صندوق تطوير وإقراض البلديات
Municipal Development & Lending Fund

Gaza Solid Waste Management Project

Sofa - El-Fukhari

Addendum No. 5 to the GSWMP Environmental & Social Impact Assessment

Environmental and Social Management Plan
For the Interim & Short-Term Cells construction,
Reshaping of existing dumpsite,
And Co-activity with new cell 1 construction

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Contract No. GSWMP 4.1.5.1

ESMP on the Proposed
Technical Note for the Short-Term Waste Management - Prepared By The Joint Venture of Antea Group France, Engicon, and EMCC, May 2017

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List of Acronyms

AMSL	Above Mean Sea Level
EQA	Environment Quality Authority
ESIA	Environmental and Social Impact Assessment
EMP	Environmental Management Plan
FS	Feasibility Study
GSWMP	Gaza Solid Waste Management Program
G-PCU	Gaza-Program Coordination Unit
MDLF	Municipal Development and Lending Fund
MoH	Ministry of Health
MoTA	Ministry of Tourism and Antiquities
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
PCBS	Palestinian Central Bearue of Statistics
PWA	Palestinian Water Authority
ST	Short -Term
SW	Solid Waste
Interim ST Cell	Interim Short Term Cell
UNDP	United Nations Development Programme
UNRWA	United Nations Relief and Works Agency
WHO	World Health Organization
JSC	Joint Service Council
KWWTP	Khan Younis Waste Water Treatment Plant

الملخص التنفيذي

إن صندوق تطوير وإقراض البلديات هي الجهة المخولة لتنفيذ مشروع إدارة النفايات الصلبة في قطاع غزة والذي يهدف إلى تحسين خدمات إدارة النفايات الصلبة في قطاع غزة. من خلال مشروع إدارة النفايات الصلبة في قطاع غزة، يتم الان بناء مكب نفايات صحي جنوبي قطاع غزة (مكب نفايات الفخاري)، والذي سيتم إدارته بمعايير ذات مستوى عالي ويخدم ثلاث محافظات من أصل محافظات قطاع غزة الخمس وذلك حتى عام 2027 وهم محافظات خان يونس ورفح والمنطقة الوسطى، كما سيتم ربط مكب نفايات الفخاري بثلاث محطات ترحيل نفايات صلبة في محافظات خان يونس ورفح والمنطقة الوسطى.

مكب النفايات الصحي الجديد سوف يقام في محيط مكب الفخاري القائم، ويبعد حوالي 6 كم في الاتجاه الشمالي الشرقي من مدينة رفح. يتمتع الموقع بأرضية مسطحة وبدون تعوجات جيولوجية. المكب القديم مقام على أرض مساحتها 26 دونم وسوف نطلق عليه في هذا التقرير اسم المكب القائم "Existing Dumpsite" و هو متصل بمساحة من الأرض الفارغة والتي سوف يطلق عليها لاحقا في التقرير خلية قصيرة المدى "Interim Short Term Cell". أما مكب نفايات الفخاري الصحي الجديد مقسم إلى خليتين 1 و 2 بمساحة 100 دونم. وسيتم استخدام خلية قصيرة المدى خلال المرحلة الإنتقالية وسيتم خلالها باعادة تشكيل المكب القائم حتى يصبح ذات ميول مستقرة وثابتة. يذكر أن خلية قصيرة المدى تم تصميمها في الأصل عام 2012 من قبل UNDP وتم إجراء مراجعة للتصميم في العام 2017 من قبل صندوق تطوير وإقراض البلديات وذلك تحت مسمى Technical Note Design – وذلك لدواعي نقل النفايات المبعثرة والتي تقع بين كل من Cell 1A و Cell 1B من موقع المكب الصحي الجديد وتقدر بحوالي 70,000 كوب والتي بدورها تشكل عقبة أمام التقدم في أعمال إنشاء المكب، بالإضافة لاستقبال النفايات الناتجة عن إعادة تشكيل المكب القائم والذي تقدر ب 230,000 كوب.

يهدف هذا التقرير إلى تقديم خطة إدارة بيئية وإجتماعية لخلية قصيرة المدى المؤقتة وذلك في مرحلتي الإنشاء والتشغيل، ويحتوي التقرير على قاعدة البيانات الأساسية (Baseline Data) بالإضافة إلى الأثار المتوقعة من المشروع (Expected Impacts) و كذلك الإجراءات التخفيفية المقترحة (Mitigation Measures) وأخيرا خطة الرقابة والمتابعة (Monitoring Measures) خلال فترة إنشاء وتشغيل الخلية.

تنقسم قاعدة البيانات الأساسية إلى ثلاث أقسام رئيسية وهي اعتمدت بشكل أساسي على ESIA التي تم إعدادها للمشروع في العام 2012، مع تحديث لبعض البيانات:

- **البيئة الفيزيائية**: وتحتوي على وصف لطبغرافية وجيولوجية الأرض، المسحات المائية، الضوضاء، الرائحة، الإنبعاثات الجوية، جودة الهواء و جودة مياه الخزان الجوفي.
- **البيئة البيولوجية:** وتحتوي على وصف مواطن الحيوانات والنباتات في المنطقة.
- **القضايا الإجتماعية والإقتصادية**: وتحتوي على وصف للوضع الإقتصادي في المنطقة، و عدد السكان ونسب ومؤشرات زيادتهم، و كميات إنتاج النفايات في المنطقة ومحتويات النفايات، الصحة العامة للمجتمع.

تم توقع مجموعة من الأثار السلبية والإيجابية التي قد تحدث خلال إنشاء وتشغيل خلية قصيرة المدى المؤقتة، ففي خلال فترة الإنشاء سيكون من مسئولية المقاول تنفيذ الإجراءات التخفيفية وسيكون من دور فريق الإشراف مراقبة تنفيذ الإجراءات التخفيفية وتوثيقها. صندوق تطوير وإقراض البلديات و مجلس الخدمات المشترك سيقومون أيضا بمراقبة الإمتثال للإجراءات البيئية وتنفيذ الإجراءات البيئية. أما في فترة التشغيل فسيكون من مسئولية مجلس الخدمات المشترك تنفيذ الإجراءات التخفيفية كونه هو المشغل لمكب النفايات.

وقد تم خلال الدراسة توقع مجموعة الأثار البيئية التي قد تنجم عن **إنشاء خلية قصيرة** المدى في رفح والتي قد تكون إيجابية أو سلبية وممكن إجمالها كالتالي:

- **التربة**: من الممكن أن تتلوث التربة من الأعمال اليومية خلال فترة الإنشاء.
- **جودة الهواء**: من الممكن أن تتغير جودة الهواء بفعل عمل أليات الحفر في الموقع.
- **الضوضاء**: من المتوقع أن ينتج تلوث ضوضائي نتيجة أعمال الإنشاء، وكذلك حركة شاحنات الحفر.
- **مواطن النباتات والحيوانات**: تأثر مواطن الحيوانات والنباتات من أعمال الإنشاء والتشغيل.
- **الصحة والسلامة المهنية للعمال**: وقد يتضمن هذا الأثر الخطر الفيزيائي من سقوط العمال من أعلى أو إصابتهم وجروحهم، وكذلك الخطر من حركة أليات النفايات الثقيلة.

- **إستقرار وثبات المكب القائم**: من المتوقع أن يكون المكب القائم أكثر ثباتا.
- **المجتمع المحلي**: من المتوقع أن ينتج عدم رضى من السكان والمزارعين بسبب الضوضاء و الأغبرة ...إلخ.
- **خلق فرص عمل**: من المتوقع ان يتم خلق مجموعة من فرص العمل خلال فترة إنشاء وتشغيل الخلية.

وقد تم خلال الدراسة توقع مجموعة الأثار البيئية التي قد تنجم عن **تشغيل خلية قصيرة المدى** في رفح والتي قد تكون إيجابية أو سلبية وممكن إجمالها كالتالي:

- **الخوان الجوفي والتربة**: من الممكن أن يتلوث الخوان الجوفي أو التربة من العصارة المتجمعة.
- **جودة الهواء**: من الممكن أن تتغير جودة الهواء بفعل حركة شاحنات النفايات على الطرق الغير معبدة وخلال عمليات تحميل وتفريغ النفايات.
- **الضوضاء:** من المتوقع أن ينتج تلوث ضوضائي نتيجة أعمال التشغيل، وكذلك حركة شاحنات نقل النفايات.
- **مواطن النباتات والحيوانات**: من المتوقع أن تتأثر مواطن النباتات والحيوانات.
- **صحة المجتمع المحلي**: من المتوقع أن يكون هناك أثر سلبي على صحة المجتمع المحلي وخاصة المزارعين القريبين بسبب الأغبرة والضوضاء وكذلك الرائحة وانتشار الذباب.
- **الصحة والسلامة المهنية للعمال**: وقد يتضمن هذا الأثر الخطر الفيزيائي من سقوط العمال من أعلى أو إصابتهم وجروحهم، وكذلك الخطر من حركة أليات النفايات الثقيلة، وخطر تعامل العمال المباشر مع النفايات.

يحتوي هذا التقرير أيضا على خطة إدارة ومراقبة بيئية وإجتماعية للخلية أثناء فترات الإنشاء والتشغيل، وقد تم صياغة الخطة بعد عقد عدة زيارات لموقع الخلية، و مراجعة البيانات البيئية والإجتماعية المتوفرة حول طبيعة الموقع، وكذلك بعد عقد لقاءات مع صندوق تطوير وإقراض البلديات، و عقد ورشة عمل لذوي العلاقة. ويمكن إيجاز الإجراءات التخفيفية التي تم إقتراحها كالتالي:

- **المياه السطحية والجوفية**: يجب تركيب نظام جمع للعصارة الناتجة عن النفايات وذلك لتجنب تلويث المياه السطحية او الجوفية، ووضع طبقات تبطين ذات فعالية جيدة.
- **جودة الهواء**: يجب رش المياه خلال فترات العمل وذلك لتقليل الأغبرة، ويجب التحكم في سرعة شاحنات نقل النفايات، وإختيار مسارات مثلى لها لتقليل أثار الأغبرة التي قد تنتج.
- **الضوضاء**: يجب ان يتم تشغيل الشاحنات والألات بشكل أمثل بحيث يتم جدولة مواعيد تشغيلها و ذلك لتقليل الضوضاء الناتج عنها، وكذلك يجب وضع حواجز صوتية في حال تم تلقي شكاوي متعلقة بالضوضاء.
- **صحة المجتمع المحلي**: يجب إبلاغ السكان المحليين بمواعيد العمل والخطط الإدارية لها، ويجب عزل مناطق العمل وتحديدها، وتطبيق إجراءات السلامة لحماية السكان من الإصابات وحماية الممتلكات المحاذية من الضرر.
- **الصحة والسلامة المهنية للعمال**: يجب على العمال إتباع الإرشادات وإتباع إجراءات السلامة والأمان، وكذلك الإستحمام كلما لزم الأمر. يجب على العمال الإلتزام بلبس ملابس الوقاية مثل سماعات الأذن الواقية، القبعات الواقية، الفيستات ذات اللون المميز، وغيرها من أدوات الحماية والتي تحمي العامل من التعرض للإصابة أو الضرر، كما يجب أن يتوفر صناديق الإسعاف الأولي في موقع العمل مع أشخاص مدربين على اجراء الإسعافات الأولية، وأخيرا يجب وضع خطط واضحة للانسحاب من الموقع في حالات الطوارئ.
- **تفعيل نظام شكاوي فاعل**: يجب تحديد قنوات واضحة لتقديم التظلمات والشكاوي.

إن خطة الإدارة البيئية التي تم إقتراحها اشتملت بشكل واضح على تعريف للإجراءات التخفيفية المطلوبة والجهات المسئولة عن تنفيذ كل منها، كما اشتملت على طريقة مراقبة ورصد تنفيذ الإجراءات التخفيفية و الجهات المسئولة عن إجراء المراقبة وكذلك عدد مرات المراقبة. إن مسئولية شركة المقاولات أن تقوم بكافة الإجراءات التخفيفية خلال فترة إنشاء المحطة، بينما على فريق الإشراف و صندوق تطوير وإقراض البلديات و مجلس الخدمات المشترك أن تراقب مدى إمتثال شركة المقاولات للإجراءات المطلوبة بشكل دوري. أما فيما يتعلق بمرحلة تشغيل المحطة، فإن مسئولية إجراء الوسائل التخفيفية تقع على عاتق مجلس الخدمات المشترك بالشراكة مع الشركاء المحليين مثل بلدية رفح، بينما تقوم سلطة جودة البيئة و صندوق تطوير

وإقراض البلديات بمراقبة تنفيذ هذه الإجراءات، كما سيكون هناك نظام تلقي شكاوي من المواطنين لتلقي أي شكاوي خلال فترات بناء أو تشغيل الخلية.

EXCUTIVE SUMMARY

The Municipal Development & Lending Fund (MDLF) is the delegated implementation agency for Gaza Solid Waste Management Project (GSWMP) which aims at improving the solid waste services in Gaza Strip. The key infrastructure component of the GSWMP include construction of a sanitary landfill in El Fukhary area with capacity to serve 3 governorates out of Gaza's 5 governorates until year 2027, namely the Middle Area, Khan Younis, and Rafah Governorates comprising approximately 64% of Gaza Strip's total geographic area inhabited by 46% of the total Gaza Strip's population. The GSWMP is aiming at improving solid waste management services through the provision of efficient environmentally and socially sound waste disposal schemes, and initiating measures to improve overall solid waste management systems. Under this project, three transfer stations will be constructed in Khan Younis, Rafah and Middle Area.

