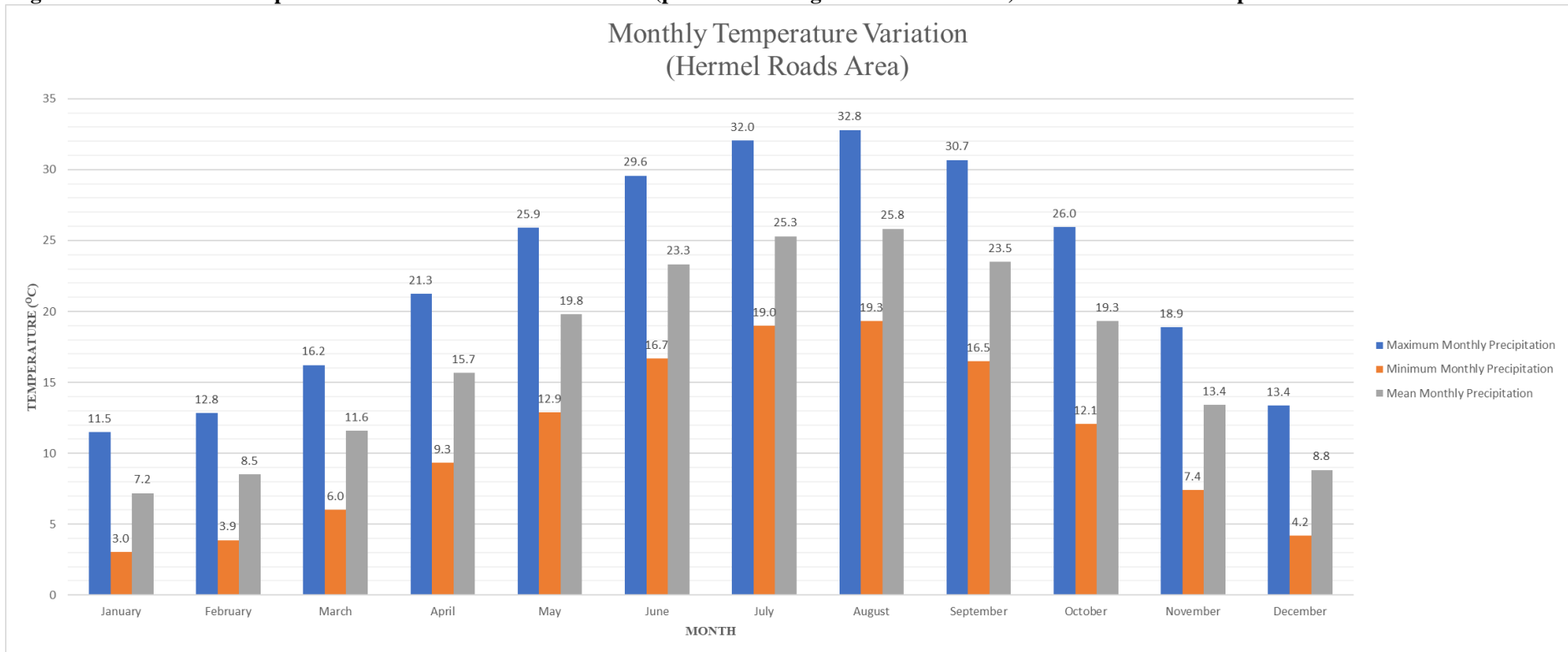
Source: CDR, DAG, & Dubertret; processed by Geoflint

**Figure V Precipitations values along all Hermel roads (period extending between 1996-2018) CHIRPS satellite 4.5 km spatial resolution**



Source: CHIRPS satellite

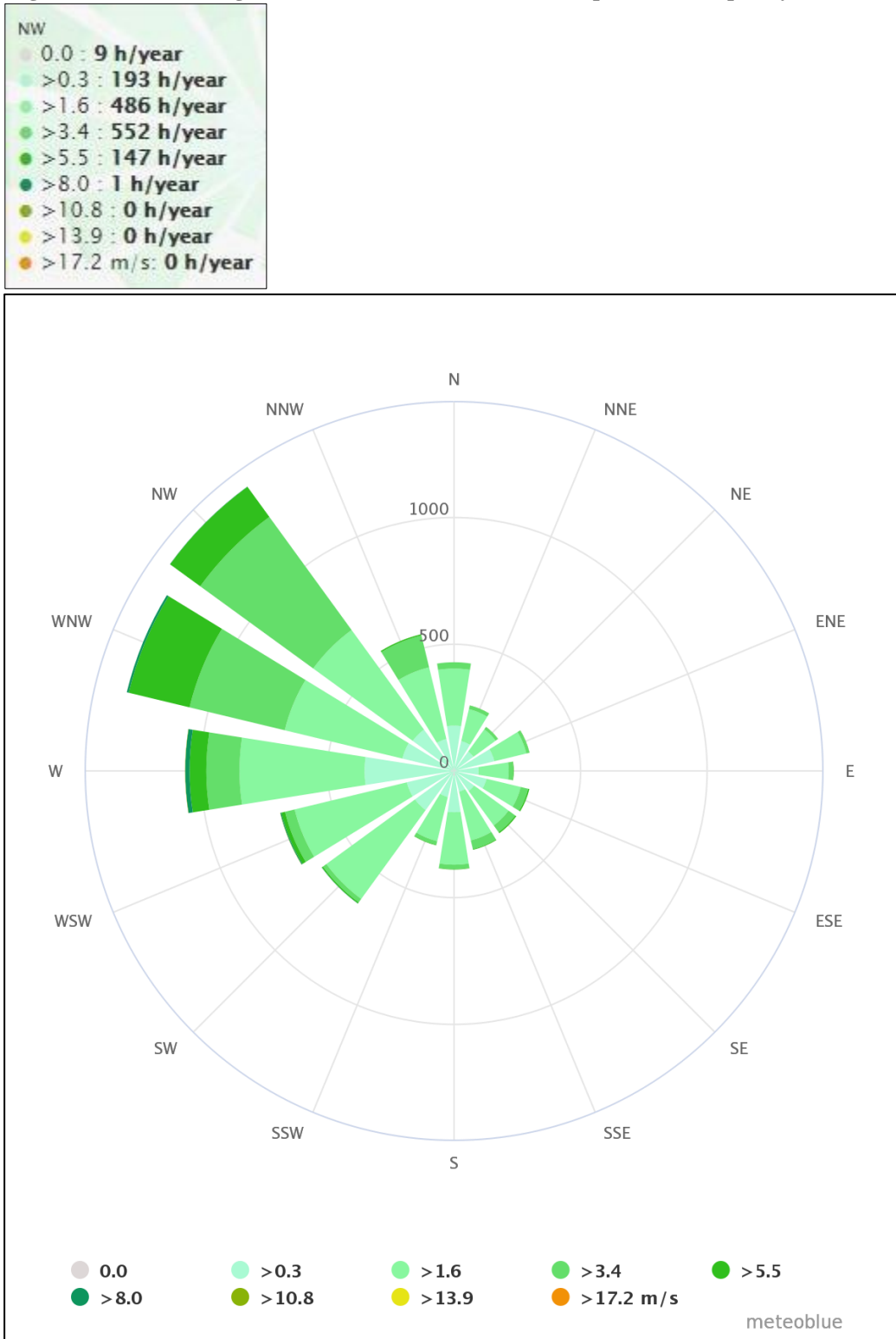
**Figure W Land surface temperature variation for all Hermel roads (period extending between 2000-2018) MODIS satellite 1km spatial resolution**



Source: MODIS satellite



**Figure X Windrose diagram Hermel area (wind direction, speed, and frequency)**



Source: Meteoblue prognostic model

**Table A Hermel R4 existing acoustic conditions (location of stations shown in Figure 3-2)**

Time	Road Section	Station	Min	Leq (avg)	Max	Allowable Noise Level
			(dB)	(dB)	(dB)	
12:02	S1	0+000	52.6	65.9	79.2	Refer to Table 2-6
12:14		1+900	50.9	66.4	81.9	
12:28		4+600	48.7	65.3	81.9	
12:40	S2	0+000	47.6	64.0	80.4	
12:52		0+750	50.9	64.0	77.1	

Source: TEAM INTERNATIONAL acoustic survey, 2020

**Table B Hermel R6 existing acoustic conditions (location of stations shown in Figure 3-3)**

Time	Road Section	Station	Min	Leq (avg)	Max	Allowable Noise Level
			(dB)	(dB)	(dB)	
12:59	Hermel R6	0+000	46.9	65.6	84.3	Refer to Table 2-6
13:05		0+600	56.3	65.9	75.4	
13:17		2+700	48.9	57.6	66.2	
13:32		9+550	53.5	69.1	84.6	

Source: TEAM INTERNATIONAL t acoustic survey, 2020

**Table C Hermel R7a existing acoustic conditions (location of stations shown in Figure 3-4)**

Time	Road Section	Station	Min	Leq (avg)	Max	Allowable Noise Level
			(dB)	(dB)	(dB)	
13:38	Hermel R7a	0+000	52.1	61.8	71.4	Refer to Table 2-6
13:46		1+200	47.9	58.8	69.7	
14:02		6+000	51.8	66.3	80.7	
14:12		9+000	42.7	64.3	85.8	
14:20		12+000	42.8	60.2	77.6	

Source: TEAM INTERNATIONAL t acoustic survey, 2020

**Table D Hermel R8 existing acoustic conditions (location of stations shown in Figure 3-5)**

Time	Road Section	Station	Min	Leq (avg)	Max	Allowable Noise Level
			(dB)	(dB)	(dB)	
14:22	Hermel R8	0+000	38.8	53.8	68.8	Refer to Table 2-6
14:24		0+300	55.6	68.6	81.5	
14:26		0+900	39.7	55.3	70.8	
14:30		1+900	45.8	62.9	79.9	

Source: TEAM INTERNATIONAL t acoustic survey, 2020

**Table E Hermel R9 existing acoustic conditions (location of stations shown in Figure 3-6)**

Time	Road Section	Station	Min	Leq (avg)	Max	Allowable Noise Level
			(dB)	(dB)	(dB)	
14:50	S1	0+000	53.9	60.4	66.8	Refer to Table 2-6
14:56		1+700	41.5	56.6	71.7	

15:02		4+000	44.3	63.9	83.4
15:10		9+100	40.6	53.4	66.2
15:16	S2	0+000	51.6	66.7	81.8
15:22		0+417	52.2	64.3	76.4

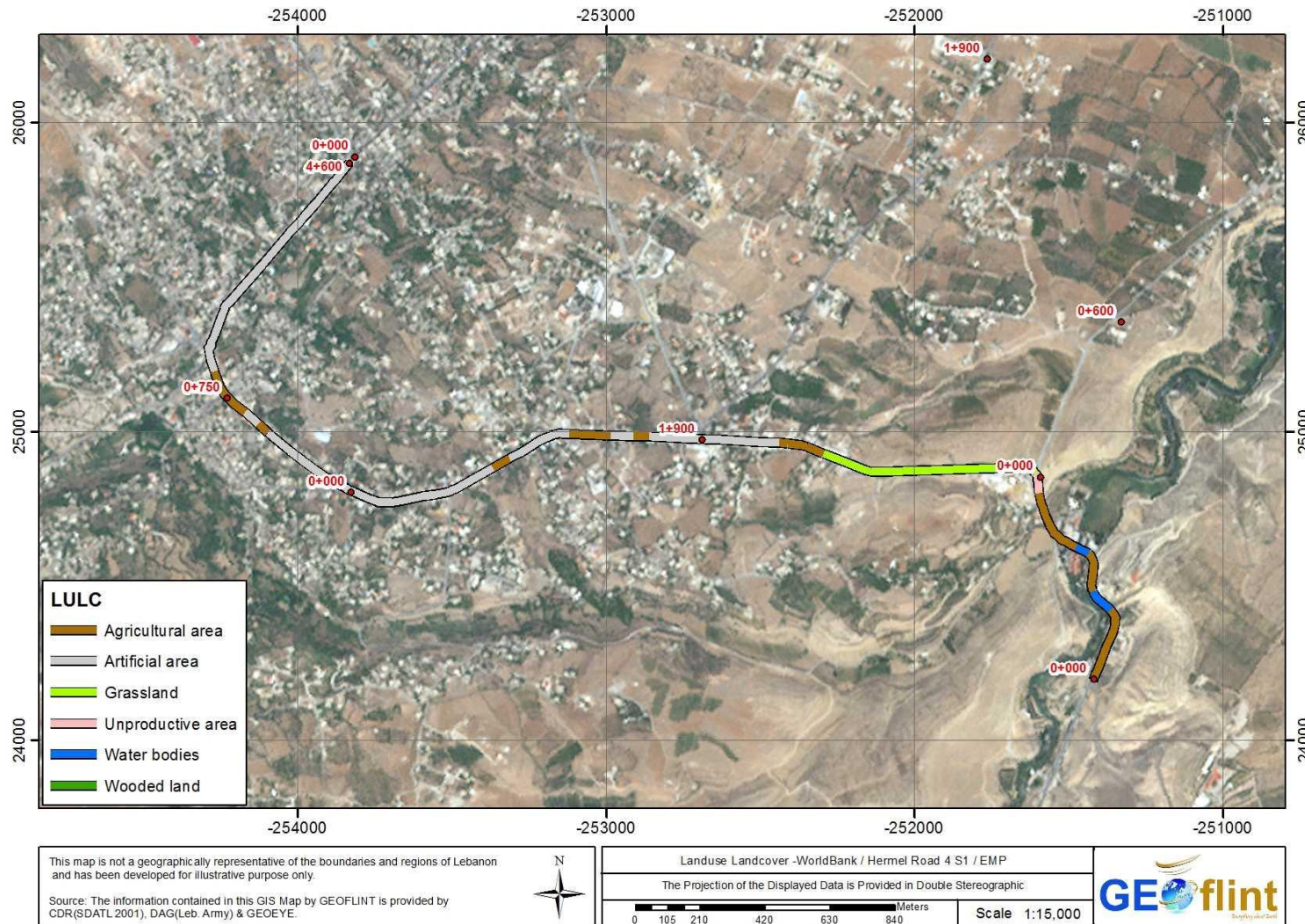
Source: TEAM INTERNATIONAL t acoustic survey, 2020

**Table F Comparing decibel measurements to an ordinary conversation (Trace R&D Center University of Wisconsin-Madison, 2004)**

Sound Environment	Sound Pressure Level (dB)	Approximate loudness with regard to ordinary conversation
Threshold of hearing	0	Don't hear anything
Broadcast studio interior or resulting leaves	10	1/32 <sup>nd</sup> as loud as conversation
Quiet house interior or rural night-time	20	1/16th as loud
Quiet office interior or watch ticking	30	1/8th as loud
Quiet rural area and small theatre	40	1/4th as loud
Quiet suburban area of dishwasher in next room	50	½ as loud
Office interior or ordinary conversation	60	Ordinary conversation
Vacuum cleaner at 10 ft	70	Twice as loud
Passing car at 10ft or garbage disposal at 3ft	80	4 times as loud
Passing bus or truck at 10ft or food blender at 3ft	90	8 times as loud
Passing subway train at 10ft	100	16 times as loud
Nigh club with band playing	110	32 times as loud
Threshold of pain	120	64 times as loud as conversation

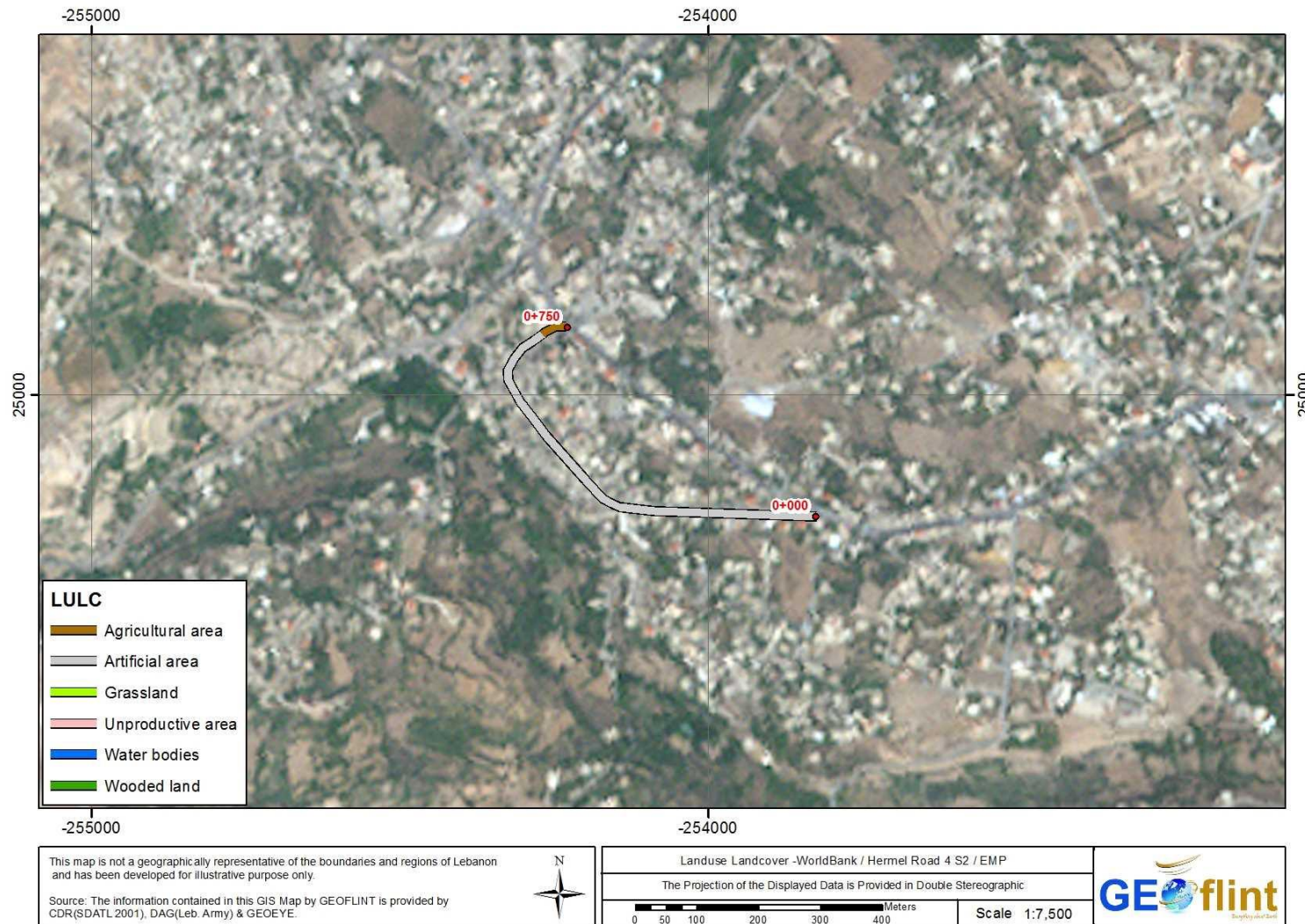
Source: Trace R&D Center University of Wisconsin-Madison, 2004

**Figure Y LULC map with work stations along Hermel R4 section 1 alignment**





**Figure Z LULC map with work stations along Hermel R4 section 2 alignment**



**Figure AA LULC map with work stations along Hermel R6 alignment**

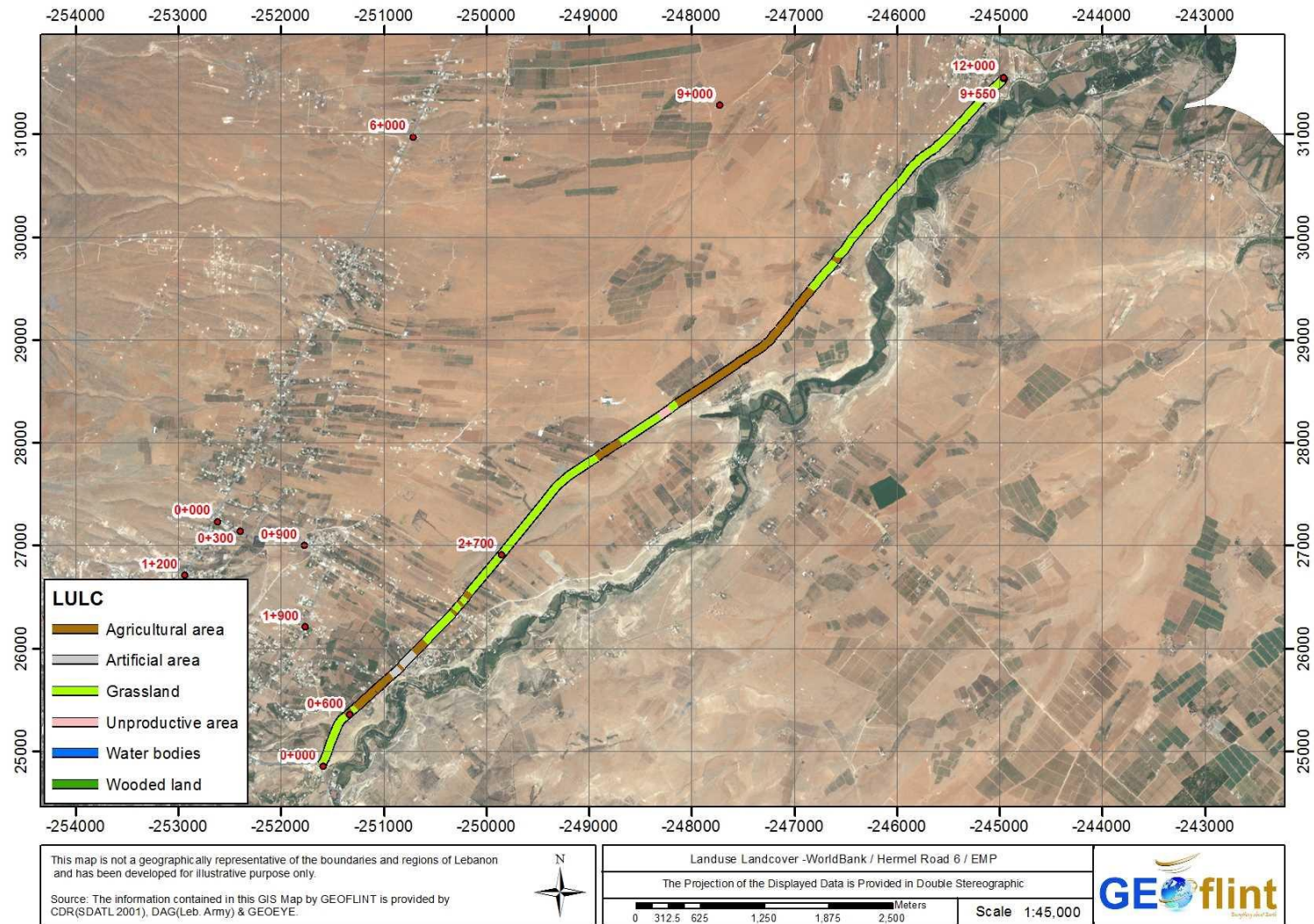
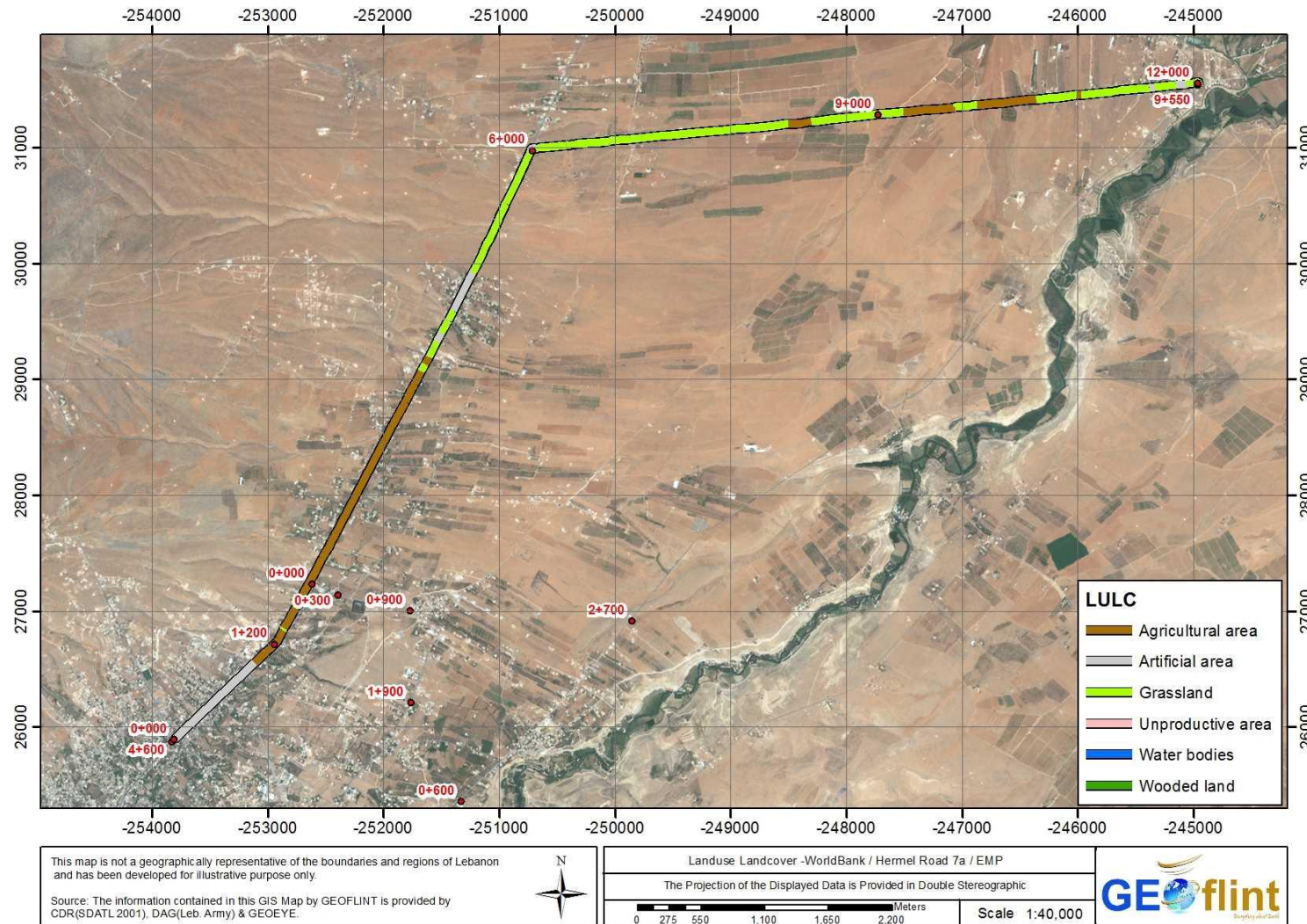