The new site of the sanitary landfill will be accommodated in the same surrounding area of the existing Al Fukhary dumpsite and is located about 6 km north-east of Rafah City. It shows a very flat area with nearly no inclinations. **The ancient site consists of a fulfilled area of 26,000m^2 - to be called hereafter as the existing dumping site - combined with the adjacent available empty Sub-Cell- to be called hereafter as the Interim Short-Term Cell (Short Term Cell and Extension Cell)**. While the new sanitary landfill is subdivided into Cells 1 & 2 (100,000 m^2). The interim short-term Cell is a transition delimited area with controlled operation to enable the dumpsite to be reshaped with a stable profile geotechnically speaking. The interim short-term Cell has been originally designed in the feasibility study in 2012 by UNDP-PAPP and DHB, and a design revision has been made in 2017 as by JV (Antea Group, EMCC, Engicon) – to be called hereafter as Technical Note Design- due to the urgent situation of existing dumpsite saturation and of scattered waste of approximate amount 70,000m^3 disposed on the location of cell 1 under current construction works of the new landfill. In addition, there is an urgent need to gentle the steep slopes of the current existing dumpsite as soon as possible (around 230,000 m^3 to remove by reshaping the existing waste body) in order to ensure its long term geotechnical stability. The interim short term cell is expected to receive the surplus waste coming from the waste cutting due to reshaping.

The current report aims at conducting an Environmental and Social Management Plan (ESMP) for the construction and operation of El Fukhary Interim ST Cell, the preliminary reshaping works on the existing dumpsite, and the co-activities developed on site in the frame of the New landfill construction. This ESMP includes the expected impacts and the proposed mitigation and monitoring measures during construction and operation phases of the Site. This ESMP is an addendum to the ESIA of the GSWMP cleared in 2012. The proposed management plan relies on the environmental and social

baseline information mentioned in the Project ESIA, 2012 and the revision design which has been made in 2017 by JV (Antea Group, EMCC, Engicon).

The available Baseline data were mainly based on ESIA study of the Gaza Solid Waste Management Project, an update in some sides were carried out. The Baseline data was found in a satisfactory quality. The environmental and social baseline data is divided into three parts:

- **Physical Environment:** including the description of the site topography, soil, groundwater, noise, ambient air quality and metrological conditions**;**
- **Biological Environment:** including fauna and flora**;**
- **Socio-economic Aspects:** including the description of general population and demographical indicators, Rafah population, waste generation and composition, land use and urban planning, roads and transportation, transportation of waste material and the collection system.

Based on the key environmental features from the baseline information, the potential environmental impacts are expected. The key impacts on physical, biological, socioeconomic and human valued receptors are identified.

During the construction and operation of Interim ST Cell, several negative impacts and other positive impacts are anticipated. During the construction phase, it is the construction contractor responsibility to take into account all construction mitigation measures of construction activities. In this context, it is the responsibility of the construction Supervision`s engineer to monitor and document the implementation of the mitigation measures. MDLF and JSC-KRM will also monitor the compliance with the mitigation measures frequently. During the operation of the site, all mitigation measures of operation works should be taken into account by the Operator (JSC-KRM).

The main potential impacts on physical environment, Biological environment and socioeconomic aspects **during the Construction phase** includes the impacts on:

- **Soil depreciation:** The transfer of soil to other locations, and soil erosion.
- **Soil contamination:** During the construction, mobile equipment must be fueled and the daily maintenance operations may potentially impact soils.
- **Air quality:** Dust emissions from movement of trucks on unfinished roads and excavated areas during construction, excavation and construction of peripheral embankments; emissions from road works. Smoke, gas and dust emissions will be emitted when reshaping the existing waste body and boreholes drilled for gas and leachate extraction within the existing waste body.
- **Noise:** Noise emissions due to construction work and trucks movements and Excavation. Movement of trucks carrying excavated soil and trucks bringing construction materials to the site.
- **Local community health:** minimum impacts will be occurred on the community health, as the residential areas are more than 1 km far away, but the impact may affect the farmers in the surrounding areas. This may include, dust resulted from movement of heavy machinery, Ammonia, VOCs and hydrogen sulfide cause nuisance to surrounding areas, impacts of heavy machinery movement, the presence of pathogens, vectors and insects. This includes also

the visual impact of soil stockpiles on site.

- **Stability of the existing dumpsite:** Possibility of side sliding of the existing dumpsite.
- **Worker health and safety:** physical hazards from falling and injuries, risks from movement of heavy machinery, physical hazards from contact with disturbances (waste, leachate, gas).
- **Local Community:** Inconvenience of Local Community might result due to the last-mentioned impacts.
- **Job Creation:** The construction of ST cell will create few new jobs.

The main potential impacts on physical environment, Biological environment and socioeconomic aspects **during the Operation phase** includes the impacts on:

- **Groundwater and Soil:** The groundwater and soil may be affected from any leachate leakage.
- **Ambient air quality**: Air quality will be affected by the movement of trucks on unfinished roads during loading and unloading of wastes. Existing landfill gas passive migration to the atmosphere with large concentration of methane through temporary covers and on operated areas, CO2 emitted by the future gas flaring system implemented on site for both old and new waste. Some fires emitting smokes and locally CO may potentially occur.
- **Noise**: Noise emissions due to operation work, and increased levels of noise from the movement of vehicles and trucks movements.
- **Flora and Fauna**: At the surrounding areas, a garden was observed and need to be protected from possible contaminants migration.
- **Local community health:** minimum impacts will be occurred on the community health, as the residential areas are far more than 1 km, impacts will be occurred on the community health in the surrounding area, this may include, dust resulted from movement of heavy machinery, odor and gas emissions would cause nuisance to surrounding community, impacts of heavy machinery movement, the presence of pathogens, vectors and insects.

  The visual impact of soils stockpiled will be limited as the soil stockpiled on site is restricted to the soil needs for operation, however, the visual impact of the elevation of waste on new cells will increase.
- **Workers health and safety:** Potential Accidents, risks from movement of heavy machinery, physical hazards from contact with disturbances, impacts on human health from contact with some toxic substances and waste.

The following is the summary of the main mitigation measures for the main receptors that will be the responsibility of the Contractor **during Construction Phase**:

- **Soil:** Install and maintain soil erosion, sediment control and pollution control measures, provide well-maintained construction vehicles and machinery in order to minimize pollutant spillage, lightly compact the top soil during or after replacement to prevent erosion, ensure that excavated soil are properly stored for refill and reuse, select appropriate area for spoil storage so that no un-favored pattern of surface water collection will occur.
- **Soil contamination:** The fuel tank is installed on a concrete retention slab and

the current maintenance operations are achieved in a workshop whose floor is protected by a 20-cm compacted clayey material. The heavy maintenance operations and regular control inspections are achieved out of the site.

- **Ambient air quality:** Check that the heavy machinery and trucks mobilized on site are up date to their mandatory periodical controls and that they got a valid compliance certificate. Check mandatory periodic controls and preventive maintenance deadlines for vehicles and equipment.

  Cover scattered waste with soil.
- **Noise:** Optimize the use of machines and noisy equipment, construction works should be kept within the daytime working hours, only equipment should be used that is fit for the required tasks, maintenance should be conducted regularly, fixed equipment and loading and unloading areas should be located far from sensitive receptors.
- **Local community health:** Management plans prepared by the contractor and take appropriate measures to prevent unauthorized persons from entering the working area. The whole site will be provided with a peripheral fence.

  Visibility of the site: Once the existing dumpsite clipped and reshaped, the maximum height of waste will be decreased down to 24 meters. The soil stockpile maintained on site will be strictly restricted to the internal needs for operations (covers, peripheral embankments).
- **Worker health and safety:** Prepare submit and implement contractor's safety plan for engineer's approval prior to start any project activities, wear all proper safety equipment at all times, knowing that the design will increase the safety.

  The drivers of the excavator and of the bulldozer will be provided with a gas detector. All workers will be vaccinated against leptospirosis and tetanus.
- **Local Community:** Sharing the information with the local community about construction works, and form a social committee from the local community to monitor the construction works. The Grievance Redness Mechanism should be updated according to the new construction works.

The following is the summary of the main mitigation measures for the main receptors that will be the responsibility of the Contractor **during Operation Phase**:

- **Groundwater and Soil:** Leachate collection system should be constructed, and the disposal should be proper to avoid groundwater or Soil pollution. Compacted clay layer in the bottom and final cover of the dumpsite should be properly maintained to protect groundwater.
- **Ambient air quality:** Implement mandatory periodic controls and preventive maintenance program for vehicles and equipment.

  Dust flying is mitigated by watering with a mobile water tank and litter flying mitigated by the installation under the wind of litter net screens.
- **Noise:** Optimize the use of machines and noisy equipment, operation works should be kept within the daytime working hours, only equipment should be used that is fit for the required tasks, maintenance should be conducted regularly, fixed equipment and loading and unloading areas should be located far from sensitive receptors.

- **Local community health:** Management plans to be prepared and take appropriate measures to prevent unauthorized persons from entering the working area. The whole site will be provided with a peripheral fence.
- **Worker health and safety:** Workers to comply with the safety plan measures and wearing the protective safety equipment.

  The drivers of the excavator and of the bulldozer will be provided with a gas detector. All workers will be vaccinated against leptospirosis and tetanus.
- **Local Community:** Sharing the information with the local community about operation works, and form a social committee from the local community to monitor the operation works. The Grievance Redness Mechanism should be updated according to the new activities.

  Dust flying is mitigated by watering with a mobile water tank and litter flying mitigated by the installation under the wind of litter net screens.

INTRODUCTION AND ESMP OBJECTIVES

Gaza Strip has been facing many of the escalating environmental threats occurring over the decades associated with the instability to financial and economic stress reflecting the development of the infrastructure sector. As a result, solid waste management (SWM) sector has presented huge challenges to manage, in a sound manner, the environment and the public services' provision.

Waste is currently collected and hauled to the three main landfills currently operating in the Gaza Strip; Johr al Deek (Gaza) Landfill located in Gaza municipality; Deir El Balah Landfill located in the east side of Deir Al Balah municipality; and El-Fukhary dumpsite located in Khan Younis municipality, east of Rafah municipality which it serves. Both Johr al Deek and El-Fukhary landfill sites are not equipped with soil protection measures which present a potential contamination risk to groundwater resources due to waste leachate percolating through the soil layers. The current situation is therefore not the most environmentally sound solution to solid waste management in the Gaza Strip. A sustainable solution with respect to social, environmental and economic impacts is therefore urgently needed for the SWM in Gaza Strip. Thus, major improvements in the sector of solid waste has been planned and financed by the France Development Agency (AFD), the European Union (EU), and the World Bank in addition to the Kingdom of Sweden through the Gaza Solid Waste Management Project (GSWMP) went into effect since 2014.

1.1 Gaza Solid Waste Management Project Background

GSWMP is a comprehensive strategic infrastructure and capacity building project, where MDLF is managing the southern component of the project covering 3 of 5 governorates in Gaza Strip, namely the Middle Area, Khan Younis, and Rafah Governorates that comprising approximately 64% of Gaza Strip's total geographic area inhabited by 46% of the total Gaza Strip's population, or approximately 800,000 people according the 2014 Palestinian Central Bureau of Statistics (PCBS) projections. The GSWMP is aiming at improving solid waste management services in the Gaza Strip through the provision of efficient and environmentally and socially sound waste disposal schemes, and initiating measures to improve overall solid waste management systems. Through the GSWMP, a sanitary landfill is currently constructed in the southern region of Gaza Strip with capacity to serve the 3 governorates until year 2025, and to serve the entire Gaza Strip until the year 2040.

1.1.1 *Description of El Fukhary Short Term Dumpsite*

El Fukhary dumpsite is located within the administrative jurisdictions of Khan Younis Governorate. Khan Younis Governorate is located in the southern part of Gaza Strip (Figure1). The existing dumpsite in El Fukhary (Sofa) is situated approximately 5 km northeast of the former Gaza Airport and 800 meters from the Israeli border.