Figure BB LULC map with work stations along Hermel R7a alignment



**Figure CC LULC map with work stations along Hermel R8 alignment**

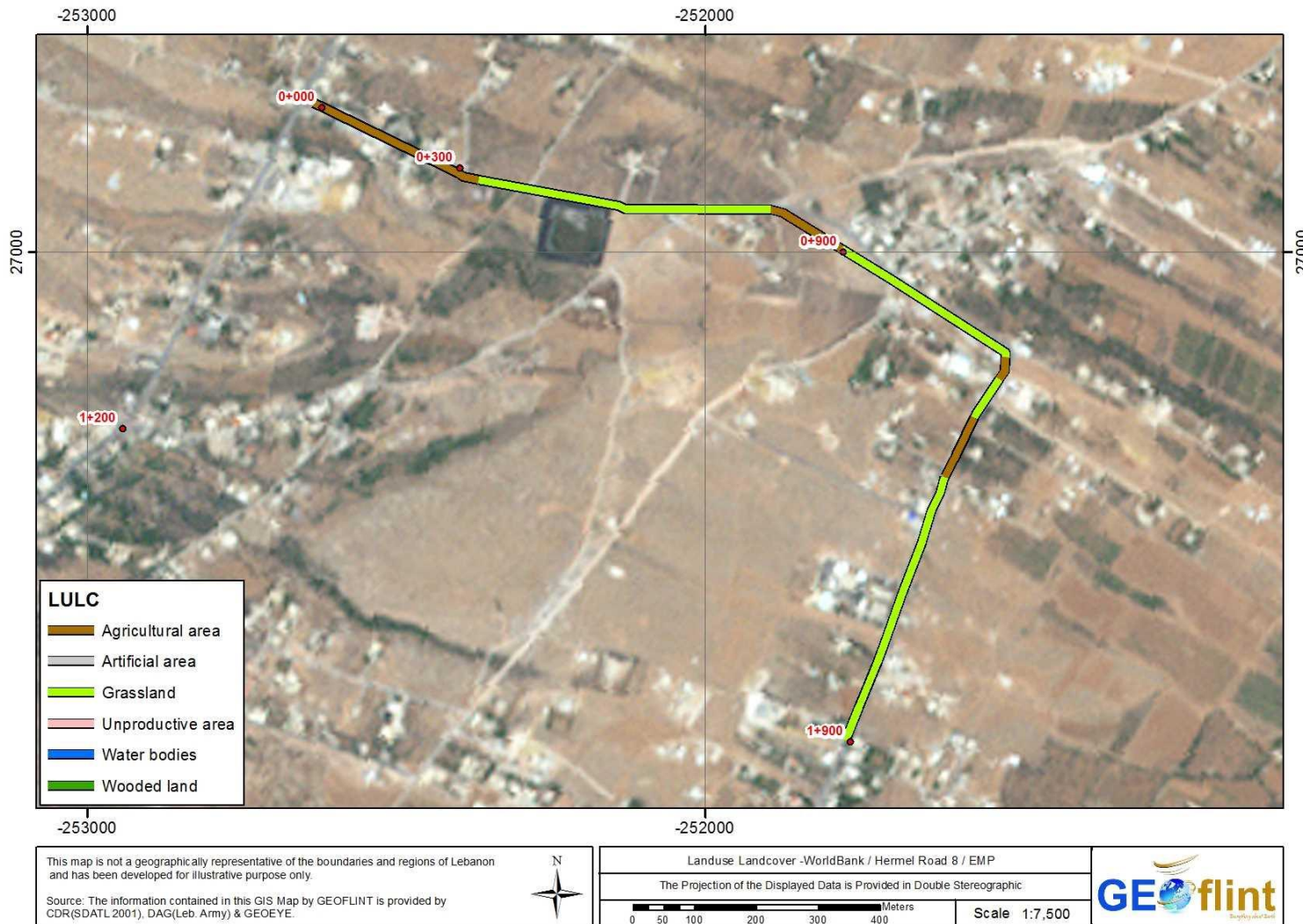
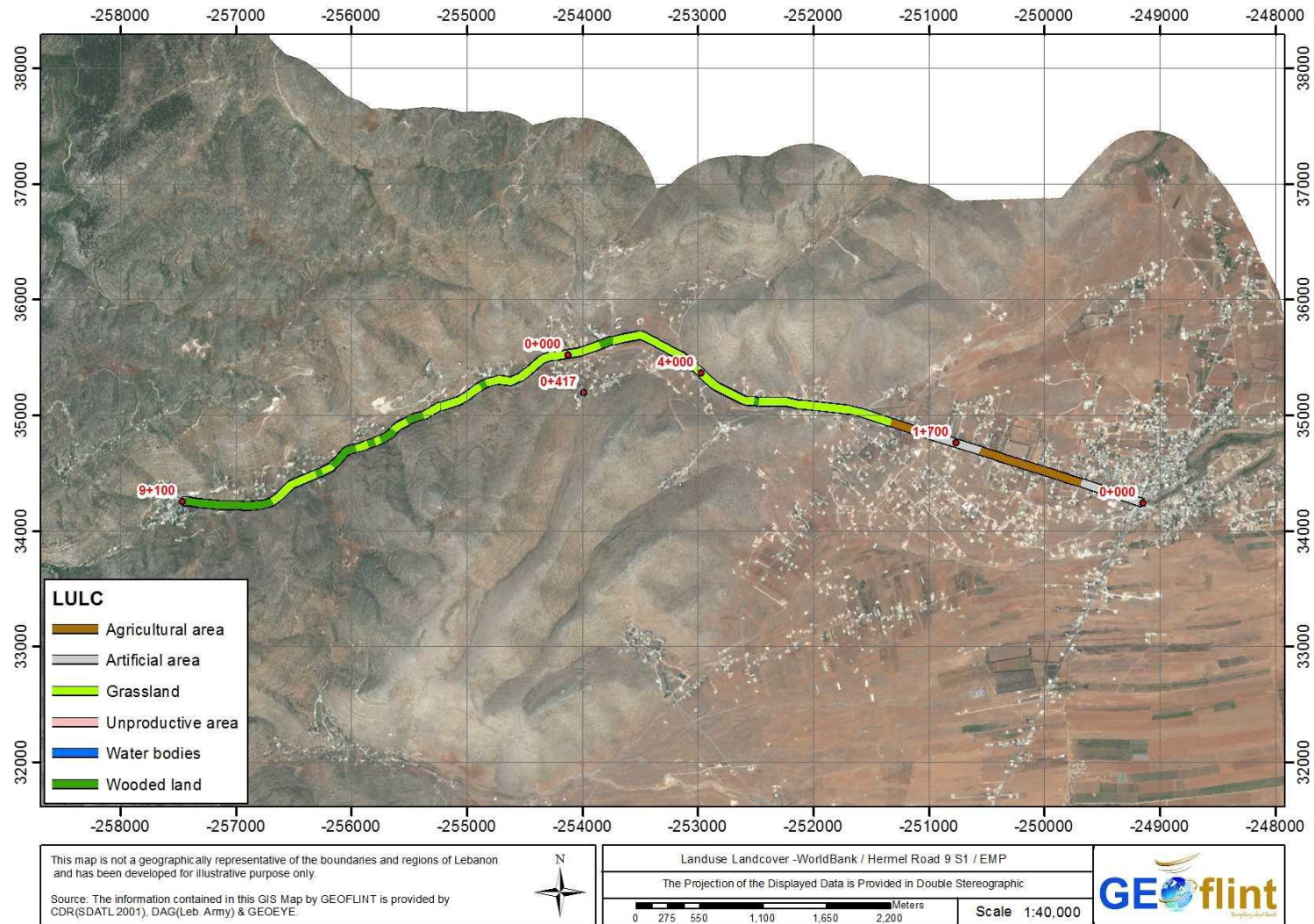




Figure DD LULC map with work stations along Hermel R9 section 1 alignment



**Figure EE LULC map with work stations along Hermel R9 section 2 alignment**



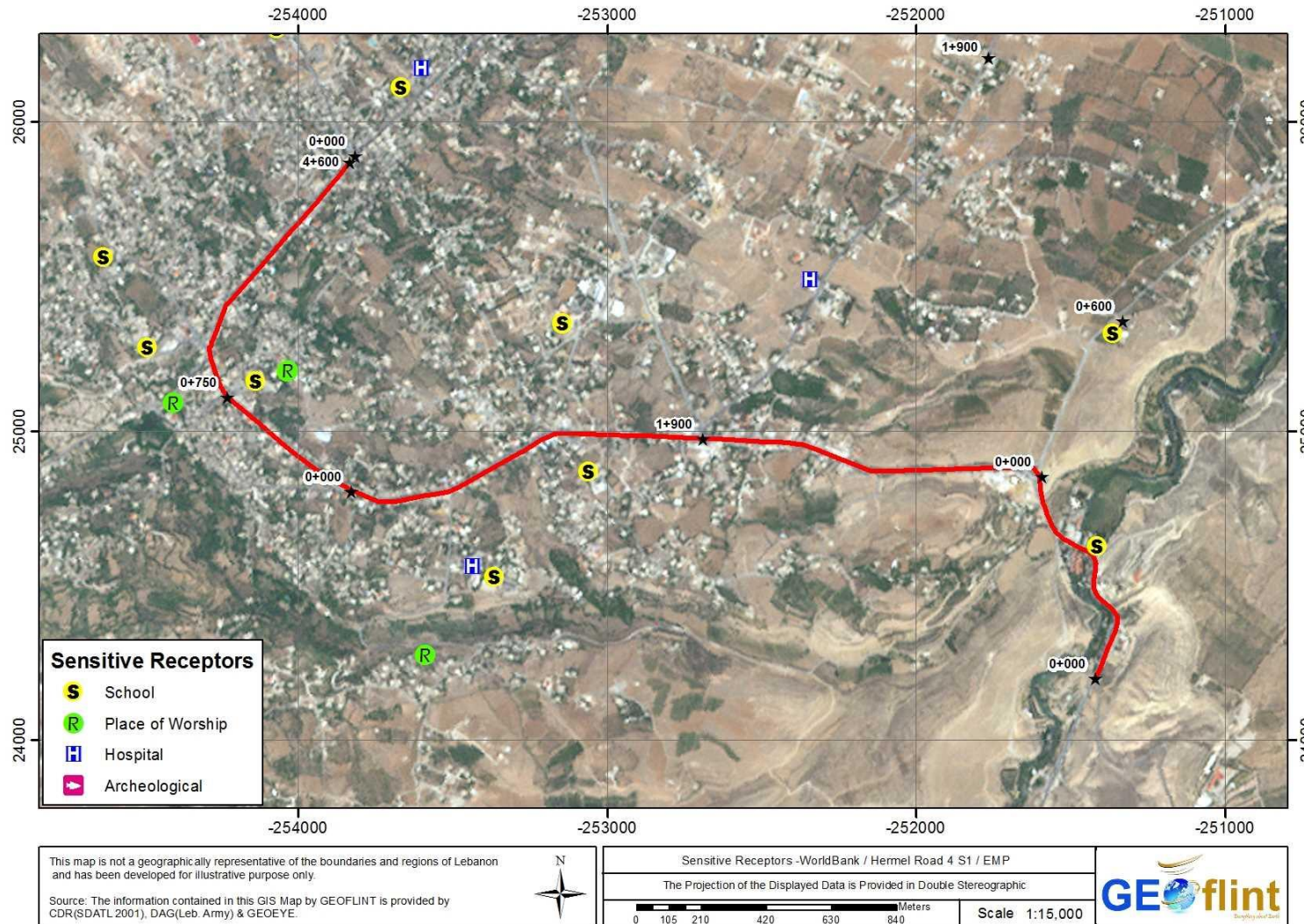
**Table G Relevant sensitive receptors encountered along and near Hermel Roads**

Name	Distance (m)
<b>Hermel R4 section 1 (Hermel)</b>	
Cemetery (ضريح الرئيس صبري حمادة)	10
Hermel school	10
إتحاد بلديات الهرمل	13
المدرسة الفندقية	25
<b>Hermel R6 (Hermel – Chouaghir – Mazraat Beit Et-Tachem – Haouch Beit Ismail)</b>	
Ecole Normale De Hermel	40
<b>Hermel R7a (Hermel – Mansoureh – Bouaida – Nasriye – Haouch Beit Ismail)</b>	
معهد الهرمل الفني	60
<b>Hermel R8 (Tall El-Far)</b>	
ثانوية الهرمل النموذجية الرسمية	20