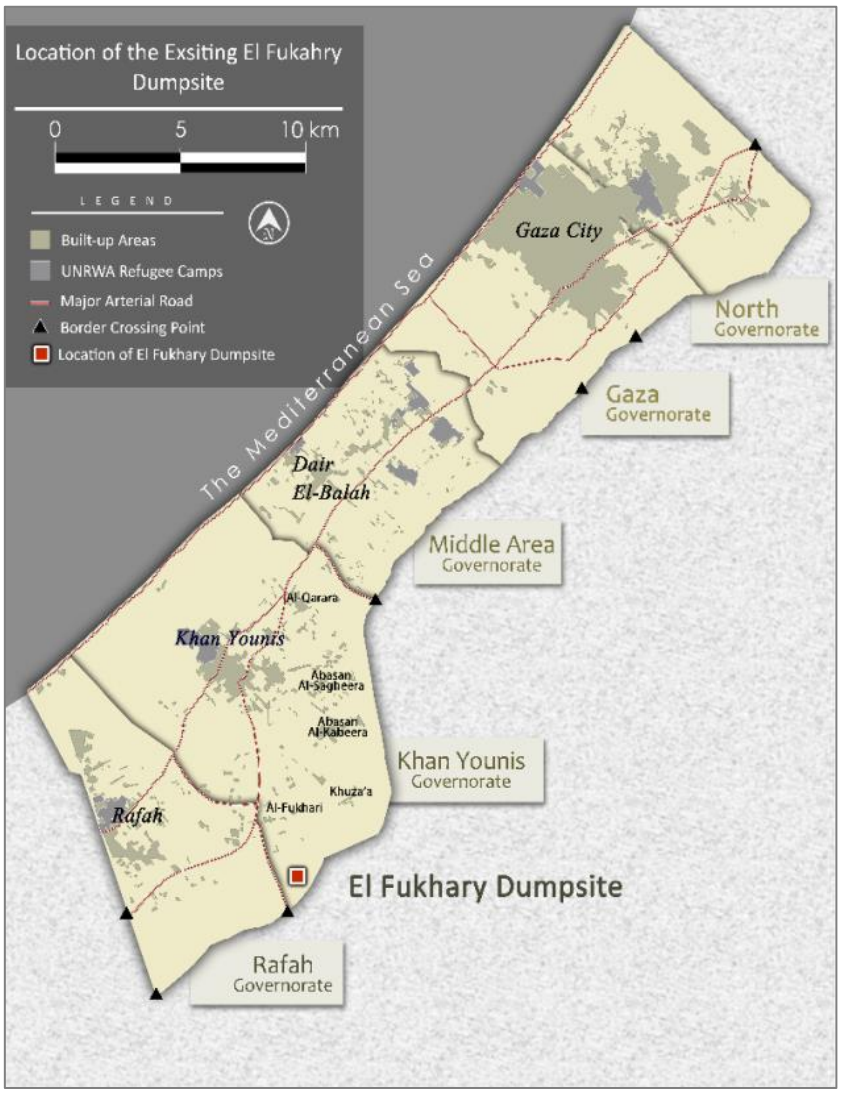


Figure 1. Location of the existing El Fukhary dumpsite

The Interim short term cell divided into two sub-cells, which are (1) the short term site (11,000m^2), and (2) the adjacent extension sub-cell (EC); both areas called hereafter as the Interim Short Term Cell (Interim ST Cell). The safety limitations and the nature of the land in the area resulted in limiting the economic or social activities. The area is also defined as buffer no man zone as no man activities are allowed within 300 m from the border line. Figure (3) shows a general view of the existing El Fukhary dumpsite, Figure (4) shows the adjacent empty Interim ST Cell.

The existing dumping site was operated since 1996 by Municipality of Rafah, and it receives the municipal solid waste from Rafah governorate only.

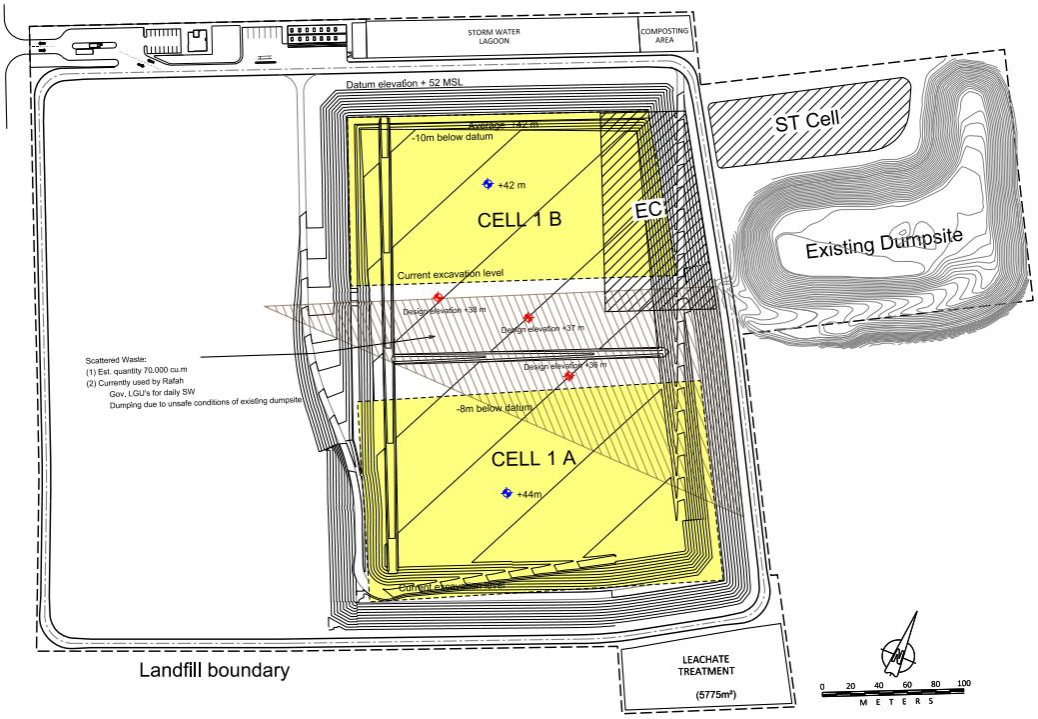


Figure 2. General Layout of El Fukhary Interim Short Term Cell

Figure 3. View of El Fukhary dumpstie (2016)

Figure 4. The Interim ST Cell (2016)

The existing dumpsite is bounded by Khan Yunis WWTP (Waste Water Treatment Plant) from the east, and around 800 meters from the Israeli border. The closest residential areas to the site are El Fukhary and Al Buyuk areas which are at a distance of around 1,600m and 1,700 m respectively as shown in Figure (5).

Figure 5. Proposed site for El-Fukhary landfill (indicated by a yellow circle) (EcoConServ, 2012)

1.1.2 *Current Situation*

While the construction of the new sanitary landfill started in December 2016 (it will last 22 months), the existing dumping site reached more that its capacity and exceeds its boundary over the adjecent lands, Northern and eastern side slopes of waste are currently spreading over the border of the existing dumpsite, and general side slopes are too steep (about 1 Horizontal : 1 Vertical) as shown in Figure (6), the waste body reaches somewhere 30 m high, and therefore its short term stability may be locally jeopardized.

At the same time, while starting soil excavation on cell 1 within the construction of El Fukhary Sanitary landfill, the operator of the exisiting dumping site (Rafah municipality) scattered some approximately 70,000 m^3 of Municipal waste as shown in Figure (7), this is due to the difficulty of waste collection vehicles travelling up to the dumpsite (increased steepness of the ramp), many collection vehicles started to unload its SW on the flat area located in the way to the dumpsite along the existing access road, that is in the middle of the planned excavation area, which limits the area of excavation and will ultimately bring excavation works to hold.

The Interim short term cell (Interim ST Cell) is a transition delimited area with controlled operation to enable the dumpsite to continue receiving waste in more environmental and safe conditions and that during the construction of the new long term sanitary landfill.

Figure 6. Side slopes of the existing dumping site (2016)

Figure 7. Scattered waste around the existing dumping site (in Cell 1A)

1.1.3 *Short term action plan for waste management on Sofa site*

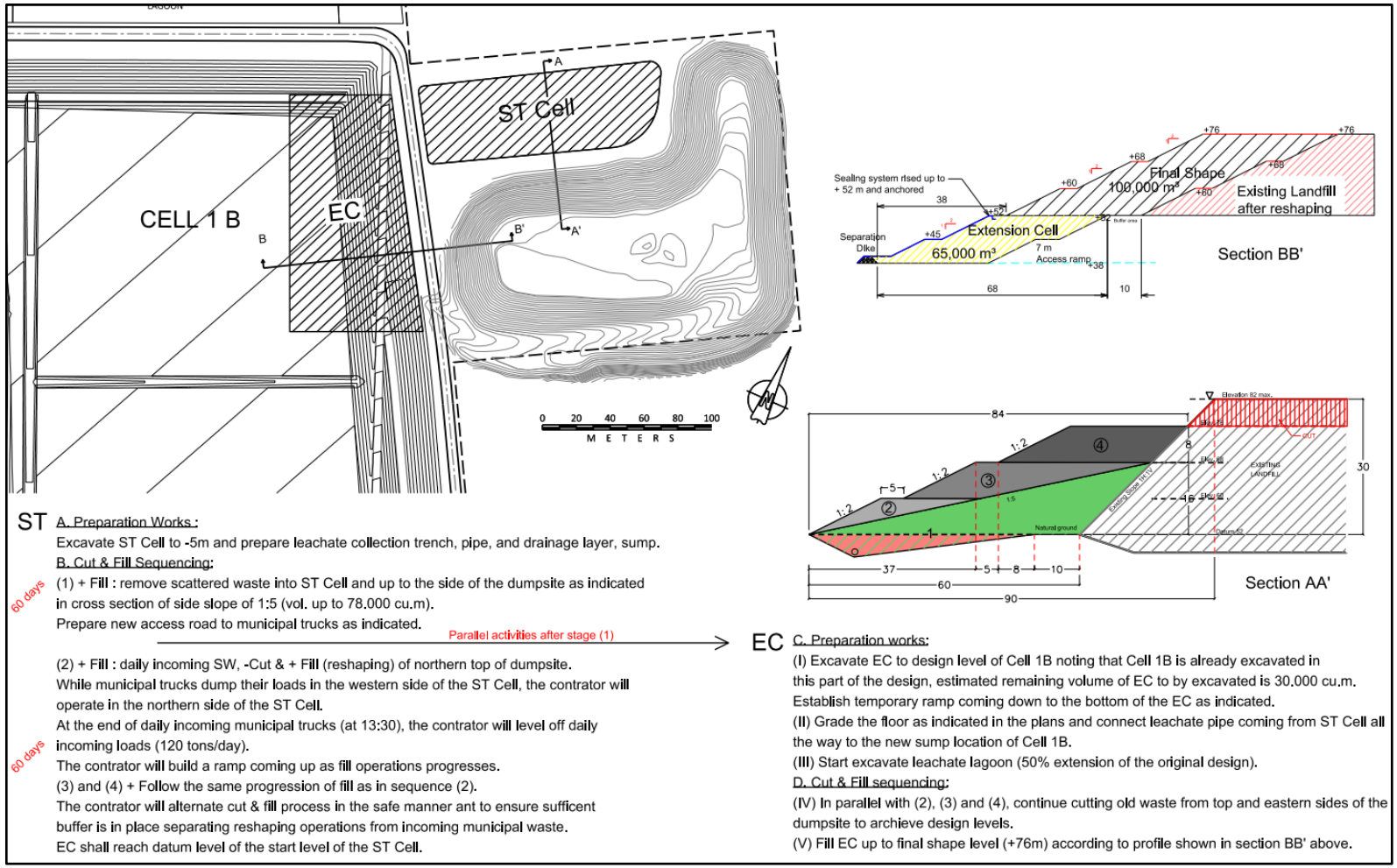


Figure 8: Short term action plan

1.1.4 *Interim Short Term Cell Design*

Interim ST Cell has been originally designed in the feasibility study in 2012 by UNDP-PAPP and DHV, and a technical note concept design has been made in 2017 by JV (Antea Group, EMCC, Engicon) due to the urgent situation in the site. The technical note concept design depends on the soil geotechnical investigation results. The Consultant recommended enlarging as soon as possible the footprint of the existing dumpsite up to the western border currently virgin (Interim Short Term Cell).

For ensuring additional traffic safety due to the removal of the additional waste scattered from cell 1A, the consultant recommended dumping waste from the base of the ST cell once the internal adjacent sides of the existing dumpsite will be reshaped with slopes 2H:1V. At the same time, the consultant recommends displacing the excess of waste from the side slopes onto the virgin area of the western boundary of the existing dumpsite and the extension cell (Interim Short Term Cell) as shown in figure (8).

The Consultant recommended excavate the area of short term sub-cell (11,000 m^2) on 5 m deep as a maximum and create a new cell. A buffer area of 5 meters will be maintained between the foot of the existing waste and the beginning of excavation. The excavation will be gradual from this buffer to the external limit of the ST cell.

Relying on the current waste body when uprising the waste up to the top. This extension of the existing dumpsite has to be done as quickly as possible given the fact that it is needed to remove the scattered 70,000 m^3 of solid waste from cell 1A urgently so as to respect the works schedule for new landfill service commencement.

Therefore, synthetic sealing liners, because of procurement delays for importation, are not recommended. The Consultant recommended as mitigation measure the implementation of 0.5 meter compacted clay on the bottom and sides of the extension cell of the existing dumpsite.

The geotechnical investigation report from the Islamic University of Gaza proves that an engineered clayey soil on site, compacted more than 95% of MTD as shown in Figure (9) can reach very low permeability, beyond the international standards requirements. The clayey soil will have to be compacted by (two) layers of 25 cm thick (each) as a maximum in order to maximize its engineering, as planned in the initial design for new cells.

SOIL HYDRAULIC CONDUCTIVITY REPORT
FALLING HEAD METHOD ASTM D-2434

Project	AL FUKHARI LANDFILL	LAB No	
CLIENT	EMCC	DATE	11/02/2015
LOCATION	bh1	DESCRIPTION:	CL-Brown silty
depth	12 0-bentonite	Tested By	

SAMPLE DATA:

Diam. (cm) =	10.1
Wt of wet soil gm=	1955
Wt. of dry soil gm=	1664
Water Content % =	17.5
Ht. (cm) =	11.7
Area (cm^2) =	80.554
Vol. (cm^3) =	938.5
Wet Unit Wt. (KN/m^3)	20.8
dryt Unit Wt. (KN/m^3)	17.7
Max dry Density. (KN/m^3)	18.00
% compaction	98.5

TEST DATA :
Falling head Test

Stand pipe Diam (cmm)	0.100
Stand pipe Area (cm2)	0.0079
Temperature- C	20.0

Test No.	t (sec.)	H1	H2	kt cm/sec
1	3600	147	134.7	2.75E-08
2	3600	153	140.6	2.66E-08
			average =	2.71E-08

remarks:
sample is of low conductivity

k_{20}= 2.7E-08 cm/sec

Figure 9. Results of Soil Geotechnical investigation (IUG, 2015)

The concept design of Interim ST Cell as shown in Figure (10) is a 5-m deep cell with a (1:2) side slope. The bottom land is filled by compacted 0.5 m clay (two compacted layers with 25cm thick for each layer. The sequence of waste filling is shown in Figure (11). Figure (12) shows the final shape topography, whereas figure (13) shows the cross section of final shape.

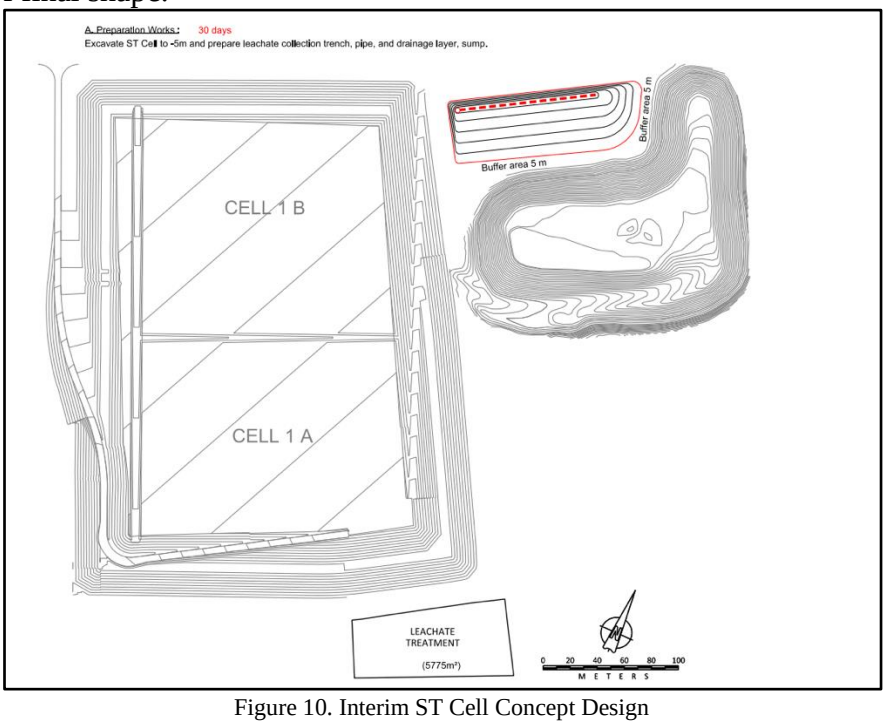


Figure 10. Interim ST Cell Concept Design

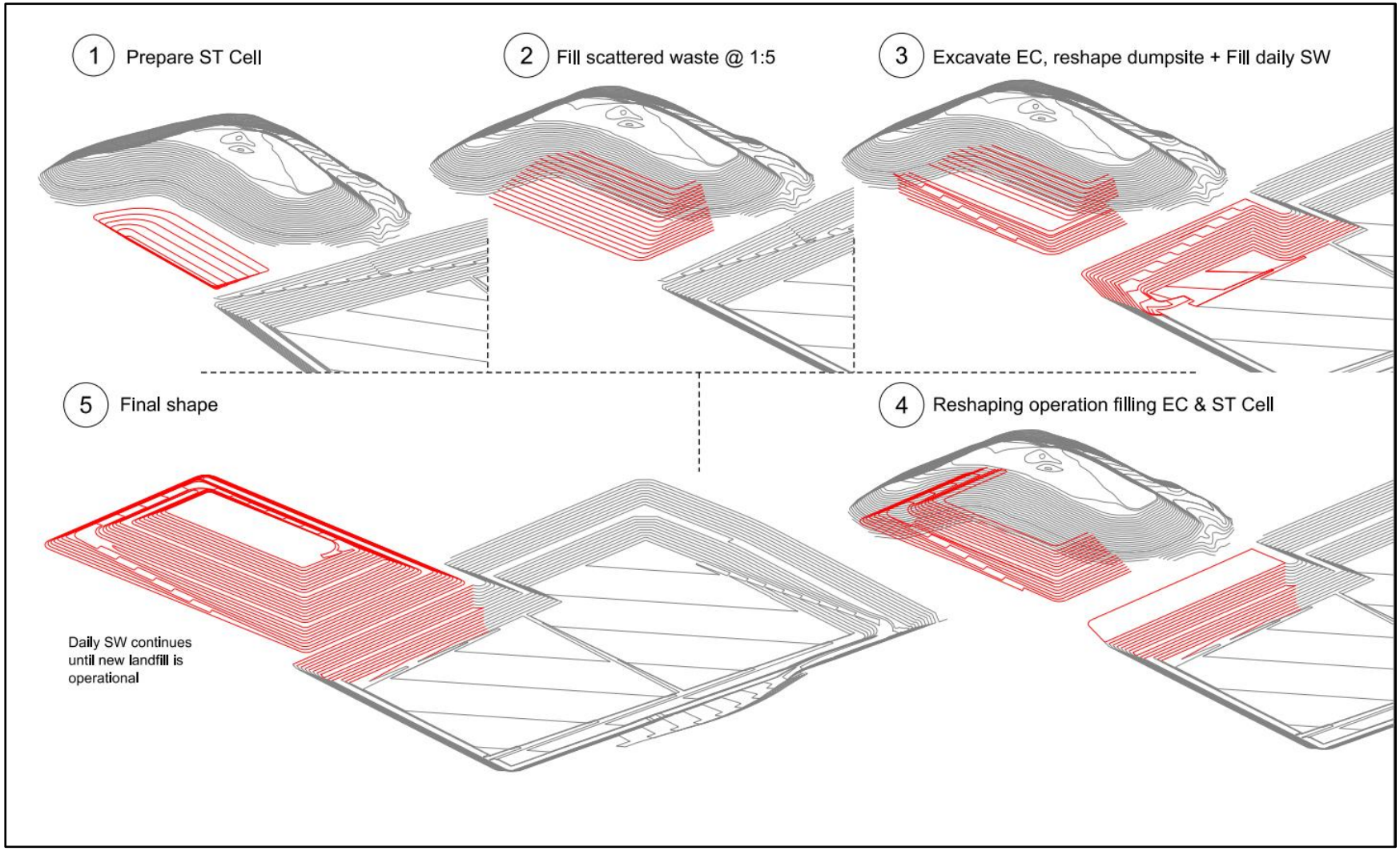


Figure 11. Sequencing of waste filling in the interim ST cell

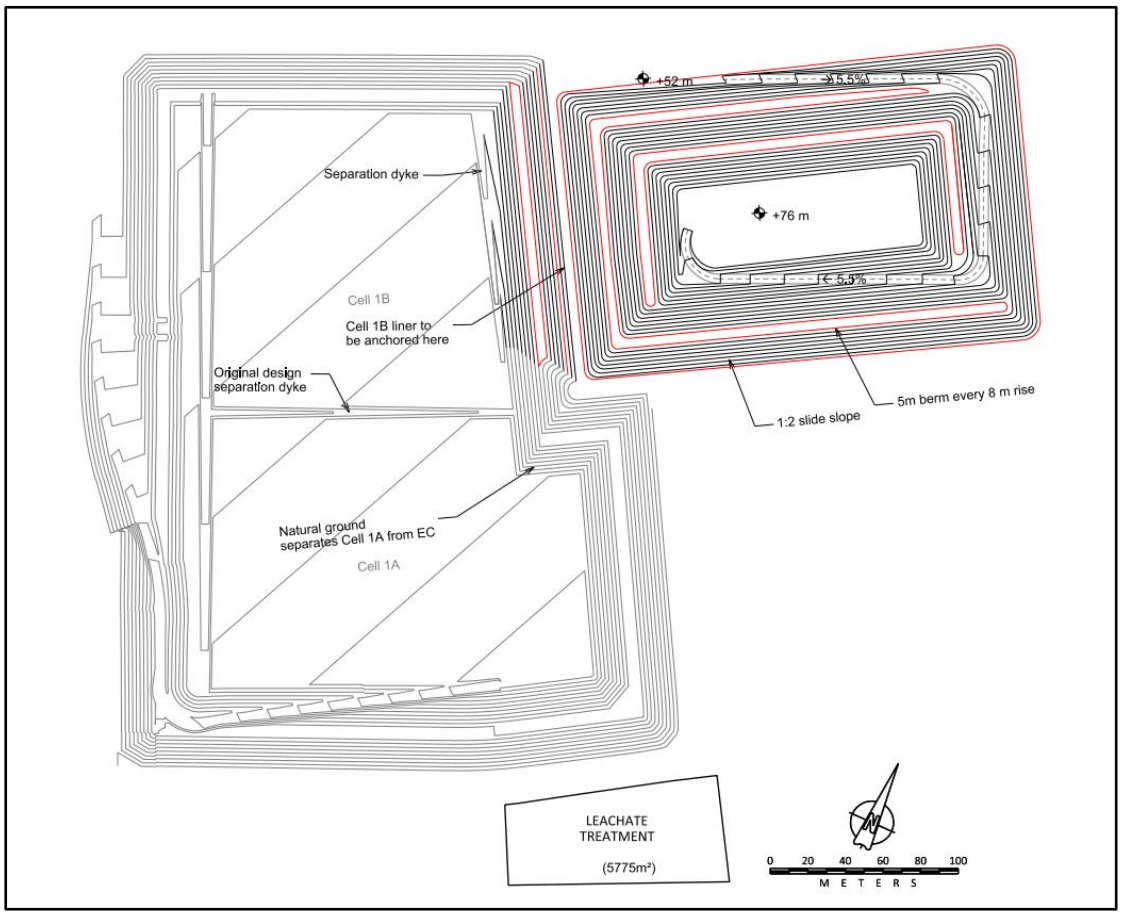


Figure 12. Final shape topography of the Interim ST cell

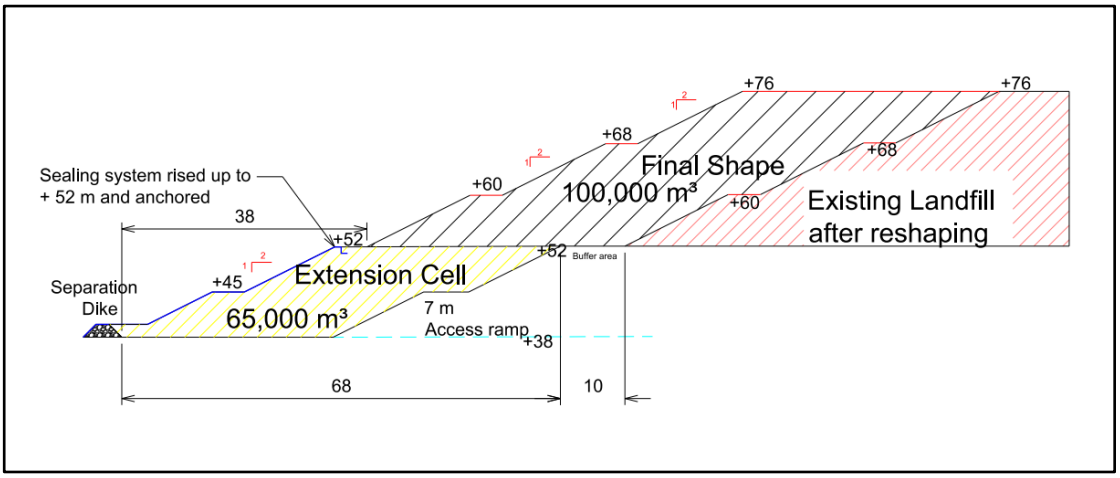


Figure 13. Final shape cross section

1.2 Project Alternatives

Gaza Solid Waste Management Project Feasibility Study which was conducted in 2012 ensured the importance of constructing an Interim Short Term cell to receive the waste from Rafah governorate instead of the unstable existing dump site. The need of an Interim Short Term cell was increased accordingly within the recent years due to the unsafe side stability of the existing dumpsite, knowing that the new sanitary landfill will not be ready to be operated before August 2018.

1.2.1 Location Alternatives

It was necessary for El Fukhary existing dump site to stop receiving waste from the top due to the unstable side slopes and the critical maximum elevation of 30 meters above GL reached. Two alternative locations were proposed to receive the generated waste from Rafah governorate for two years until the Sanitary Landfill in El Fukhary be ready to be operated. A financial and technical analysis was proceeded to select the better location, and a consultation was made with stakeholders mainly with municipality of Rafah in order to help in decision make. The following are the alternative locations.