Source: Geoflint s.a.r.l. survey results, 2020



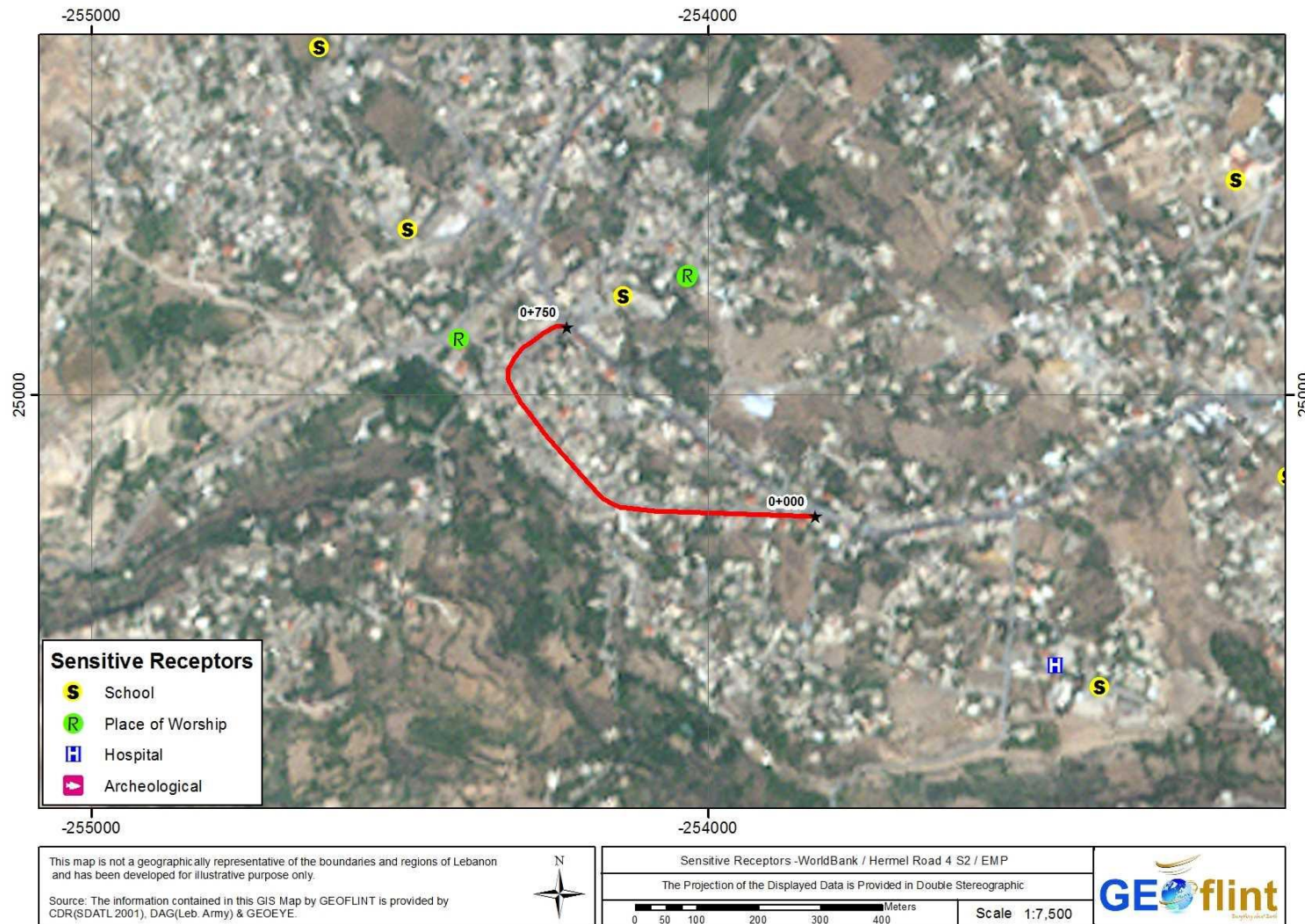
Figure FF Closest sensitive receptors along Hermel R4 section 1



Source: Geoflint s.a.r.l. & TEAM INTERNATIONAL, 2020

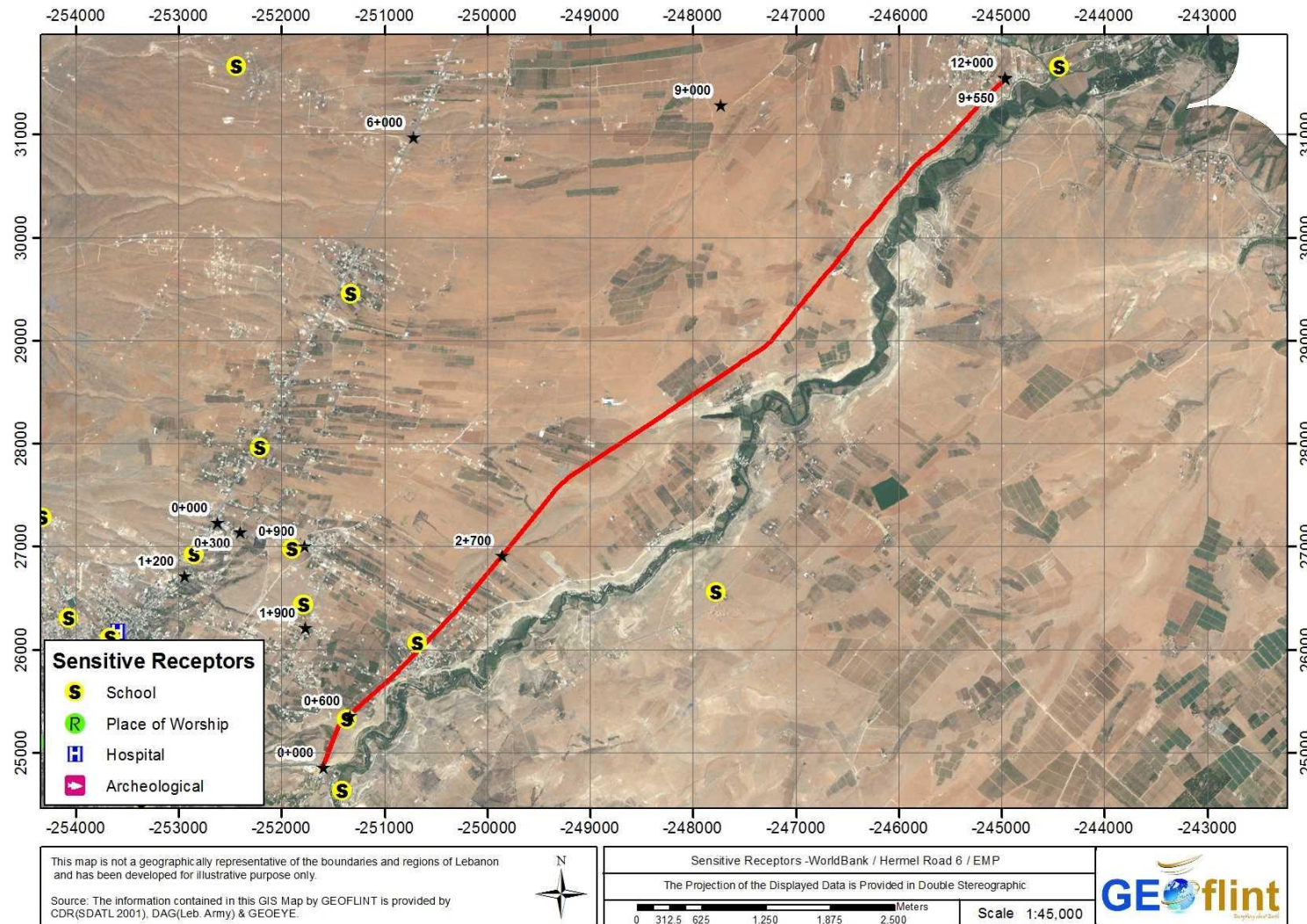


**Figure GG Closest sensitive receptors along Hermel R4 section 2**



Source: Geoflint s.a.r.l. & TEAM INTERNATIONAL, 2020

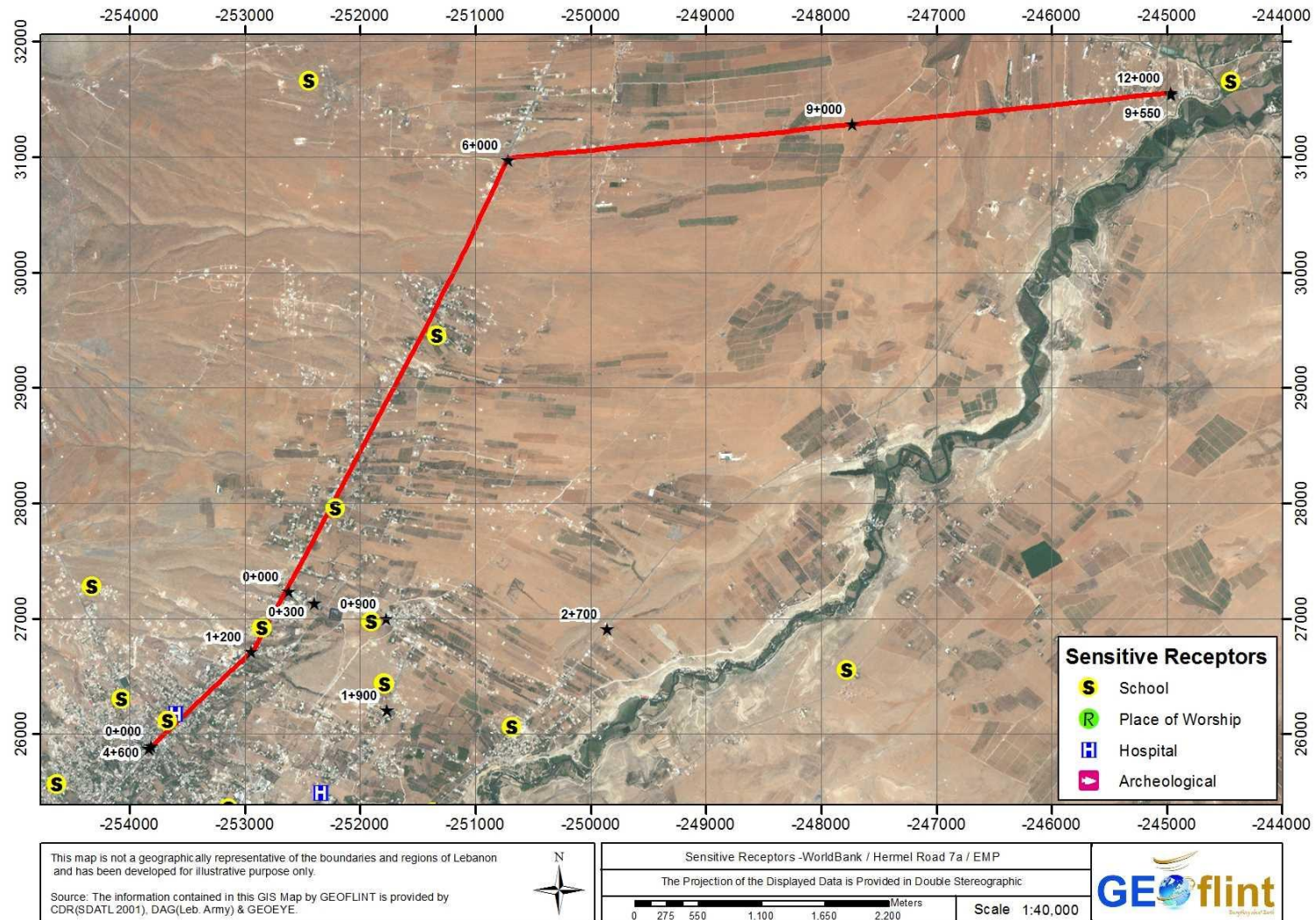
Figure HH Closest sensitive receptors along Hermel R6