El Fukhary Interim Short Term Cell

Short Term (ST) cell land located adjacent to the existing dumpsite, and owned by JSC-KRM. It is an empty land without any previous uses. The Interim ST Cell land is surrounded by the existing dumpsite from the north and east sides, the new sanitary landfill from the south side, and agricultural land from the west side. The access to the Interim ST Cell is possible, even during the construction of new sanitary landfill.

Dier Al Balah Landfill

Deir El Balah central landfill was built in 1995 and extended in 2002 by the support of the Federal Republic of Germany. The landfill is located on the eastern part of Deir Al Balah city closed to green line boundaries. The total dumping area of the landfill in the first phase was 34,900m^2 with a waste height of 5m. After the extension of phase two, the total dumping area of the landfill becomes 59,900m^2 and 22m of waste height. It is worth mentioning that Dier Al Balah landfill has reached its design capacity since 2008, knowing that it still receives waste from the middle area until now with unsafe side slopes and exceeded heights.

After the technical and financial analysis, it was found that Rafah transfer station is far about 10km, and 17km from Interim ST Cell land and Dier Al Balah Landfill consequently, thus the cost of transferring the waste is expected to be doubled in the case of Dier Al Balah landfill location. Moreover, Dier Al Balah landfill is not capable to receive excess quantities of wastes.

Interim short-term Cell land was selected to be an alternative to receive the waste for the coming two years until the operation of El Fukhary sanitary landfill.

Figure 14. Distance between Rafah transfer station and alternative locations

1.2.2 Alternative Design and Technology

The designer submitted two alternative designs, improvements were requested to be added to the design in order to mitigate the environmental and social impacts mainly impacts related to health and safety. The designer was requested not to excavate just beside the existing dumpsite, and to proceed slope stability tests in order to work in safer environment with less potential impacts. The designer is also requested to suggest a method to collect the leachate and not to deteriorate the soil and groundwater aquifer under the Interim ST Cell.

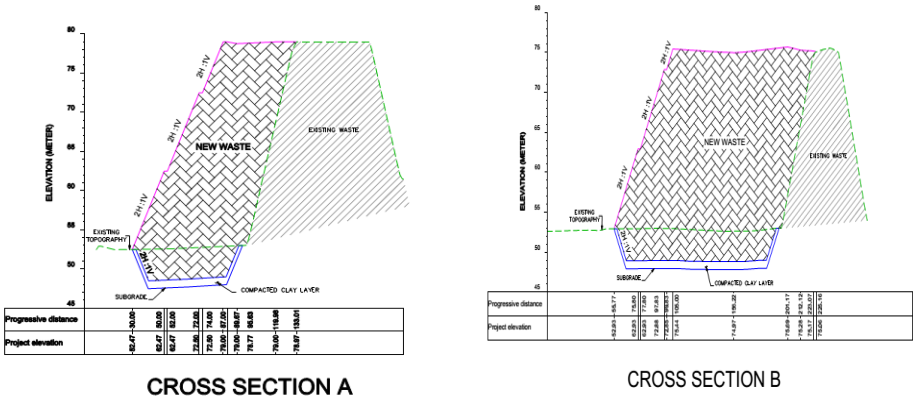


Figure 15 First alternative design

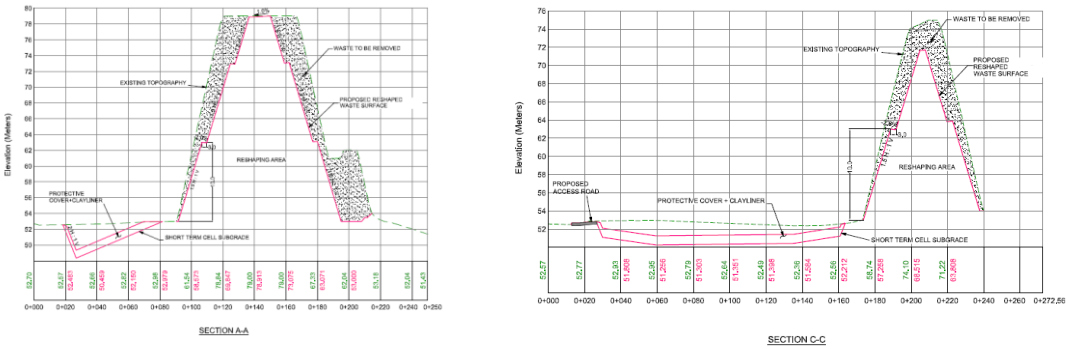


Figure 16 Second alternative design

Another alternative scenario was discussed is to change the design of sanitary landfill through completing the construction of cell 1B, and accordingly design a separate ramp and separate leachate collection for Cell 1B in order to start operation early while Cell 1A design will be changed to have a separate ramp, and to be operated separately later once its fully constructed.

However, it appears according to our calculations that given the geotechnical stability constraints and the huge quantity of waste to remove for reshaping safely the existing dumpsite, no alternative design (whatever the profile may be) could avoid JSC service disruption. Therefore, we are obliged to consider the necessity of an additional footprint extension of the existing dumpsite to close safely this existing dumpsite and ensure JSC service continuity.
This extension implies the modification of the initial design for the construction of new cells.

1.2.3 Selected Alternative: Shortening of the "cell 1B" and extension of the "Interim ST cell"

Our proposed scenario 3 intends to integrate the following targets & constraints:

- Ensure JSC service continuity
- No footprint extension possible beyond the current project boundary
- Propose additional void space for existing dumpsite minimizing loss of void space planned in the frame of the new sanitary landfill (cells 1 to 3)
- Minimize design modifications of initial project whose construction phase started
- Minimize additional environmental impact
- Separate as far as it is possible physically Old waste from New waste; Old leachate from new leachate

Moreover, 285 000 m3 were already excavated (maximum depth of excavation currently reached 11 meters) from the north part of cell 1B, and this proposal intends to take a maximum advantage from the excavation works currently achieved.

Our proposal can be summarized as follows:

- Maintain design of cell 1A,
- Extend ST cell using eastern part of cell 1B,
- Shorten footprint of cell 1B,
- Compensate the loss of void space on cell 1B by leaning on existing dumpsite waste,
- Mitigate the additional environment impact of the footprint of the extension of the existing dumpsite with 2 meters of compacted clayey material implemented at the bottom of this "unsealed additional cell",
- Create a continuity between New landfill and Old dumpsite by sealing eastern sides of New cell 1B over waste of existing dumpsite,
- Create a central access ramp and a unique delivery / circular turnover for dumping onto extension of existing dumpsite, cell 1A and cell 1B,
- Resize Leachate lagoons capacity and leachate pre-treatment equipment,
- Main dyke separating cell 1 from 2 and 3 remains unchanged; internal dyke separating cell 1A and cell 1B + "unsealed cell" is redesigned like Main dyke.

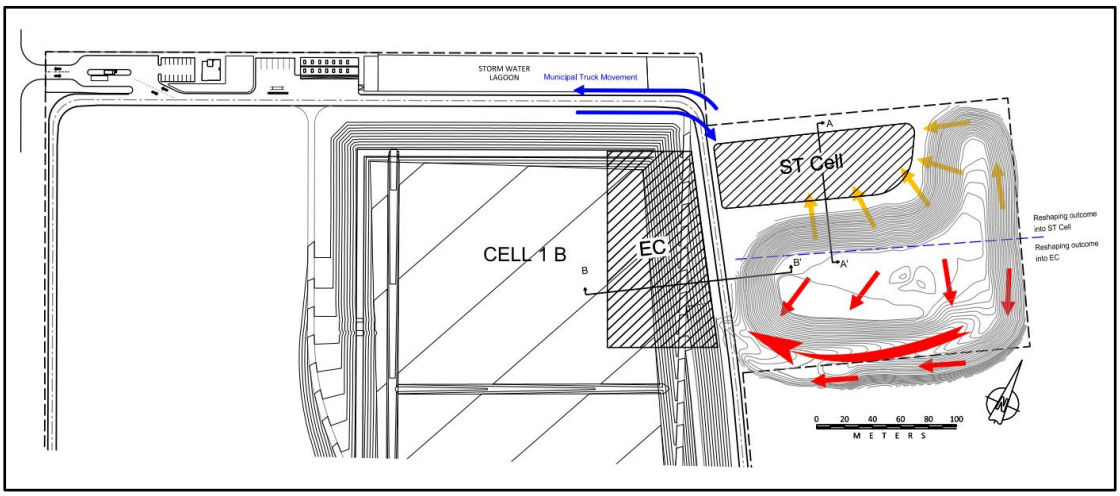


Figure 17 Selected alternative, receiving scattered waste in ST cell and receiving the reshaped waste in EC

1.3 Key Activities in relation with Interim ST cell and "Extension of interim ST cell" construction

The construction key activity is mainly soil excavation and waste removal for reshaping and secure the stability of the existing dumpsite.

The top soil layer will be stored in a separate place to be used later for other activities such as agriculture. The construction of the Interim ST Cell and its extension is also including implementation of aggregates for leachate drainage and some mechanical works such as collection and pumping system for leachate. All used materials are expected to be supplied from the local market (except pumps). The construction of Interim ST Cell and its extension is expected to last about four months before operating it.

1.3.1 Excavation

A buffer area of 5 meters is recommended between the foot of existing waste northern & eastern internal sides (adjacent to ST cell) and the beginning of excavation of the ST cell. This buffer area is an additional mitigation measure for landslide prevention during excavation works.
A buffer area of 10 meters is recommended between the foot of existing waste western internal side (adjacent to cell 1B initially designed) and the beginning of excavation of the extension of ST cell. This buffer area is an additional mitigation measure for landslide prevention during excavation works.

Excavation depth of the ST cell will be limited to 5 meters as a maximum and the lowest level will be northern border (external side) of short term cell. Excavation depth will decrease progressively from the external border of short term cell (5 meters) down to 0 at the buffer area northern border.

The ST cell stands for 20,000 m3 of excavation soil, whereas the Extension Cell (EC) stands for 30,000 m3 of excavation soil.

1.3.2 Leachate Management

The ponds & aerators were initially sized based on 16,000 m3/year from the water balance of the New sanitary landfill based on the cells 1 to 3 complete phasing operational plan.

The set of a drainage layer and installation of a sump pump on short term cell will facilitate additional leachate extraction from the existing dumpsite. This leachate extraction from the existing dumpsite will be reinforced in the future with the implementation of a complete remediation plan comprising boreholes drillings and drainage trenches.

Therefore, the construction of the leachate lagoon must be achieved as soon as possible, and an additional leachate storage capacity is needed in the long-term.

Previously, Leachate was chemically analyzed, the following table shows results of five samples taken from El Fukhary existing dumpsite.

Table 1. Leachate Chemical Analysis (2016)

Test		Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
pH	-	7.66	7.69	7.65	7.9	7.8
T.K.N	%	0.59	0.39	0.35	0.4	0.57
EC	mS	79	79	70.6	75	77
Ammonia	%	0.49	0.29	0.9	0.26	0.44
CL	mg/l	22000	21200	33600	21200	24000
S.S	mg/l	1.4	1.5	1.5	2.2	1.46
BOD	mg/l	2000	1800	1800	9600	2000
COD	mg/l	27000	29000	27000	30000	28000
Pb	mg/l	1	0.9	0.9	2	0.9
Cu	mg/l	0.1	0.1	0.2	1	0.2
Fe	mg/l	70	60	60	75	70
Cr	mg/l	0.4	0.3	0.3	0.6	0.4
Cd	mg/l	0.09	0.08	0.08	0.03	0.09
Al	mg/l	9	10	10	12	9
Mn	mg/l	0.01	0.01	0.01	0.02	0.01
Ni	mg/l	0.1	0.1	0.1	0.1	0.1
Zn	mg/l	10	12	12	14	11
Sr	mg/l	1	1.1	1.2	1.3	2
Ba	mg/l	0.01	0.02	0.02	0.01	0.02

A leachate system will be constructed for interim ST cell, a drainage layer composed of 30 cm of gravel will be installed, and leachate collection pipes, leachate sump and sump pump will be installed to collect the leachate.

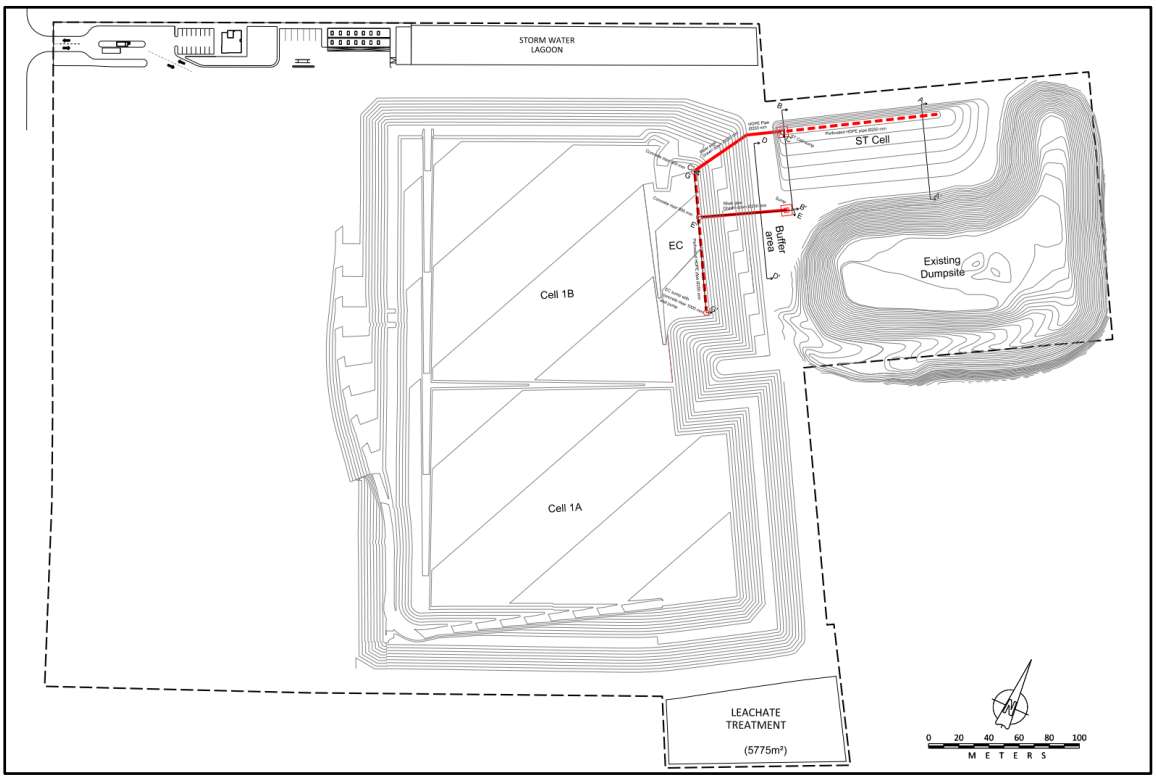
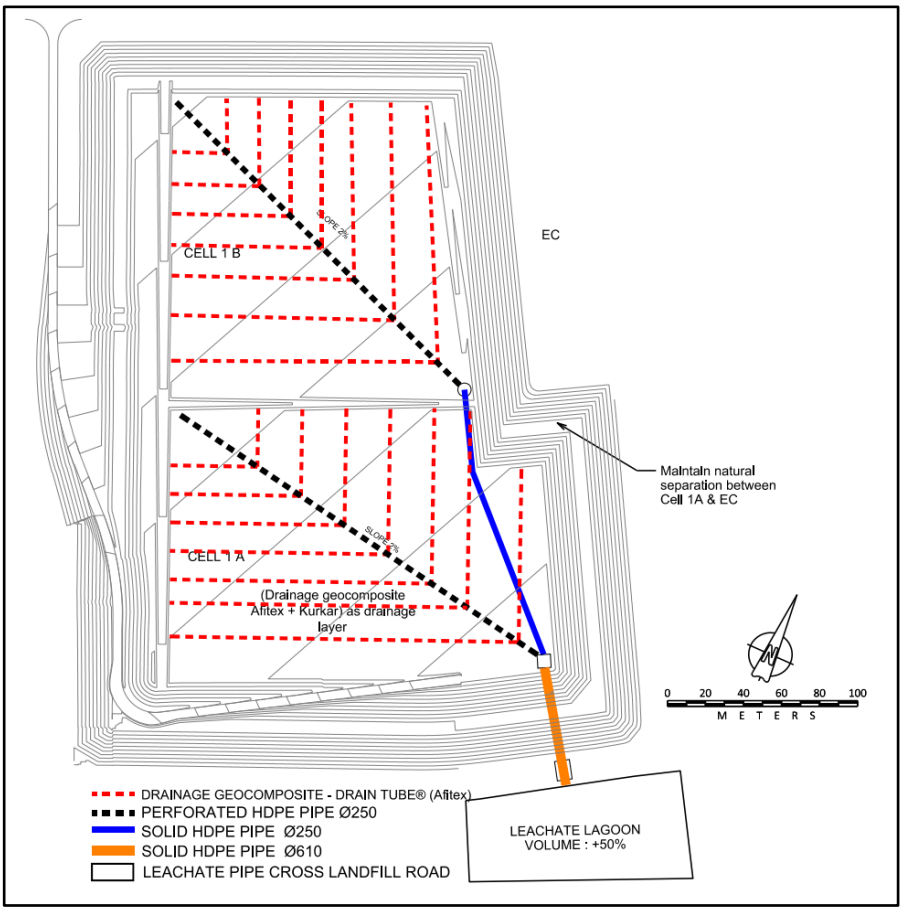
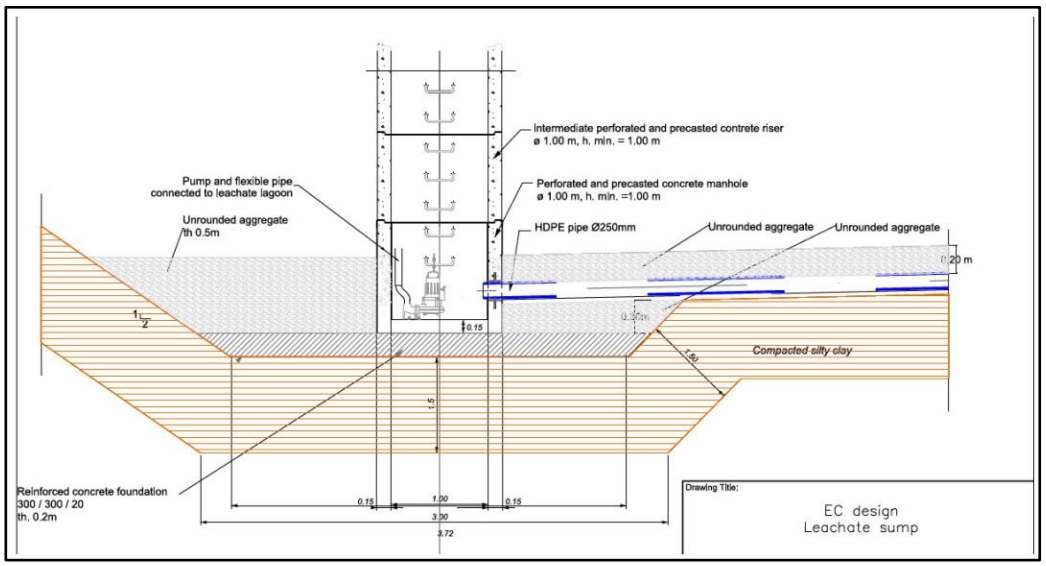


Figure 18. Leachate Drainage System



(a.)



(b.)

Figure 19. (a.) leachate drainage system of ST and EC, (b.) Leachate sump pit

1.3.3 Lining

The preparation of the adjacent short-term cell beside the existing dumpsite must be done as soon as possible given the fact that we need to remove the approximately 70,000 m3 of scattered waste from cell 1A &B so as to be able to continue excavations. Therefore, synthetic sealing liners, because of procurement delays for importation, are not recommended to be integrated in the design. We recommend as mitigation measure the implementation of a 0.5-meter thick compacted clay layer on the bottom of the short-term cell. The geotechnical investigation report from the Islamic University of Gaza proves that an engineered a clayey soil on site, compacted more than 95% of MTD (see extract from the report below) can reach very low permeability, beyond the international standards requirements. The clayey soil will have to be compacted by two layers of 25 cm thick each as a maximum in order to maximize its engineering. Moreover, according to the same report, the clayey soil layer thickness is at least 25 meters and the expected depth of ground water table is more than 52 meters. Therefore, the potential environmental impact of the maximum excavation of 5 meters on the short-term cell is limited. The extension cell will be provided with a 1.5-meters thick compacted clay layer on the bottom as mitigation measure.

1.4 Employment and Equipment

The construction of Interim ST Cell and the reshaping works are expected to create about 10 - 15 new job vacancies. The contractor will be requested to cover the insurance of all employees and comply with the safety and health measures: All risks Insurance schedule policy and workmen compensation Insurance policy will be contracted for all the activities above described, and extended to all workers assigned on site: workers directly hired by the contractor, but also by its sub-contractors, by the MDLF, by JSC, and the JV supervision.

The hired employees are expected to be from local community (Khan Younis and Rafah Governorates), others can come daily from the other governorates since Gaza governorates are all very close in terms of culture and customs, no issues are expected in terms of how the workers coming from different places will be dealing with each other and the neighbouring communities. Moreover, no workers will be accommodated

overnight in the project locations and all will commute to their Governorates of residence and means of transportations are available all the time to allow for that. The contractor will be requested to comply with this ESMP during the construction phase, whereas MDLF and JSC-KRM will monitor the compliance to mitigation measures including the workers' insurance issues and the establishment and the application of a code of conduct for workers as indicted in Table 7.
Four loaders and eight trucks are expected to be used during the construction phase of the ST interim cell and its extension, and the contractor will be requested to have insurance for all equipment inside the construction site, uncovered equipment by valid insurance will not be allowed to enter the site, as well as unlicensed drivers or any worker under 17 years old. Qualified foremen training certificates and permits will be checked before assignment.

1.5 Objective of the Assignment

The objective of this study is:

1. To expect the environmental and social impacts during the construction and operation of the El Fukhary Interim ST Cell and its extension; during reshaping works of the existing dumpsite;
2. To propose mitigation measures to eliminate, reduce, or compensate the environmental and social impacts for the above-mentioned activities;
3. To develop ESMP. The necessary mitigation measures that would be considered and implemented during construction and operation phases.

Final draft of the ESMP will be disclosed in electronic format on MDLF website; JSC Facebook page; and the World Bank InfoShop. The ESMP document in hard copy format will be available in MDLF office – Khan Younis Branch; and JSC-KRM main office.

1.6 Scope of Work

The scope of this assignment is to study the environmental and social impacts during the construction and operations of El Fukhary Interim ST Cell, its extension, and related activities: reshaping of the existing dumpsite by waste removal, waste transfer from cell 1 onto Interim ST Cell. It intends to propose preventing or mitigation measures to each impact. Finally, an ESMP will be proposed based on the predicted impacts and mitigation measures in the following steps.

- To be in conformity of the World Bank safeguard policies, taking into consideration the environmental and social regulations of the Palestinian Environment Quality Authority (EQA)
- To be based on information and data from field visits and investigations as appropriate
- Recognize the environmental impacts, recommend control, mitigation and monitoring measures to be addressed during the implementation of the Project
- Identify key environmental and social impacts of the the site during both *construction* and *operation* phase
- Identify mitigation measures for all expected adverse environmental and social impacts during both construction and operation phases.
- Propose Mnagement plan during both construction and operation phases
- Provide MDLF with the necessary recomendations

2. DESCRIPTION OF LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 Description of legal framework

National and international guidelines for environmental assessment were reviewed. A review of the most pertinent regulations and standards governing health and safety has been included. The section also includes a review of environmental quality standards for ambient air, water, and limit values for liquid and gaseous emissions.

2.1.1 Local Council Law, 1997

According to the new law, waste collection and disposal are the responsibility of local councils, which was clearly stated as follows:

- Waste collection from streets, houses and public areas, transportation and regulated disposal is the responsibility of the local council.
- Protection measures for safe public health shall also be taken by the council, this includes the implementation of an efficient waste collection system.

2.1.2 Palestinian Environmental law 7, 1999

Referring to the project ESIA, the Environmental Law of Palestine (PEL) includes a framework for environmental protection, the following articles are reviewed by the consultant:

- Article 7
- Articles 8 to 10
- Articles 11 to 13
- Articles 23
- Articles 26
- Article 30

2.1.3 Regulations which complement the Environmental Law

a. Solid Waste Management Regulations (2004)

MSW collection is the responsibility of municipalities and village councils, as well as ensuring that this the process does not have health and/or environmental implications. It is the responsibility of industrial, commercial and agricultural waste generators to arrange for the collection and transport of their wastes to the designated treatment/disposal areas.

b. Key guidelines for landfills included in the regulations

The landfill operator shall be responsible for monitoring the landfill for a period of 20 years following its closure. Additional technical considerations related to the site selection and landfill design are mentioned in the project ESIA.

2.1.4 National Strategy for Solid Waste Management in the Palestinian Territory, 2010

The main policy related to this task among the strategy's policies is:

- Policy (5) – Strategic Objective 3 : Safe and efficient disposal of SW in regional sanitary landfills servicing all communities

2.1.5 Laws and Regulations Relevant to Water Pollution Control

The potential impact of landfills on water resources is recognized. This could be the result of uncontrolled leaching of contaminants from the body of the landfill or the

discharge of treated landfill leachates. Within this context, the following national laws and regulations were reviewed:

- Palestinian Water Law
- Regulations for Groundwater Pollution Control
- Guidelines for Wastewater Reuse in the Gaza Strip, Palestine 2002
- Water Pollution Control System

2.1.6 World Bank Safeguard Policies and Guidelines

Among the ten safeguard policies of the WB, five are considered by the Consultant to be relevant to the ESMP, these are listed and discussed below:

- Environmental Assessment (OP 4.01)
- Involuntary Resettlement (OP 4.12)
- Access to Information Policy
- Natural Habitats (OP 4.04)
- Cultural Property (OP 4.11)

2.1.7 IFC EHS guidelines for waste management facilities:

These IFC guidelines (IFC, 2007) concerns the design, construction and operation of non-hazardous/hazardous waste facilities. The guidelines cover the following aspects:

- Project siting
- Erosion and sediment
- Waste collection, handling and transport
- General environmental requirements such as impacts to air and water resources, gas collection systems, leachate collection systems, landfill depth, buffer zone to water resources
- Guidance on project operations
- Employee health and safety
- Training requirements
- Record keeping and monitoring

2.1.8 Standards/Guidelines

The following national and international standards and guidelines were reviewed:

- EU Landfill Directive (1999/31/EC).
- IFC Occupational Health and Safety Guidelines.
- World Health Organization (WHO) Guidelines for Air and Water Quality.
- WB Guidelines Effluent Discharge Requirements.
- European Commission Environmental Standards.
- Israeli Environmental Standards.
- Egyptian Environmental Law Limit Values for Ambient Air Quality.