Source: Geoflint s.a.r.l. & TEAM INTERNATIONAL, 2020



Figure II Closest sensitive receptors along Hermel R7a



Source: Geoflint s.a.r.l. & TEAM INTERNATIONAL, 2020

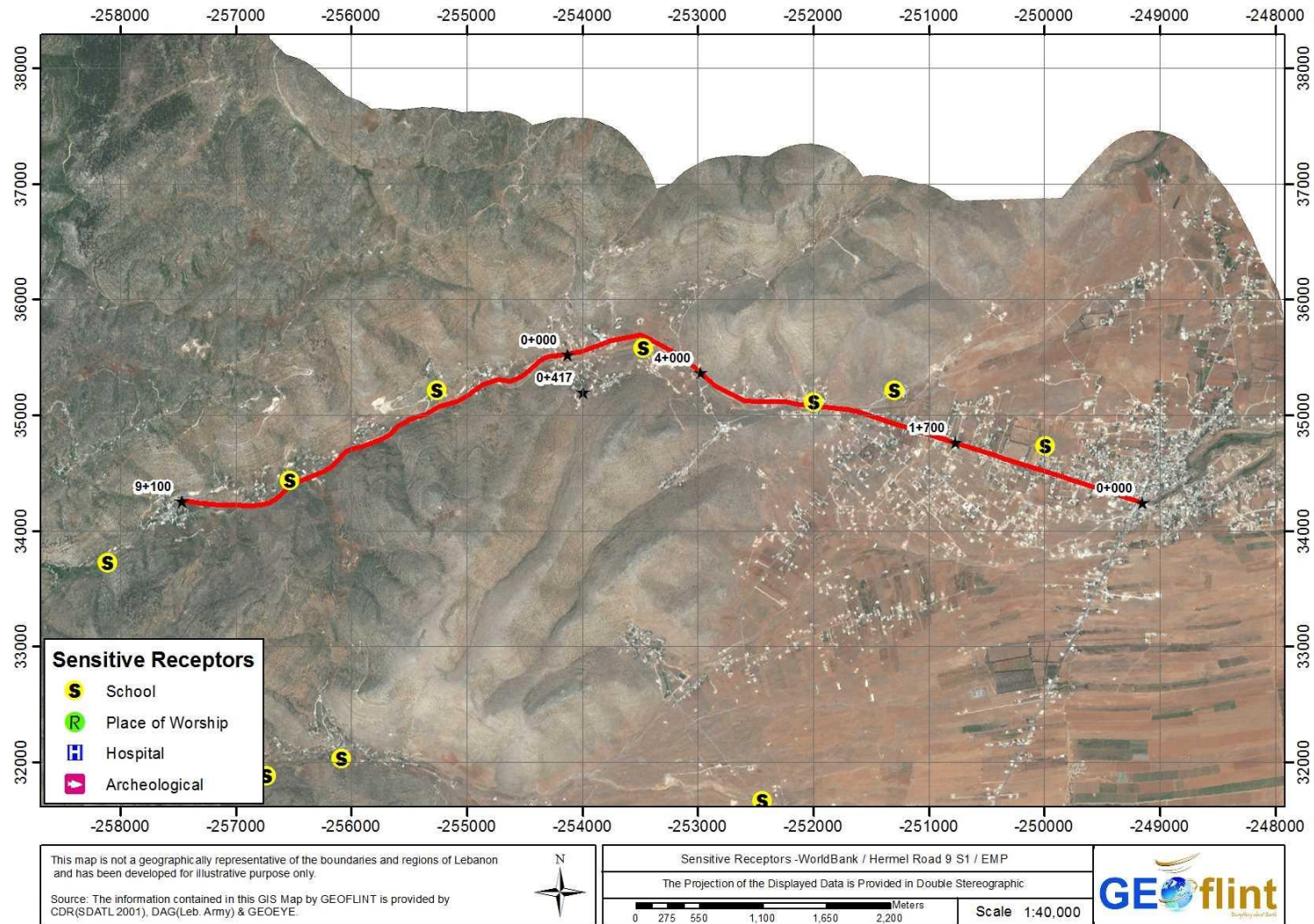


**Figure JJ Closest sensitive receptors along Hermel R8**



Source: Geoflint s.a.r.l. & TEAM INTERNATIONAL, 2020

**Figure KK Closest sensitive receptors along Hermel R9 section 1**



Source: Geoflint s.a.r.l. & TEAM INTERNATIONAL, 2020



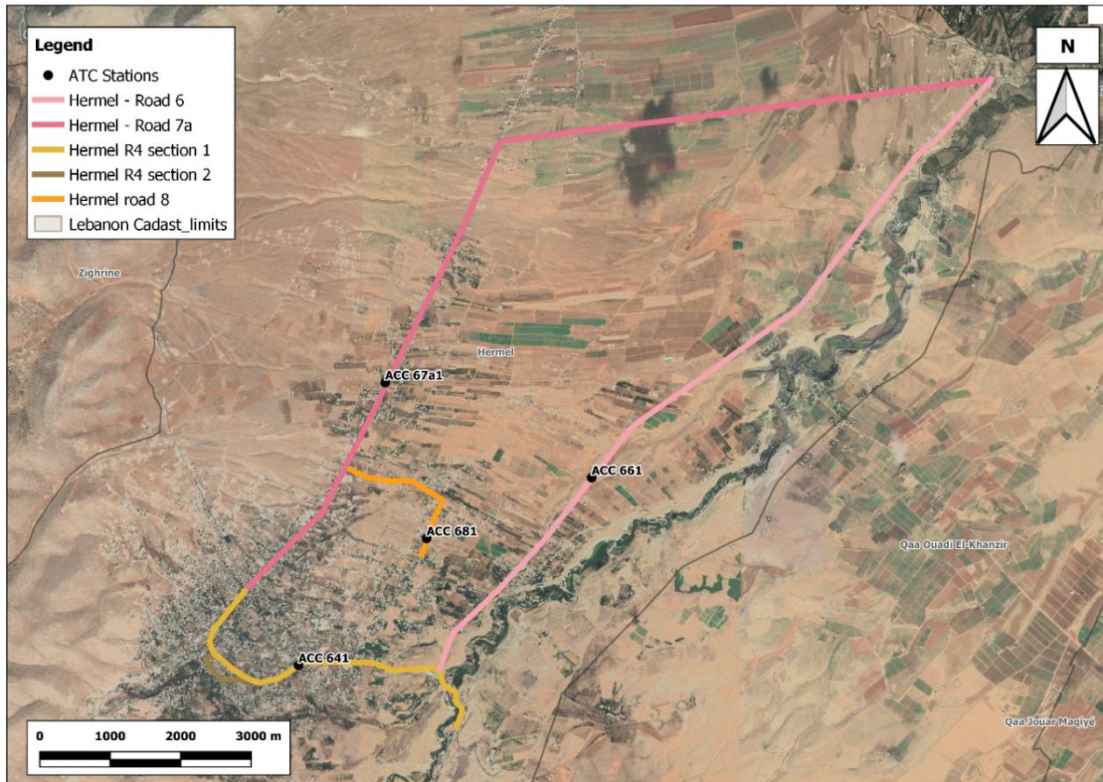
**Figure LL Closest sensitive receptors along Hermel R9 section 2**



Source: Geoflint s.a.r.l. & TEAM INTERNATIONAL, 2020

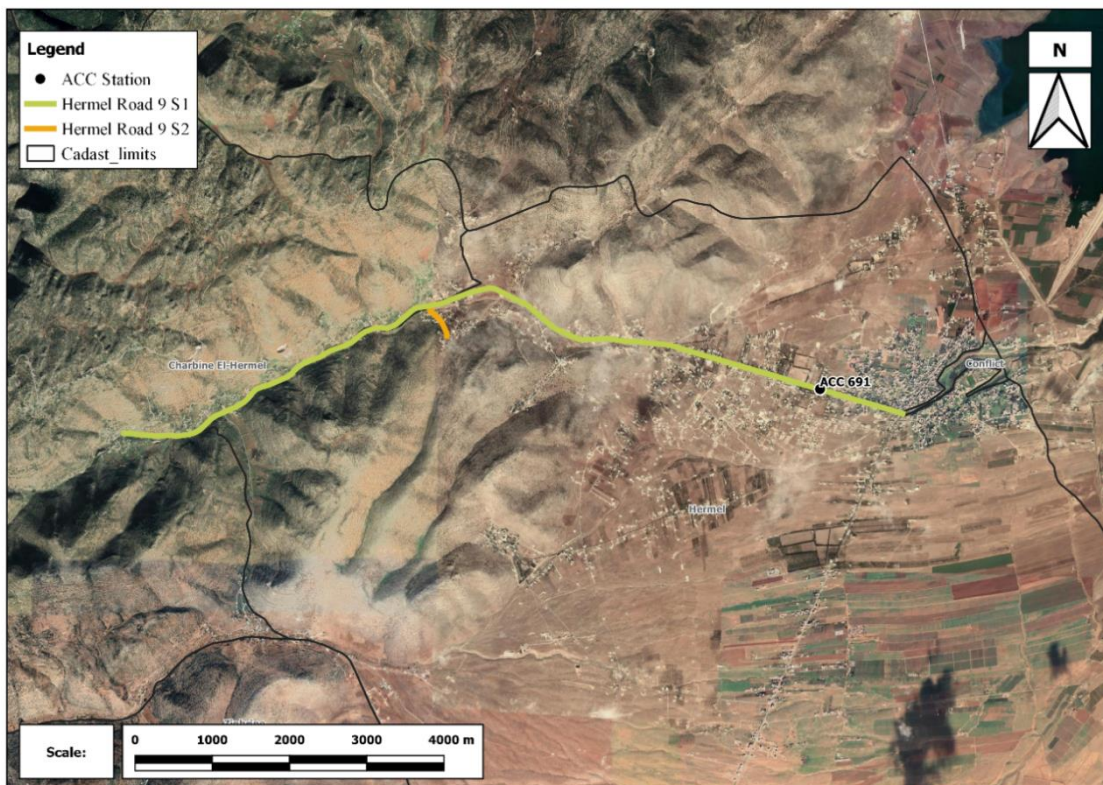


Figure MM Location of ATC stations for Hermel roads R6, 7a, R4, and R8



Source: Geoflint s.a.r.l. & TEAM INTERNATIONAL, 2020

Figure NN Location of ATC stations for R9 road



Source: Geoflint s.a.r.l. & TEAM INTERNATIONAL, 2020

**Table H ADT values for all Hermel Roads**

Caza	Road	Station	ADT
			(veh/day)
Hermel	R4	ACC 641	4,699
	R6	ACC 661	1,202
	R7a	ACC 67a1	6,952
	R8	ACC 681	2,254
	R9	ACC 691	2,781

Source: TEAM INTERNATIONAL, 2020

## Annex 2: Assessment Methodology

The assessment followed the Lebanese MoE grading methodology stated in Decree 260/1, dated 2015. The impact grading methodology is explained in this section.

This approach was adopted in order to address the several sources of impacts from the project's rehabilitation and operational phases. The stages of the evaluation process are the following:

1. Identification of project-related activities (sources) and environmental aspects.
2. Identification of potential impacts to the environment (physical, biological, human, cultural).
3. Evaluation and assessment of the related unmitigated impact significance.

Impacts are first classified as shown the table below:

**Table I Classification of impacts**

Matrix	Classification	Criteria
<b>N</b> (Nature)	<b>P</b> (Positive)	<ul style="list-style-type: none"> <li>• The proposed activity offers benefits for the overall project</li> </ul>
	<b>N</b> (Negative)	<ul style="list-style-type: none"> <li>• Impacts having minimal to major negative influence</li> </ul>
	<b>D</b> (Direct)	<ul style="list-style-type: none"> <li>• Impact arising directly from the project activities</li> </ul>
	<b>I</b> (Indirect)	<ul style="list-style-type: none"> <li>• Impacts arising from activities not directly related to the project development</li> </ul>
<b>M</b> (Magnitude)	<b>L</b> (Low)	<ul style="list-style-type: none"> <li>• High potential to mitigate negative impacts on the physical, biological or human environment to the level of insignificant effects.</li> <li>• Disturbance of degraded areas with little conservation value. Minor changes in species occurrence or variety.</li> <li>• Simple mitigation measures may be needed to minimize impacts</li> </ul>
	<b>M</b> (Moderate)	<ul style="list-style-type: none"> <li>• Medium range (beyond site boundary but restricted to local area).</li> <li>• Medium-term (reversible over time, duration of operational phase).</li> <li>• Potential to mitigate negative impacts on physical, biological or human environment. However, the implementation of mitigation measures may still not prevent some negative effects.</li> <li>• Destruction/Disturbance of areas with potential conservation value. Complete changes in species occurrence or variety.</li> <li>• Mitigation measures will help minimize impacts</li> </ul>
	<b>H</b> (High)	<ul style="list-style-type: none"> <li>• Disturbance to areas of high conservation value. Destruction of rare or endangered species.</li> <li>• Mitigation is required.</li> <li>• Largely irreversible impacts on the physical, biological or human environment.</li> <li>• Has a massive impact on the surrounding livelihood.</li> <li>• Potentially irreparable damage to a site of social and/or cultural importance</li> </ul>



Matrix	Classification	Criteria
<b>E</b> (Extent)	<b>L</b> (Local)	<ul style="list-style-type: none"> <li>Limited to the project area</li> <li>Locally occurring impact within the locality of the proposed project</li> </ul>
	<b>G</b> (Global)	<ul style="list-style-type: none"> <li>Extend beyond the local area</li> <li>National impact affecting resources on a national scale</li> </ul>
<b>T</b> (Timing)	<b>S</b> (Short-term)	<ul style="list-style-type: none"> <li>Activities and their related impacts are characterized by a short duration of effect</li> </ul>
	<b>M</b> (Medium-term)	<ul style="list-style-type: none"> <li>Activities and their related impacts are characterized by a medium duration of effect</li> </ul>
	<b>L</b> (Long-term)	<ul style="list-style-type: none"> <li>Activities and their related impacts are characterized by a long duration of effect</li> </ul>
<b>D</b> (Duration)	<b>C</b> (Construction)	<ul style="list-style-type: none"> <li>Impacts arise during the construction phase of the proposed project</li> </ul>
	<b>O</b> (Operation)	<ul style="list-style-type: none"> <li>Impacts arise during the operational phase of the project</li> </ul>
<b>R</b> (Reversibility)	<b>R</b> (Reversible)	<ul style="list-style-type: none"> <li>Impacts may be reversible, or able to be rehabilitated upon the decommissioning of the proposed project</li> </ul>
	<b>I</b> (Irreversible)	<ul style="list-style-type: none"> <li>Impacts may not be reversible, or able to be rehabilitated upon the decommissioning of the proposed project</li> </ul>
<b>L</b> (Likelihood of occurrence)	<b>L</b> (Low)	<ul style="list-style-type: none"> <li>The classified impact is unlikely to occur under normal operating conditions</li> </ul>
	<b>M</b> (Medium)	<ul style="list-style-type: none"> <li>The classified impact may possibly occur</li> </ul>
	<b>H</b> (High)	<ul style="list-style-type: none"> <li>The classified impact is unlikely to occur under normal operating conditions</li> </ul>
<b>S</b> (Significance)	<b>L</b> (Low)	<ul style="list-style-type: none"> <li>Results in no substantial adverse change to existing environmental conditions</li> </ul>
	<b>M</b> (Medium)	<ul style="list-style-type: none"> <li>Substantial adverse change to existing environmental conditions</li> <li>Can be mitigated to less-than-significant levels by implementation of proposed potentially feasible mitigation measures or by the selection of an environmentally superior project alternative</li> </ul>
	<b>H</b> (High)	<ul style="list-style-type: none"> <li>Substantial adverse change to existing environmental conditions</li> <li>Cannot be fully mitigated by implementation of all feasible mitigation measures</li> </ul>

The environmental significance matrix adopted is based on the well-known “weighted scoring” or “weighing and scoring” method used as a tool in various decision analysis applications. In this method, the following steps takes place:

1. Attributes relevant to the project are chosen
2. Weights or numerical values are assigned to each attribute depending on its importance (values should be based on objective data or expert opinion to exclude subjectivity during the process).
3. Scores are allocated to each option to reflect its status with respect to each attribute

The final result is a single weighted score for each option, which is used to quantify its overall performance/significance. As such, the adopted matrix is designed to allow subjective conclusions to be numerically recorded or quantified, therefore providing at the same time an impact evaluation and quantitative record to revert to in the future:

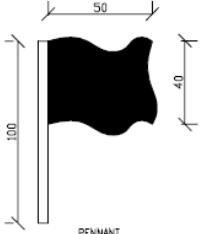
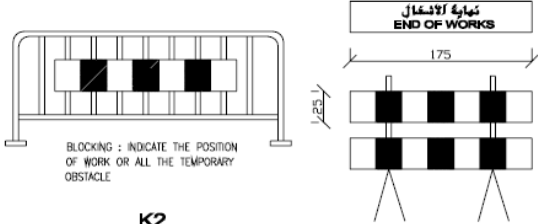

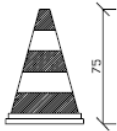
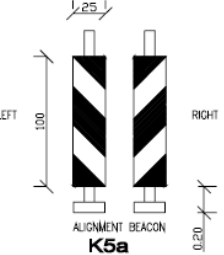
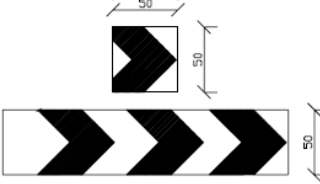
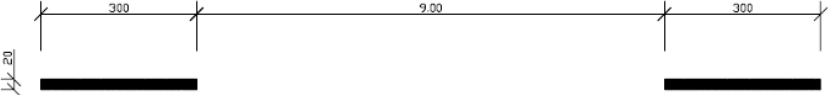
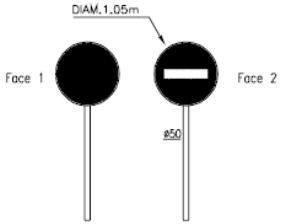
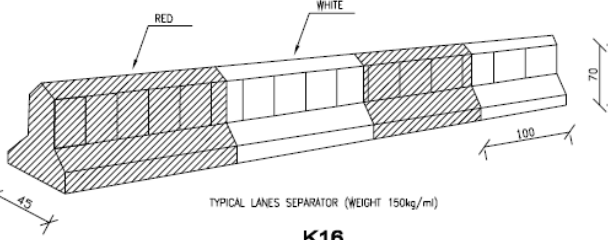
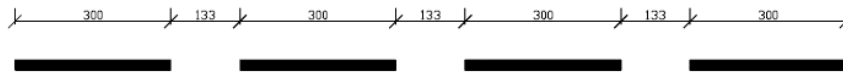
**Table J Significance Impact Matrix**

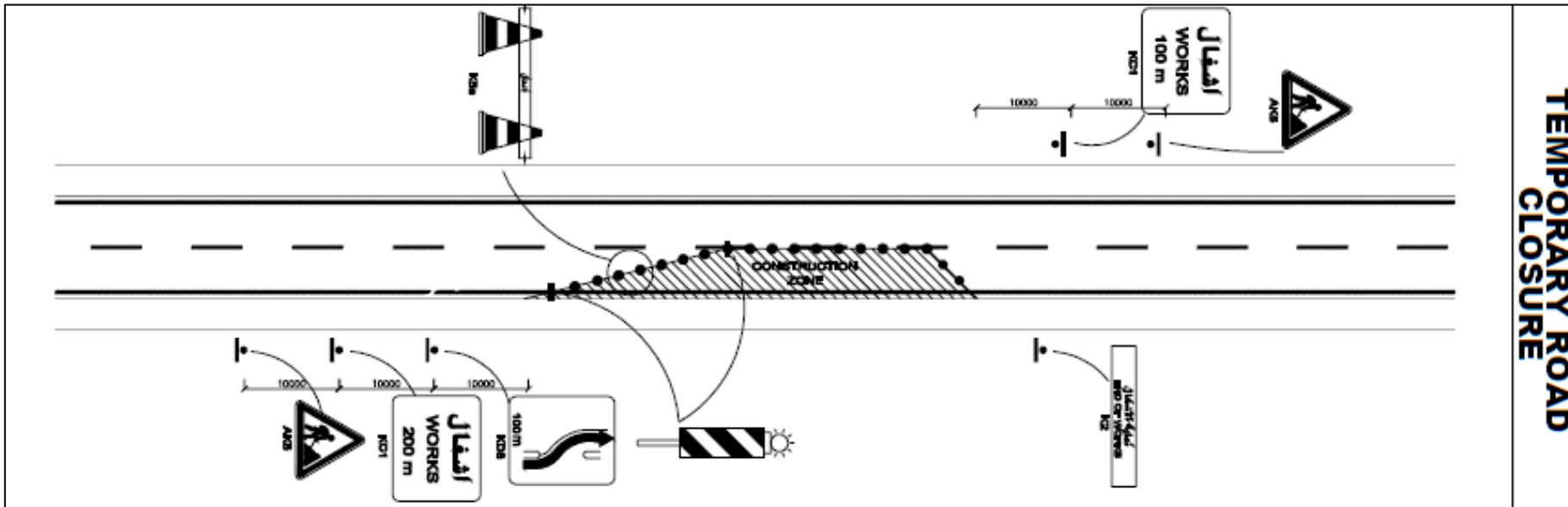
		Magnitude x Extent x Duration								
		1	2	3	4	5	6	7	8	9
Likelihood x Frequency	1	2	4	6	8	10	12	14	16	18
	2	4	6	9	12	15	18	21	24	27
	3	6	8	12	16	20	24	28	32	36
	4	8	10	15	20	25	30	35	40	45
	5	10	12	18	24	30	36	42	48	54
	6	12	18	24	30	36	42	48	54	











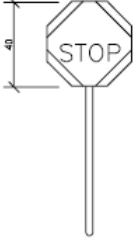
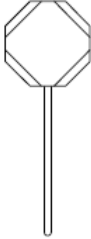
*Yellow: Negligible / Green: Low significance / Blue: Medium significance / Red: High significance*

**Annex 3: Road signs, markings, lights, and barricades to be used during rehabilitation works**

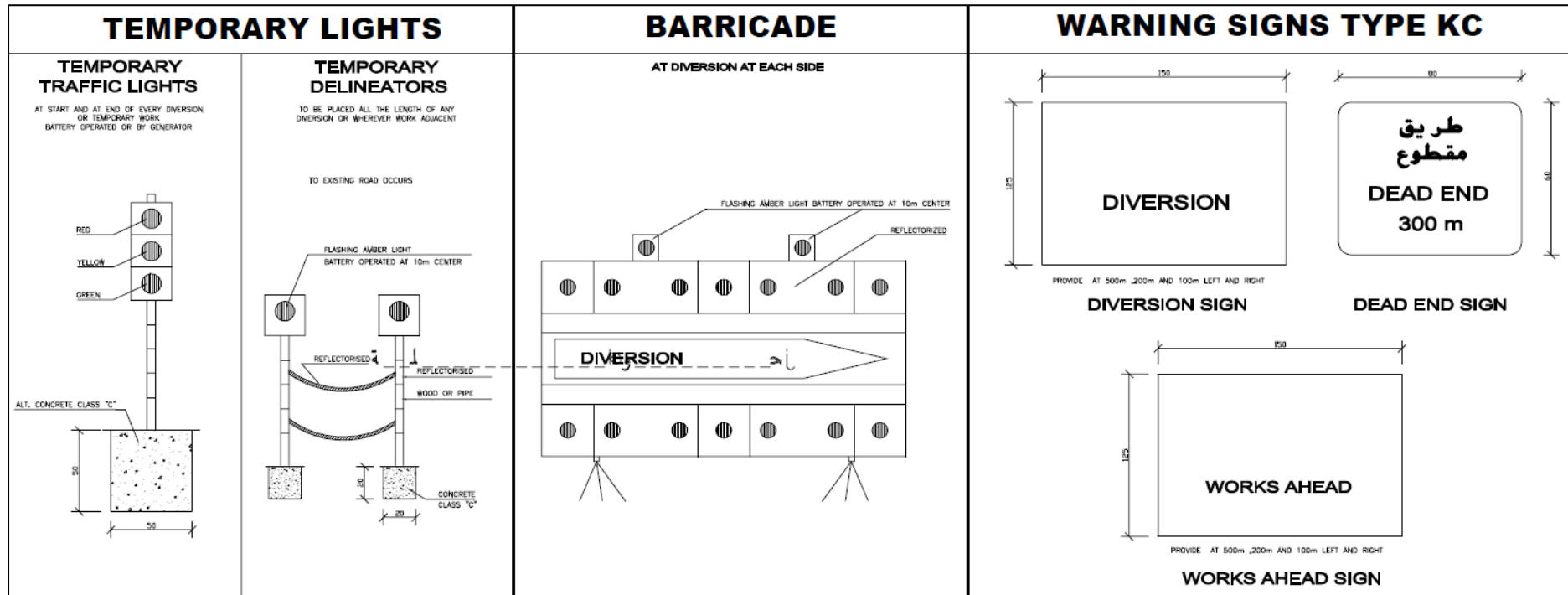
<b>GUIDE SIGNS TYPE KD</b>					<b>REGULATORY SIGNS TYPE B</b>		
<b>SUPPORT IS YELLOW AND SYMBOLS, LETTERS AND LISTEL ARE BLACK</b>					<b>DIAMETER 085m</b>		
 150 x 90	 90 x 90	 125 x 150	 150 x 125	 150 x 125 (225 FOR EXPRESSWAY)	 B3	 B12	 B14
 150 x 90	 90 x 90	 125 x 150	 150 x 125	 150 x 125 (225 FOR EXPRESSWAY)	 B21a1	 B21a2	 B31
 100 x 100	 100 x 100	 60 x 100	 60 x 100	 60 x 100	 B15		
<small>KD24- DIRECTION FOR DETOUR</small>	<small>KD21a- DIRECTION FOR A DETOUR WITH TOWN NAME</small>	<small>KD22b- CATEGORICAL DIRECTION FOR DETOUR</small>	<small>KD21b- CATEGORICAL DIRECTION FOR DETOUR WITH TOWN NAME</small>	<small>KD23- CATEGORICAL DIRECTION FOR DETOUR WITH TOWN NAME</small>			

<h2 style="text-align: center;">SIGNS TYPE K</h2>		<h2 style="text-align: center;">TEMPORARY MARKING</h2>	
 <p style="text-align: center;">PENNANT <b>K1</b></p>	 <p style="text-align: center;">BLOCKING : INDICATE THE POSITION OF WORK OR ALL THE TEMPORARY OBSTACLE <b>K2</b></p>	<p style="text-align: center;"><b>THESE LINES ARE YELLOW AND REFLECTORISING.                  THEY CAN BE ERASED OR REMOVED WITHOUT ANY RESIDUAL TRACE.</b></p>  <p style="text-align: center;">FOR CONTINUOUS EDGE LINE AND FOR SEPARATING THE TRAFFIC IN OPPOSITE DIRECTIONS</p> <p style="text-align: center;"><b>MR2 TEMPORARY</b></p>	
 <p style="text-align: center;"><b>K5a</b></p>	 <p style="text-align: center;">ALIGNMENT BEACON <b>K5a</b></p>  <p style="text-align: center;">BLOCKING : INDICATE THE POSITION OF DIVERSION OR THE TEMPORARY PAVEMENT NARROWING <b>K8</b></p>	 <p style="text-align: center;">FOR SEPARATING THE TRAFFIC IN THE SAME DIRECTION</p> <p style="text-align: center;"><b>TYPE T1</b></p>	
 <p style="text-align: center;"><b>K10a</b></p>	 <p style="text-align: center;">TYPICAL LANES SEPARATOR (WEIGHT 150kg/m) <b>K16</b></p>	 <p style="text-align: center;">FOR SEPARATING THE TRAFFIC IN THE SAME DIRECTION</p> <p style="text-align: center;"><b>TYPE T3</b></p>	



WARNING SIGNS TYPE AK	BY FLAGMEN
<p style="text-align: center;">SIDE 0.70 m</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="text-align: center; margin: 10px;">  <p>AK2</p> </div> <div style="text-align: center; margin: 10px;">  <p>AK3</p> </div> <div style="text-align: center; margin: 10px;">  <p>AK4</p> </div> <div style="text-align: center; margin: 10px;">  <p>AK5</p> </div> <div style="text-align: center; margin: 10px;">  <p>200 m</p> <p>AK3+KM1</p> </div> <div style="text-align: center; margin: 10px;">  <p>AK14</p> </div> <div style="text-align: center; margin: 10px;">  <p>AK17</p> </div> <div style="text-align: center; margin: 10px;">  <p>AK22</p> </div> <div style="text-align: center; margin: 10px;">  <p>طريق عاطل ↑ 4.5 km ↑</p> <p>AK14+KM9+KM2 EXAMPLE</p> </div> <div style="text-align: center; margin: 10px;">  <p>حفر يات</p> <p>AK5+KM9</p> </div> </div>	<p style="text-align: center;">STANDARD SIGNS PADDLE</p> <div style="text-align: center; margin: 20px;">   </div>





## Annex 4: Code of Conduct

**Table K Contractor Code of Conduct Form**

**Contractor Code of Conduct:**

1. All employees, associates, and representatives commit to treating women, children (under the age of 18), and men with respect, regardless of race; color; language; religion; political or other opinion; national, ethnic or social origin; sexual orientation or gender identity; disability; birth or other status.
2. GBV constitutes acts of gross misconduct and is therefore grounds for sanction, which may include penalties and/or termination of employment. All forms of GBV are unacceptable, regardless of whether they take place on the worksite, the worksite surroundings, or off-site. In addition to the potential sanctions listed above, legal prosecution will be pursued, if appropriate, for any employees, associates, and representatives alleged to have committed GBV.
3. Demeaning, threatening, harassing, abusive, or sexually provocative language and behavior are prohibited among all company employees, associates, and representatives.
4. Sexual favors, making promises or favorable treatment dependent on sexual acts are prohibited.
5. Unless there is the full consent by all parties involved, sexual interactions between the company's employees (at any level) and members of the surrounding communities are prohibited. This includes relationships involving the withholding or promise of any kind of reward.
6. All employees, including volunteers and sub-contractors are expected to report suspected or actual GBV by a fellow worker, whether in the same company or not. Reports must be made in accordance with GBV allegation procedures.
7. All employees are required to attend an induction training course prior to commencing work on site to ensure they are familiar with the GBV Code of Conduct.
8. All employees must attend a mandatory training course once a month for the duration of the contract starting from the first induction training prior to commencement of work to reinforce the understanding of the institutional GBV Code of Conduct.
9. All employees will be required to sign an individual code of conduct confirming their agreement to support GBV activities.