2.2 Description of Institutional Framework

2.2.1 Rafah Municipality

Rafah Municipality manages the solid waste in Rafah Governorate including primary and secondary collection, it also manages the Rafah landfill. Rafah Municipality supports the concept of an integrated body to manage solid waste across all Gaza Strip. Rafah landfill is owned and operated by Rafah Municipality. It serves more than 200,000 of population, and employs 140 workers.

2.2.2 Environmental Quality Authority (EQA)

The main responsibility of EQA is to protect the environment and the natural resources in the project area. EQA is primarily concerned with the development of regulations, strategies, management plans and monitoring programs, with an aim of sound use and conservation of the environmental resources in Palestine. One other major role and responsibility that EQA emphasizes upon is public awareness promoted through educating and training environmentalists and the public.

2.2.3 The Job Creation Program (JCP)

Workers are divided into groups each group consists of 10 workers and a supervisors. The project coordinator in full collaboration with the municipalities and the Joint Service Councils develops daily plans.

2.2.4 Municipal Development and Lending Fund(MDLF)

MDLF is implementing the Gaza Solid Waste Management Project in the Southern region of Gaza with its financing. Project Development Objective: The objective of the project is to improve solid waste management services in the Gaza Strip. This objective would be met through the provision of more efficient, environmentally and socially sound waste disposal systems, and by initiating measures to improve Gaza and the West Bank's overall solid waste management system.

2.2.5 Joint Service Council

Joint Services Council (JSC) will be responsible for the project operation during the first years of operation. This will include the operation of solid waste management system (collection, transfer, composting/recycling and disposal at El Fukhary Dumpsite) for the waste of Deir Al Balah, Khan Yonus, Rafah and UNRWA camps in correspondent area.

3. ENVIRONMENTAL AND SOCIAL BASELINE DATA

3.1 Physical Aspects

3.1.1 Topography

The general topography of El Fukhary dumpsite is mostly flat with a gently slope towards the border. The maximum length (from west to east) of the total site is about 720 m and shows a height difference of about 1 m. The maximum width extends from north to south to a distance of about 650 m with a height difference of about 2 m towards north direction. The natural inclination of the site area mainly declines from south to north(UNDP, Environmental Impact Assessment, 2009). There are no rivers or valleys in the surrounding of the site.

3.1.2 Soil

The ground mainly exists of sandy and silty materials. Drillings' results by the design revision team submitted on 2016 as following:

- The first soil layer encountered is Clayey Silts (ML) with a depth varying from 0 – 10 m. The average water content is 10% and the average Plasticity Index is 3.5.
- The second soil layer, encountered is a Fine Sands (SP) up to depth of 11 m. The average water content is 5% and the average Plasticity Index is 3.2.
- Third soil layer with a thickness of two meters is Clayey Silts (ML) and started from depth from 11 m up to 13 m. The average water content is 13% and the average Plasticity Index is 3.2.
- The fourth soil layer, is a silty Sand (SM) from 13 m deep up to 18 m deep. The average water content is 7% and the average Plasticity Index is 2.7.
- The soil type in the fifth layer is Silt-Clay-Sands Mixtures (SM-SC) and started at depth started from 18 up to 21 m. The average water content is 5.3% and the average Plasticity Index is 5.5.
- The sixth soil layer is gravelly Sands (SP) from a depth 21 up to 26 m .The average water content is 5.3% and the average Plasticity Index is 5.5.
- The seventh layer is silty Sands (SM) from 26 m up to depth of 29 m. The average water content is 10% and the average Plasticity Index is 3.

3.1.3 Groundwater

The groundwater level at El Fukhary dumpsite area is relatively deep compared with the rest of the strip. The groundwater depth below the ground surface is very considerable (about 40 to 50 m). The groundwater tends to flow away from Al Fukhary area (UNDP, Environmental Impact Assessment, 2009).

95% of the Gaza strip groundwater aquifer is contaminated by high concentrations of Nitrate and Chloride contaminants. The recommended level of concentration of chloride for drinking water by World Health Organization (WHO) is 250 mg/L. The Chloride concentration at El Fukhary area is observed to be between 2,279 and 2,711 mg/L, which is caused by intrusion of saline sea groundwater. The nitrate concentration in the area surrounding El Fukhary landfill reaches 60 mg per liter exceeding the level

recommended by the World Health Organization (WHO) of 50mg/l (UNDP, Environmental Impact Assessment, 2009). The nearest groundwater municipal well is located at distance more than 5 km from Al Fukhary site due to the high level of chloride and nitrate concentrations in Al Fukhary area and surroundings. The groundwater at Al Fukhary site was not tested in term of other chemical parameters, and the depth of saturated zone is not known accurately. However, four piezometers are planned to be installed within the construction of Al Fukhary Sanitary Landfill. The piezometers which are used for groundwater monitoring will be accessible and ready for taking groundwater samples and testing them before the operation of the short-term cell. Groundwater samples will be tested in term of key chemical parameters related to leachate prior the operation of the short-term cell. Results of chemical tests will be considered as a baseline for the later periodic tests.

3.1.4 Surface Water

The potential for increased risk of flooding is not applicable as there is no big surface water catchment area in the vicinity of El Fukhary dumpsite. However, there is potential for occasional surface water flows during the winter/wet season.

3.1.5 Ambient Air Quality

Ambient air quality and noise measurements at El Fukhary dumpsite site conducted in 2012 during preparing the Feasibility Study for GSWMP are reviewed. The measurements were conducted adjacent to the existing dumpsite as well as at the nearest residential cluster to the landfill. The field measurements for ambient air at study area include CO_2, CO, $PM_{2.5}$, PM_5 and PM_{10}. The results could be summarized as follows. The lowest CO_2 concentration was 214.0 ppm recorded at noon and the maximum was 742.0 ppm recorded at around 4 PM. The mean daily value was 429.0 ppm, standard deviation of 233.0 ppm. The lowest CO concentration was 0.1 ppm recorded at noon and the maximum was 6.8 ppm recorded at around 4 PM. The mean daily value was 1.4 ppm standard deviation of 2.5 ppm. The lowest concentration for PM_{10} being measured was 420 $\mu g/m^3$, recorded at around noon and the highest was 8691 $\mu g/m^3$, recorded at around 10AM. The mean daily value was 2053 $\mu g/m^3$, with a standard deviation of 1829 $\mu g/m^3$ (EcoConServ, 2012).

3.1.6 Noise

The proposed project site is located in open rural areas with no industrial activities undertaken in the vicinity of the sites. Major noise sources site are basically the traffic volume and natural sources, such as the occasionally strong winds .The lowest noise level being measured at the dumpsite during the feasibility study conducted in 2012 was 65.6 dB recorded at around 4PM and the highest was 79.9 dB recorded at around 11AM. The mean daily value was 75.4 dB, standard deviation of 4.9 dB. However, the lowest noise level being measured at the surrounding areas of El Fukhary Dumpsite was 73.5 dB recorded at around 4 PM and the highest was 87.5 dB recorded at around 11AM. The mean daily value was 78.6 dB, standard deviation of 5.9 dB (TECC, 2012).

Hence, the Noise level is increased since the start of construction of El Fukhary Sanitary landfill, but the consultant didn't make new noise measurements.

3.1.7 Meteorological Conditions

Rainfall Precipitation

Rainfall during the season 2015-2016 is 352 mm on average for the whole Gaza strip and 236 mm for Rafah Governorate. Rainfall is unevenly distributed and varies considerably by governorates from the North to the South. The average rainfall is calculated over the period 2015-2016 for 3 stations: Deir Al Balah, Khanyounis and Rafah rainfall stations as shown in Figure (20) (Consultant, 2016). The average annual rainfall in the study location is around 260 to 270 mm.

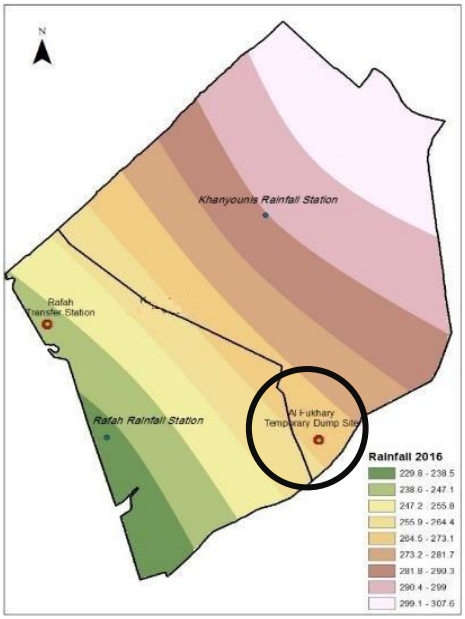


Figure 20. Annual Average Rainfall Data for Khanyounis and Rafah Governorates (Consultant, 2016)

Climate

There are two well-defined seasons in Gaza Strip: the wet season starting in October and extending into April, and the dry season from May to September. Peak months for rainfall are December and January.

Temperature

The average daily mean temperature in Southern part of Gaza Strip ranges from 25 0C in summer to 13 0C in winter, with the average daily maximum temperature range from 29 0C to 17 0C and the minimum temperature range from 210C to 9 0C, in summer and winter respectively.

Humidity

The daily relative humidity fluctuates between 65% in daytime and 85% at night in summer and between 60% and 80% respectively in winter.

Wind

Readings recorded for winds throughout the year by 8 readings per day, at difference of 3 hours between each reading. Average Wind speeds of year 2012 were divided four sections by seasons of the year. Figure (21) shows the average wind speed throughout the months of the year 2012. The Average wind speed in the spring is equal 3.92 m/s and the maximum average wind speed is equal 4.77 m/s in the March, we can summarize on a yearly average wind speeds for year 2012 in the Gaza Strip, it is equal 3.75 m/s. (Abu-Zarifa, 2014).

The monthly and annual wind direction in geographical area in year 2012 was common most months of the year, north-west. If we rearrange the wind direction by season, then it will look like this: Spring: The wind direction is common north-west to west-southwest. In the summer is common north-west to west-north west; in the autumn is common north-northwest to north-west and in the winter is common south-west to west- southwest.

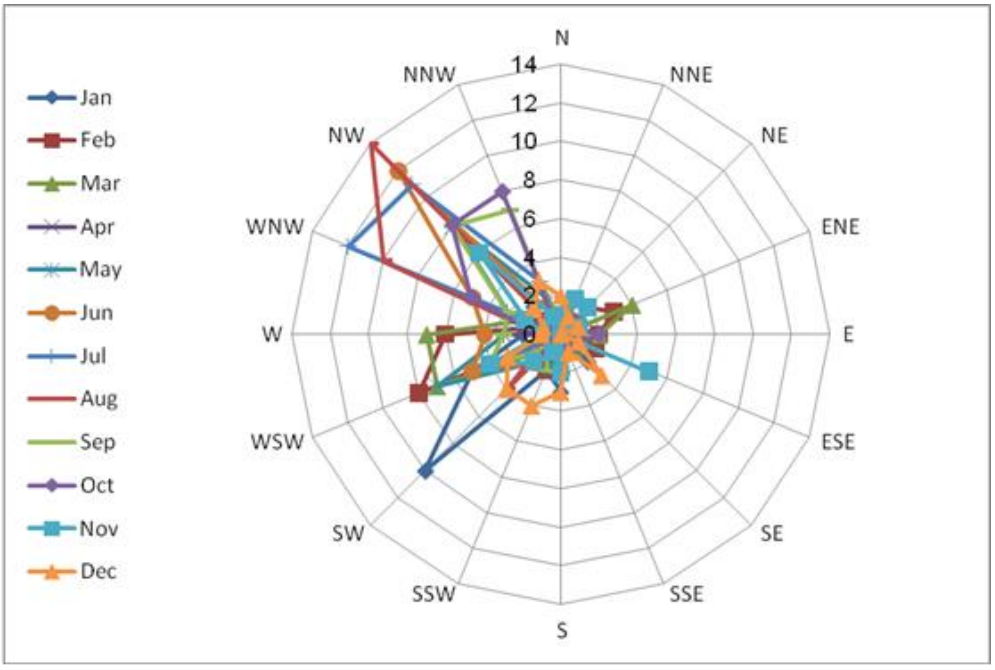


Figure 21. Wind Direction and Speed near the Transfer station site. (Abu-Zarifa, 2014)

3.1.8 Land Use and Urban Planning

El Fukhary area as part of the South East of Gaza Governorates is classified as agricultural area. The safety limitations and the nature of the land in the area resulted in limiting the economic or social activities. The area is also defined as buffer no man zone as no man activities are allowed within 300 m from the border line. The location of the main Rafah road in the area that drives to Rafah commercial crossing with Israel which was the main source for all commercial activities in Gaza in the past before the siege on Gaza. Agriculture was restricted due to the dust created by the commercial road in the past and now it is not possible because of the security hazard and limited rain-fed farming is taking place in the area. The land plots surrounding the location of El Fukhary dumpsite are privately owned lands by farmers.The closest residential areas

to the site are El Fukhary and Al Buyuki areas which are at a distance of around 1600m and 1700 m respectively.