I do hereby acknowledge that I have read the foregoing GBV Code of Conduct, and on behalf of the company agree to comply with the standards contained therein. I understand my role and responsibilities to prevent and respond to GBV. I understand that any action inconsistent with this Code of Conduct or failure to act mandated by this Code of Conduct may result in disciplinary action.

Company Name:

Signed by:

Title:

Date:

Table L Contractor Code of Conduct Form (in Arabic)

مدونة قواعد سلوك المقاول

1. يلتزم جميع الموظفين والمنتسبين والممثلين بمعاملة النساء والأطفال (تحت سن ١٨ عامًا) والرجال باحترام ، بغض النظر عن العرق ؛ اللون؛ اللغة؛ الدين؛ الرأي السياسي أو غيره ؛ الأصل القومي أو العرقي أو الاجتماعي ؛ التوجه الجنسي أو الهوية الجنسية ؛ العجز؛ الولادة أو حالة أخرى.

2- يُشكل العنف المبني على النوع الاجتماعي أفعال سوء سلوك جسيمة ، وبالتالي فهو سبب للعقوبة ، والتي قد تشمل عقوبات و / أو إنهاء العمل. جميع أشكال العنف المبني على النوع الاجتماعي غير مقبولة ، بغض النظر عما إذا كانت تحدث في موقع العمل ، أو محيط موقع العمل ، أو خارج الموقع. بالإضافة إلى العقوبات المحتملة المذكورة أعلاه ، ستتم متابعة المقاضاة القانونية ، إذا كان ذلك مناسبًا ، ألي من الموظفين والشركاء والممثلين المزعم أنهم ارتكبوا العنف المبني على النوع الاجتماعي.

3. تحظر اللغة والسلوك المهين ، أو التهديد ، أو المضايقة ، أو المسيء ، أو الاستفزازي الجنسي بين جميع موظفي الشركة ، والزملاء ، والممثلين.

4. يحظر التحيز الجنسي ، والوعد أو المعاملة المفضلة التي تعتمد على الأفعال الجنسية.

5. ما لم يكن هناك موافقة كاملة من جميع الأطراف المعنية ، يحظر التفاعل الجنسي بين موظفي الشركة (على أي مستوى) وأعضاء المجتمعات المحيطة. وهذا يشمل العلاقات التي تنطوي على حجب أو وعد بأي نوع من المكافأة.

6. يُتوقع من جميع الموظفين ، بمن فيهم المتطوعون والمقاولون من الباطن الإبلاغ عن العنف المبني على النوع الاجتماعي المشتبه به أو الفعلي من قبل زميل عامل ، سواء في نفس الشركة أم لا. يجب إعداد التقارير وفقًا لإجراءات ادعاء العنف المبني على النوع الاجتماعي.

7. يُطلب من جميع الموظفين حضور دورة تدريبية تمهيدية قبل بدء العمل في الموقع للتأكد من أنهم على دراية بقواعد السلوك المتعلقة بالعنف المبني على النوع الاجتماعي.

8. يجب على جميع الموظفين حضور دورة تدريبية إلزامية مرة واحدة في الشهر طوال مدة العقد بدءًا من التدريب التمهيدي الأول قبل بدء العمل لتعزيز فهم مدونة قواعد السلوك المتعلقة بالعنف القائم على النوع الاجتماعي.

9. يُطلب من جميع الموظفين التوقيع على مدونة سلوك فردية تؤكد موافقتهم على دعم أنشطة العنف المبني على النوع الاجتماعي.

أقر بموجب هذا بأنني قرأت مدونة قواعد السلوك المتعلقة بالعنف المبني على النوع الاجتماعي السابقة ، وبالنيابة عن الشركة أوافق على الامتثال للمعايير الواردة فيها. أفهم دوري ومسؤولياتي لمنع العنف المبني على النوع الاجتماعي والاستجابة له. أفهم أن أي إجراء يتعارض مع مدونة قواعد السلوك هذه أو عدم اتخاذ إجراء يفرضه قانون قواعد السلوك هذا قد يؤدي إلى اتخاذ إجراءات تأديبية.

اسم الشركة:  
موقعة من قبل:  
العنوان:  
التاريخ:

**Table M Individual Code of Conduct Form (in English)**

- This individual Code of Conduct should be signed by all employees, from senior managers through the operational staff, and should also be required from any Contractors working with the company.
- I, \_\_\_\_\_ acknowledge that preventing gender-based violence (GBV) is important, and that preventing it is my responsibility. At [Company], GBV activities constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. All forms of GBV are unacceptable, be it on the worksite, the worksite surroundings, or in the community. Prosecution of those who commit GBV may be pursued if appropriate.
- I agree that while working on the [Project], I will:
- Consent to a police background check.
- Treat women, children (persons under the age of 18), and men with respect regardless of race; color; language; religion; political or other opinion; national, ethnic or social origin; sexual orientation or gender identity; disability; birth or other status.
- Not use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- Not request or engage in sexual favors—for instance, making promises or favorable treatment dependent on sexual acts.
- Understand that unless there is the full consent by all parties involved, sexual interactions between the company’s employees (at any level) and members of the surrounding communities are prohibited. This includes relationships involving the withholding or promise of monetary or non-monetary reward.
- Attend and actively partake in training courses related to HIV/AIDS and GBV as requested by my employer.
- Report through the grievance redress mechanism or to my manager any suspected or actual GBV by a fellow worker, whether in my company or not, or any breaches of this Code of Conduct.

**Sanctions**

[Company] has established a grievance redress mechanism for receiving, reviewing, and addressing allegations of GBV. If an employee has breached the Code of Conduct, the employer will take disciplinary action which could include:

- Informal warning
- Formal warning
- Additional training
- Loss of up to one week’s salary
- Suspension of employment (without payment of salary), for a minimum period of one month up to a maximum of six months
- Termination of employment

In addition to the above, if warranted, [Company] will report the employee to the police as per local legal regulations.

I understand that it is my responsibility to use common sense and avoid actions or behaviors that could be construed as GBV or breach this Code of Conduct. I do hereby acknowledge that I have read the foregoing Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to GBV. I understand that any action inconsistent with this Code of Conduct or failure to take action mandated by this Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Individual Name:

Signed by:

Title:

Date:

**Table N Individual Code of Conduct Form (in Arabic)**

<p>• يجب التوقيع على مدونة قواعد السلوك الفردية هذه من قبل جميع الموظفين ، من كبار المديرين من خلال الموظفين التشغيليين ، ويجب أن تكون مطلوبة أيضاً من أي مقاولين يعملون مع الشركة.</p> <p>• أنا _____ الموقع أدناه ، أقر بأن منع العنف القائم على نوع الجنس مهم وأن منعه هو مسؤوليتي. في [الشركة] ، تشكل أنشطة العنف المبني على النوع الاجتماعي أفعال سوء سلوك جسيمة ، وبالتالي فهي أسباب للعقوبات أو إنهاء العمل المحتمل. جميع أشكال العنف المبني على النوع الاجتماعي غير مقبولة ، سواء كانت في موقع العمل أو في محيط موقع العمل أو في المجتمع. يمكن ملاحظة من يرتكبون العنف المبني على النوع الاجتماعي إذا لزم الأمر.</p> <p>• أوافق على أنني أثناء العمل في [المشروع] ، سأقوم بما يلي:</p> <p>• الموافقة على الفحص الأمني للشرطة.</p> <p>• معاملة النساء والأطفال (الأشخاص الذين تقل أعمارهم عن ١٨ سنة) والرجال باحترام بغض النظر عن العرق ؛ اللون ؛ لغة ؛ دين ؛ الرأي السياسي أو غيره ؛ الأصل القومي أو العرقي أو الاجتماعي ؛ التوجه الجنسي أو الهوية الجنسية ؛ عجز ؛ ولادة أو حالة أخرى.</p> <p>• عدم استخدام لغة أو سلوك تجاه النساء أو الأطفال أو الرجال غير اللائق أو المضايقة أو التعسفي أو الاستفزازي الجنسي أو المهين أو غير المناسب ثقافياً.</p> <p>• لا تطلب أو تشارك في خدمات جنسية - على سبيل المثال ، تقديم وعود أو معاملة تفضيلية تعتمد على الأفعال الجنسية.</p> <p>• أفهم أنه ما لم يكن هناك موافقة كاملة من جميع الأطراف المعنية ، يحظر التفاعل الجنسي بين موظفي الشركة (على أي مستوى) وأعضاء المجتمعات المحيطة. وهذا يشمل العلاقات التي تنطوي على حجب أو الوعد بمكافأة نقدية أو غير نقدية.</p> <p>• حضور والمشاركة بنشاط في الدورات التدريبية المتعلقة بفيروس نقص المناعة البشرية / الإيدز والعنف القائم على نوع الجنس بناء على طلب صاحب العمل.</p> <p>• الإبلاغ من خلال آلية معالجة المنظمات أو إلى مديري عن أي نوع من أنواع العنف المبني على النوع الاجتماعي المشتبه فيه أو الفعلي من قبل زميل عامل ، سواء في شركتي أم لا ، أو أي انتهاكات لقواعد السلوك هذه.</p> <p>العقوبات</p> <p>أنشأت [الشركة] آلية لمعالجة المظالم لتلقي ومراجعة ومعالجة مزاعم العنف المبني على النوع الاجتماعي. إذا انتهك موظف قواعد السلوك ، فإن صاحب العمل سيتخذ إجراءات تأديبية قد تشمل:</p> <ul style="list-style-type: none"><li>• تحذير غير رسمي</li><li>• تحذير رسمي</li><li>• تدريب إضافي</li><li>• فقدان راتب يصل إلى أسبوع واحد</li><li>• تعليق العمل (بدون دفع الراتب) ، لمدة لا تقل عن شهر واحد بحد أقصى ستة أشهر</li><li>• الفصل من العمل</li></ul> <p>بالإضافة إلى ما سبق ، إذا لزم الأمر ، سنقوم [الشركة] بإبلاغ الموظف بالشرطة وفقاً للوائح القانونية المحلية.</p> <p>أفهم أنه من مسؤوليتي استخدام الحس السليم وتجنب الإجراءات أو السلوكيات التي يمكن تفسيرها على أنها العنف المبني على النوع الاجتماعي أو خرق قواعد السلوك هذه. أقر بموجب هذا أنني قرأت مدونة قواعد السلوك السابقة ، وأوافق على الامتثال للمعايير الواردة فيها وفهم أدوار ومسؤولياتي لمنع العنف المبني على النوع الاجتماعي والاستجابة له. أفهم أن أي إجراء يتعارض مع مدونة قواعد السلوك هذه أو عدم اتخاذ إجراء يفرضه قانون قواعد السلوك هذا قد يؤدي إلى إجراء تأديبي وقد يؤثر على عملي المستمر.</p> <p>الاسم الفردي: موقعة من قبل: العنوان: التاريخ:</p>
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## **Annex 5: Public Consultation Notes, Presentation, Invitation Letters, and Attendance Sheets**

### ***Notes:***

This ESMP was publicly consulted where a public participation meeting was arranged for Hermel Caza. The public meeting was held at the Union of Hermel Municipalities on Thursday February 27.

The number of attendees was 16 of which 2 were women. During the meeting, attendees were informed about the project objectives, the identified natural, economic, and social resources of importance in the area, the project's possible environmental and social risks, the planned mitigation measures and Grievance Redress Mechanism (GRM).

First, local authorities were not satisfied about the selection of roads within the scope of REP. According to them, there are roads that are in greater need for rehabilitation. They asked about the selection process as they were not consulted at the beginning of the project. In this context, the consultant explained that the Government prioritized roads in Hermel Caza based on municipalities' official requests beside several technical criteria.

The second main concern was the coordination with relevant authorities, especially with respect to public works (i.e. wastewater and water infrastructure, etc.). The head of municipalities were worried whether there would be coordination among ministries and infrastructural institutions before the project implementation to avoid re-excavations of roads and further disturbances and pressures. In this context, the public was informed that CDR will ensure that a full coordination among municipalities and authorities prior to project execution.

Further, technical concerns were revealed during the meeting including whether the scope of work encompasses installing new drainage systems when needed and rehabilitating existing wastewater channels that are in bad conditions. In this context, the consultant explained that, when needed, proper drainage systems will be installed, however, wastewater channels are not included in the project scope. Finally, women shared the same concern of the rest of attendees (road selection, coordination between relevant authorities, and works included within the project scope).



***Photos:***

**Public Participation meeting for Hermel roads (building of Union of Hermel Municipalities)**





**Slides:**

## نقاط حوار الجلسة

- المقدمة
- أهداف اللقاء
- الجهات المعنية بالمشروع
- وصف المشروع
- ماذا يتضمن المشروع خلال مرحلة التنفيذ؟
- الآثار البيئية والاجتماعية الإيجابية للمشروع
- الآثار البيئية والاجتماعية السلبية المحتملة للمشروع
- خطة الإدارة البيئية والاجتماعية
- أسئلة ومناقشة عامة



## مشروع الطرق والعمالة في لبنان

### خطة الإدارة البيئية والاجتماعية

## قضاء الهرمل

### جلسة مشاركة العامة



## مقدمة

- يخطّط مجلس الانماء والاعمار لتنفيذ مشروع الطرق والعمالة في لبنان عبر تمويل من البنك الدولي
- يشمل المشروع أعمال تأهيل عدة طرق في بلدات من كافة الأقسضية اللبنانية
- يهدف هذا المشروع إلى تحسين كفاءة قطاع الطرق من خلال تحديد أولويات أعمال الطرق وتحسين تقنيات إدارة شبكة الطرق والسلامة العامة

## مقدمة

- تتمتع شبكة الطرق في لبنان بنطاق وتغطية كافيين بشكل عام
- لكن نسبة كبيرة من تلك الطرق في حالة سيئة وهو الأمر الذي يؤدي إلى إعاقة التنمية المحلية والاقتصادية، خاصة في المناطق الريفية التي تعتبر فيها حالة شبكة الطرق أدنى مستوى من حالة الطرقات على المستوى الوطني ككل

## 1. أهداف اللقاء

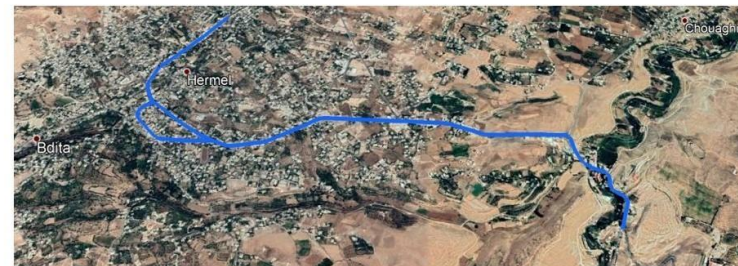
- تحقيق الشفافية عبر إعلام الرأي العام بالمشروع لإبداء ملاحظاتهم وذلك وفقاً لسياسة ضمانات البنك الدولي (سياسة تشغيلية رقم 4.01)
- عرض لأهم الآثار البيئية والاجتماعية والتدابير التخفيفية المرتبطة بتنفيذ المشروع
- مناقشة خطة الإدارة البيئية والاجتماعية للمشروع التي تهدف لحماية الصحة البشرية، السلامة العامة والموارد البيئية

## 2. الجهات المعنية بالمشروع

الصفة	الجهة
ممول المشروع	البنك الدولي
إدارة وتنفيذ	مجلس الانماء والاعمار
استشاري هندسي	Team international للاستشارات الهندسية والإدارية
استشاري بيئي	جيوفلنت ش.م.م.

## 3. وصف المشروع

Road 4: 5.0 km  
الهرمل





### 3. وصف المشروع

Road 6: 10.0 km

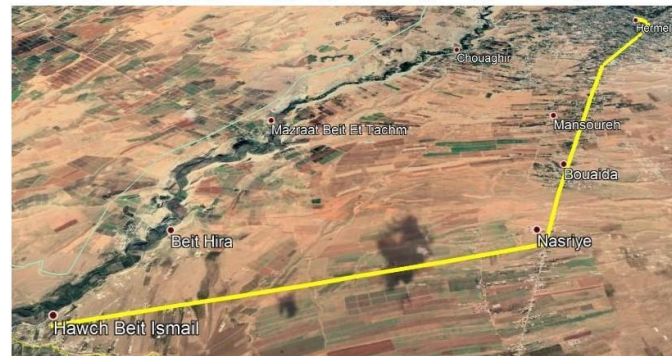
شواغير الفوقا - شواغير التحتا - مزرعة بيت الطشم - حوش بيت اسماعيل



### 3. وصف المشروع

Road 7a: 13.0 km

الهرمل - منصورة - بويضة - ناصرية الهرمل - حوش بيت اسماعيل





### 3. وصف المشروع

Road 8-1: 1.9 km

القصر - تلال الفار



### 3. وصف المشروع

Road 9: 9.0 km

القصر - فيسان





## 4. ماذا يتضمن المشروع خلال مرحلة التنفيذ؟

الأنشطة خلال مرحلة التنفيذ:

- استبدال أو تأهيل طبقات الإسفلت بحسب نتائج اختبار من أجل إعادة تأهيل
- إعادة تأهيل شبكة تجميع مياه الأمطار عند الحاجة
- وضع إشارات السير وتخطيط الطرقات
- بناء جدران دعم وحاجز السلامة عند الحاجة



## 5. الآثار البيئية والاجتماعية الإيجابية للمشروع

مشاريع الطرق:

- تقلل أو تمنع الغبار، وتحسن التصريف، وتقلل العقبات المرورية
- تضمن سلامة الطرق وخاصة القريبة على المدارس والمحلات
- تحد من الحوادث المرورية
- تشجع الناس على الحفاظ على نظافة وأمانة أحيائهم
- ترفع قيمة الأراضي وتزيد الخيارات للأنشطة التجارية على طول الطريق

## 6. الآثار البيئية والاجتماعية السلبية المحتملة للمشروع خلال مرحلة التنفيذ

## 6. الآثار البيئية والاجتماعية السلبية المحتملة للمشروع خلال مرحلة التنفيذ

التدابير التخفيفية	الآثار المحتملة على البيئة
<ul style="list-style-type: none"> <li>• استخدام آلات ذات انبعاثات منخفضة</li> <li>• توجيه مصادر الانبعاثات بعيداً عن المساكن المحيطة</li> <li>• رش الطرق بانتظام بالمياه لمكافحة الغبار</li> <li>• تغطية مركبات نقل المواد الأولية والمخلفات من وإلى موقع المشروع</li> <li>• تحديد سرعة الشاحنات والمركبات</li> </ul>	تلوث الهواء
<ul style="list-style-type: none"> <li>• استخدام حواجز لمنع وصول الترسبات الرملية إلى قنوات المياه</li> <li>• تغطية مواد البناء لتجنب غسلها إلى المسطحات المائية</li> <li>• تطبيق ممارسات ترشيد المياه من قبل عمال البناء</li> </ul>	تلوث المياه
<ul style="list-style-type: none"> <li>• التأكد من صيانة المركبات والمعدات ومن عدم وجود أي تسرب للوقود</li> <li>• توفير أطقم في الموقع لمعالجة أي انسكاب عرضي على الفور</li> <li>• تعيين مسؤولين عن الممارسات الجيدة في الموقع بما في ذلك العلاج السريع لأي انسكاب عرضي</li> </ul>	تلوث التربة
<ul style="list-style-type: none"> <li>• تدريب الموظفين على إدارة النفايات</li> <li>• إزالة المخلفات الصلبة من الموقع خلال 24 ساعة، والتخلص منها في مكبات قانونية محددة.</li> </ul>	إنشاء المخلفات الصلبة

التدابير التخفيفية	الآثار المحتملة على المجتمع
<ul style="list-style-type: none"> <li>• التخطيط والتشغيل السليمين للتحويلات المرورية</li> <li>• إعادة تأهيل الطريق بشكل تدريجي</li> <li>• وضع علامات سير وأنظمة إضاءة في الأماكن الحساسة لضمان سلامة النقل</li> </ul>	تغير في حركة السير
<ul style="list-style-type: none"> <li>• تطوير خطة للتأكد من التزام المقاولين بالمبادئ التوجيهية للصحة والسلامة المهنية</li> <li>• توفير المعدات المناسبة للحماية الشخصية</li> <li>• توفير التدريب على الصحة والسلامة المهنية للعمال</li> <li>• توفير إرشادات السلامة فيما يخص الأضواء والشرائط البرتقالية والبيضاء...</li> </ul>	خطر على الصحة والسلامة المهنية والعمامة (في حال حصول اي حادث)
<ul style="list-style-type: none"> <li>• تسريع العمل من خلال الوضع والالتزام بأهداف ومقاييس واضحة لتقييم الأداء ومتابعة سير العمل</li> <li>• إعادة تأهيل الطريق بشكل تدريجي</li> </ul>	تأثر الحركة التجارية للمؤسسات والمحلات القائمة على جانبي الطريق
<ul style="list-style-type: none"> <li>• حصر الأعمال في ساعة محددة ومصرح عنها سابقاً</li> <li>• صيانة دورية للمعدات وتجنب تعطلها</li> <li>• الحد من استخدام الأجهزة والمعدات التي تسبب الضوضاء خصوصاً بالقرب من المنشآت الحساسة (المدارس وأماكن الصلاة)</li> </ul>	الضوضاء

## 7. خطة الإدارة البيئية والاجتماعية

**هدف الخطة الادارة البيئية:** مراقبة المشروع والتأكد من مطابقته مع جميع المعايير البيئية. بعد دراسة الآثار المحتملة للمشروع، تقوم الدراسة باقتراح اساليب تخفيفية لهذه الآثار وسبل لمراقبتها.

### **خطة الإدارة البيئية تتضمن:**

- مراقبة نوعية المياه
- مراقبة نوعية التربة
- مراقبة نوعية الهواء
- مراقبة نوعية التنوع البيولوجي
- مراقبة الصحة والسلامة العامة
- خطة طوارئ في حال حدوث اي حادث مفاجئ.

## 6. الآثار البيئية والاجتماعية السلبية المحتملة للمشروع خلال مرحلة التشغيل

التدابير التخفيفية	الآثار المحتملة على البيئة
• استخدام مصادر الإضاءة الصديقة للطيور بدلاً من الأضواء الصناعية للطرق العامة	اضطراب الأنظمة الايكولوجية (زيادة مستويات التلوث الضوئي)
• إعادة تأهيل شبكة تجميع مياه الأمطار عند الحاجة	زيادة الجريان السطحي (Increased runoff) تسريب محتمل للمعادن الثقيلة
• وضع إشارات المرور و تعيين الحد الاقصى لسرعة المركبات	زيادة سرعة السائقين

## أسئلة ومناقشة عامة

شكراً لحضوركم  
ومشاركاتكم

يمكنكم إبداء رأيكم

عبر التواصل مع شركة جيوفلنت ش.م.م.  
هاتف: 05 954 662 /3/4  
فاكس: 05 954 662 Ext. 108  
بريد الكتروني: m.ballouk@geoflint.com

أو عبر التواصل مع وحدة مشروع الطرق والعمالة في مجلس الانماء والاعمار  
هاتف: 01 980096 Ext. 317  
بريد الكتروني: [rstephan@cdr.gov.lb](mailto:rstephan@cdr.gov.lb)

## Public Consultation Invitation Letters



Geoflint s.a.r.l.  
Cell. : 00961-3-219 059  
Phone: 00961-5-954 662/3/4  
Fax: Ext. 108  
GF floor – center Mar Roukoz- Hazmeih  
P.O.Box: 45 - 165  
BEIRUT – LEBANON  
website: www.geoflint.com

جيوفلنت ش.م.م.  
خليوي: ٠٠٩٦١-٣-٢١٩ ٠٥٩  
هاتف: ٠٠٩٦١-٥-٩٥٤ ٦٦٢/٣/٤  
فاكس: مقسم ١٠٨  
الطابق الأرضي - ماروكز سنتر - الحازمية  
صندوق بريد: ٤٥ - ١٦٥  
بيروت - لبنان  
شهاد تسجيل شركة رقم: ٢٣٩٢٢٦٤

### الموضوع: دعوة لحضور إجتماع مشاركة عامة حول مشروع "الطرق والعمالة"

تحية طيبة وبعد،

بما أن مجلس الإنماء والإعمار يقوم بتمويل من البنك الدولي بتنفيذ مشروع "الطرق والعمالة" لتأهيل طرقات في جميع المحافظات اللبنانية، بإستثناء محافظة بيروت؛

ولما كانت تكلفت شركة دار الهندسة نزيه طالب وشركاه من قبل مجلس الإنماء والإعمار للقيام بالدراسات الهندسية والبيئية المتعلقة بالمشروع والتي بدورها كلفت شركة جيوفلنت ش.م.م. للإستشارات البيئية بإعداد خطة ادارة بيئية وإجتماعية للمشروع المذكور؛

وحيث أنه برزت الضرورة لعقد اجتماعات تشاورية مع الجهات المعنية والعمامة بشؤون البيئة والأمور الإجتماعية ذات الصلة بمشاريع الطرق والإستماع إلى آرائهم المتعلقة بالمشروع؛

وبما أن قضاء الهرمل يتضمن ٥ طرق من مجموع الطرق الملحوظة للتأهيل في هذا المشروع؛

لذلك،

ندعوكم لحضور إجتماع مشاركة للعمامة في تمام الساعة الحادية عشر صباحاً من يوم الخميس الواقع في ٢٧ شباط في مبنى اتحاد بلديات الهرمل؛ ونتمنى على المواطنين الكرام، إبداء الملاحظات الخطية، في حال وجودها، حول المشروع المذكور، وإرسالها إلى شركة جيوفلنت ش.م.م. بواسطة الفاكس على الرقم التالي: ٠٥/٩٥٤٦٦٢ أو إيداعها في مبنى اتحاد بلديات الهرمل.

وتفضلوا بقبول فائق الاحترام

مدير شركة جيوفلنت ش.م.م.  
  
خلييل زين

Attendance Sheets:



27/2/2020

REP project- Hermel

ESMP-Public Participation

قائمة حضور

رقم الهاتف	البريد الإلكتروني	المنصب	الاسم
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