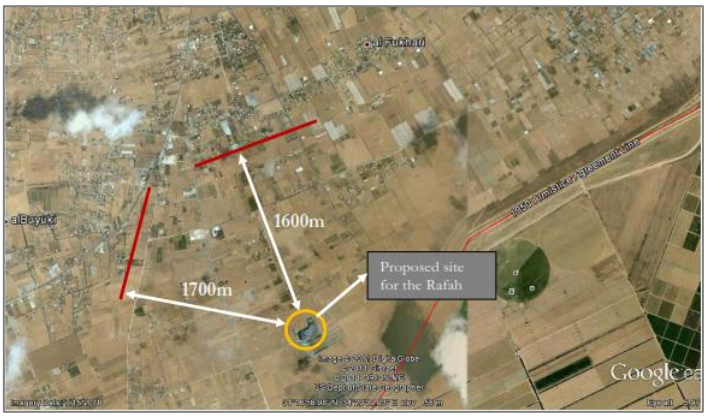


Figure 22. Proposed site for El-Fukhary landfill (indicated by a yellow circle) (EcoConServ, 2012)

3.1.9 Roads and Transportation

The existing access roads to the landfill are presently damaged and show insufficient width and tonnage capacity.

The access road is connected directly to Salah El-Deen Street (the main road crossing Gaza strip) and comprises two main roads leading to the site. The first access road starts from Salah El-Deen Street and is about 2.3km long and 18m wide. Only 6m of this road are paved. The second access road is about 500m long and 10m wide, of which only 6m are paved. This second road links the first road with the landfill site. Following Figure (23) shows the two roads to the dumpsite location.

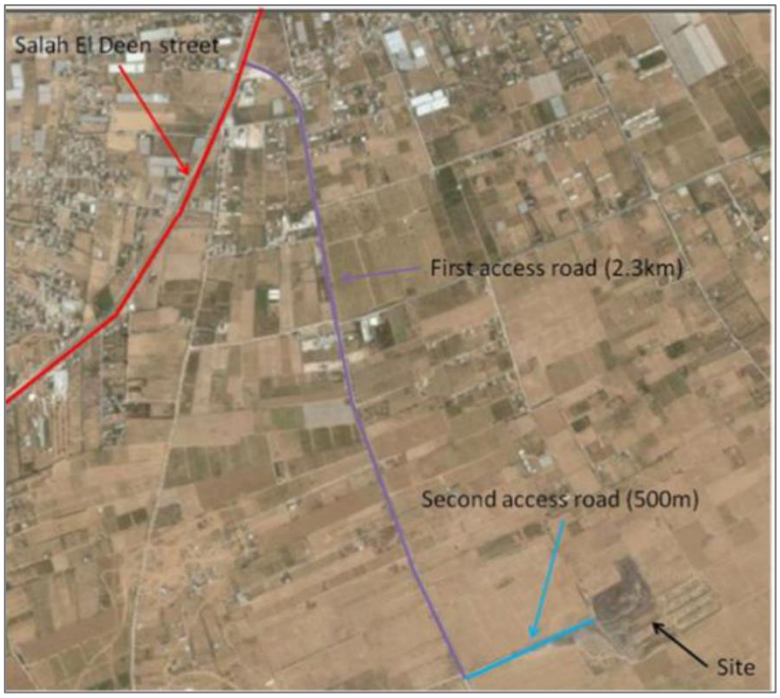


Figure 23. Different access roads to Rafah landfill site (J.V. Antea Group, EngiCon, EMCC, 2015)

First road is 18m wide of which only 6m are paved; 4m from each side are unpaved (which leads to a 14m-wide road and not 18m). The pavement of the first 1.2km is in a

good structural condition. Along the whole width of the road deep cuts are observed of 20cm deep by 6m long. The pavement of the other segment is in a general good condition with small holes and cracks with a total area of 20m². While, the second road is 10m wide with only 6m paved. About 2m from each side of the road are unpaved. The pavement of the first 200m is in a good structural condition. There are holes and cuts of about 20cm deep by 8m long along the whole width. There are several segments where the width of the road decreases to only 3m. In other segments, the condition of the road is generally good with a few cracks and small holes.

3.2 Biological Aspects

3.2.1 Fauna and Flora

No rare, sensitive or endangered fauna or flora species were observed during the visits to the site and that would be non-negatively impacted by the construction and operation activities of the landfill. Only the Olive and Aloe Vera trees near El Fukhary dumpsite need to be protected from possible contamination migration due to their cultural heritage. Diverse and abundant fauna species currently use the sites for nesting, breeding or feeding. These may be affected by the controlled operation of the landfills as compared with the existing situation. The number of birds observed at El Fukhary dumpsite was low, this is an important factor to be considered when assessing the impact on the nearby Rafah airport – which is not functioning at the moment.

ESIA of the Gaza Solid Waste Management Project which was conducted in 2012 presented the list of fauna and flora available in Palestine, and what found in El Fukhary region, no updates would be added.

3.3 Socio-Economic Aspects

In 1948, Gaza Strip had a population of less than 100,000 people. By 2007, approximately 1.4 million Palestinians lived in Gaza Strip, of whom almost one million were UN-registered refugees. The current population is estimated to be in excess of 2 million, distributed across five Governorates.

Unemployment continues to increase amongst youth and adults in Rafah; it is estimated that at least 58% of the population does not have a regular source of income. While, donors and civil society actors continue to highlight the plight of the Gaza population in general, funding shortages and lack of viable political solutions has caused fatigue among the international community, especially concerning the Gaza Strip. This has resulted in the serious neglect of key projects including the reconstruction of necessary infrastructure like water, waste and power facilities. Likewise, programmes to improve governance, access to basic services, and psychosocial support have also been undermined by shrinking international interest and funding.

The local private sector in Rafah is yet to recover from the losses sustained from the 2014 hostilities, which caused extensive and widespread damage to productive assets, already weakened by the crippling ten-year long blockade. Continuing severe restrictions on imports and exports have driven many out of business, forced others to relocate to neighbouring Arab countries, or left those who remain working well below

production capacity. Gaza's private sector is isolated from the rest of the State of Palestine and from international markets, seriously reducing its productive capacity.

According to PCBS (2016) results of local economy study showed that there was an increase of those who are working in commerce, restaurants and hotels sector from 19.0% in 4th quarter 2015 to 22.2% in the 1st quarter 2016, and a decrease in the percentage of those who worked at transportation, storage and communication sector from 7.9% to 6.2% at the same period. On the other hand the results showed that the percentage of employed persons at services and other branches sector reached 52.0% in Rafah in the 1st quarter 2016.

3.3.1 Population

The following Table (2) provides an overview of the 2016 census performed by thePalestinian Central Bureau of Statistics (PCBS) and the projection for 2017, 2018, 2019.

Table 2. Rafah Population

Years	Rafah
2016	233,489
2017	241,124
2018	248,792
2019	256,480

Source: UNDP-DHV Feasibility study and detailed design for solid waste management in Gaza Strip

3.3.2 Cultural Properties

Tangible cultural Heritage

Gaza has its influential position within the Levant due to a number of religious, historic and commercial factors. The area is considered the birth place of most biblical religions with a good number of religious structures still remaining and functioning. Figure ….. shows the locations of historical sites in the GS. Most of the sites are located within the old city of Gaza such as the Great Umari Mosque. Those historic sites contribute to the tourism of Gaza and are subject to the Ministry of Tourism and Antiquities, no heritage site is located in the vicinity of El Fukhary site. The closest cultural site of significance is located more than 3 kilometers away from the site.

Intangible cultural Heritage

Both climate and vegetation contribute to the area being famous for its olive tree implantation. The area's inhabitants' livelihoods depend largely on olive and olive oil production. In addition, many locals have inherited the shepherding profession from their ancestors with all the related traditional activities which come within.

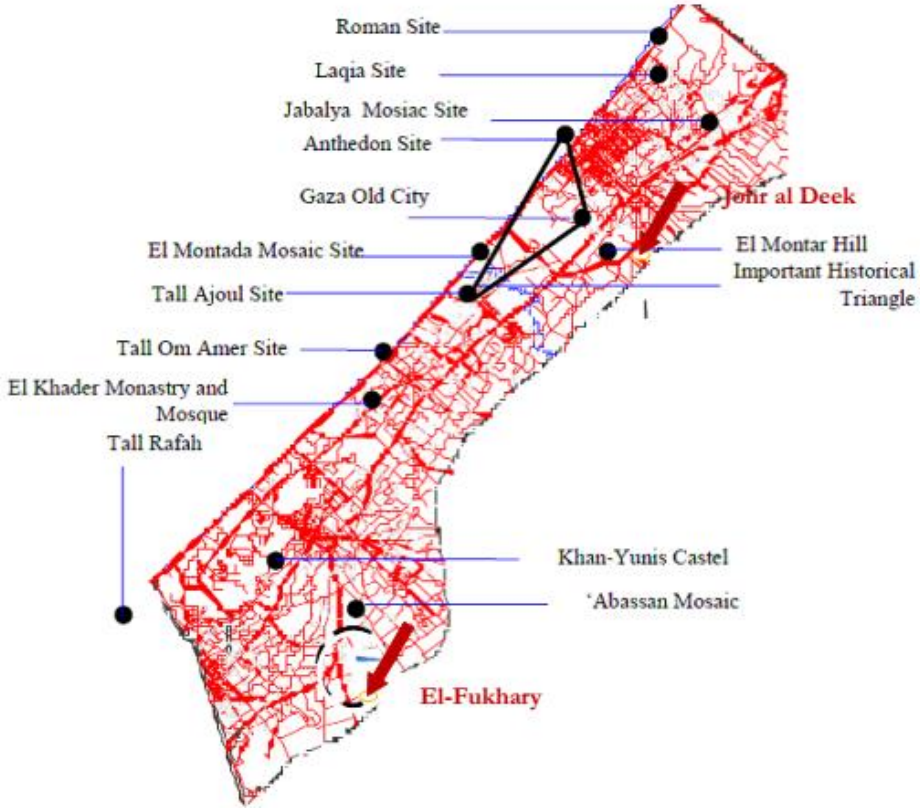


Figure 24. Map for the historical site attractions in the GS. Source (UNDP/PAPP 2009; PWA 2011)

3.3.3 Solid Waste Composition

According to the study implemented by Environmental Friends Society in 2012 for solid waste composition at Rafah City, the majority of the MSW are composed of organic waste with 65% as shown in Figure (25).

Component	Average (by Weight %)
Organic material	**65**
Paper and cardboard	**10**
Plastics	**10**
Glass	**3**
Metals	**5**
Others	**7**

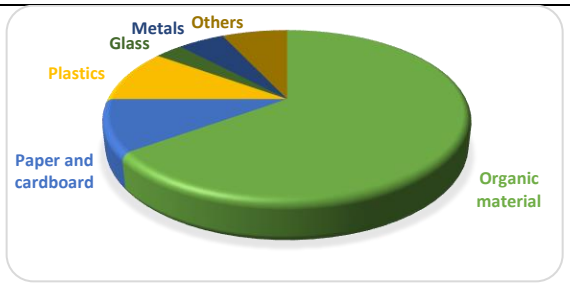


Figure 25.Composition of different waste fractions and average percentage in Rafah municipal waste

3.3.4 Transportation of Solid Waste

InRafahmuniciplaity18 vehicles are basically used in the solid waste, five Compactors, one Tipper Cranes, two Hook Lifts, one Skip Lift, two Tippers, four tractors, two wheel loaders and one skid loader. The following table (3) shows the different types of vehicles

Table 3. Different types of vehicles by Rafah municipality 2016

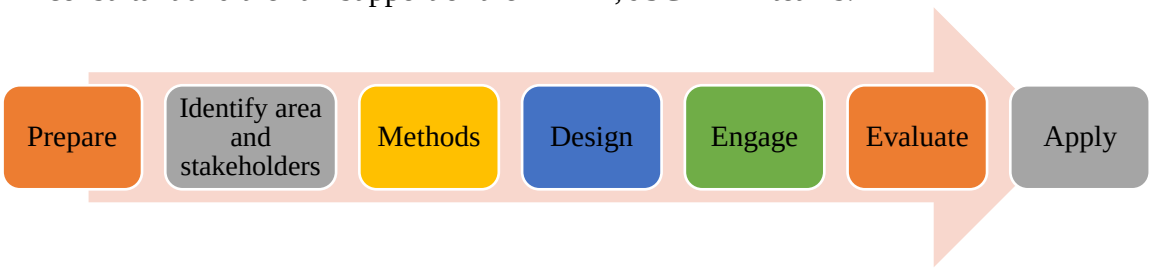
Make	Type	Year of Production	Vehicle No.
DAF-PF183M	Compactor	2000	3045455
DAF	Compactor	2004	3077055
DAF-CF75/1250	Compactor	2001	3043755
Iveco-H03E091	Compactor	1999	3007355
Isuzo-NPP	Compactor	1995	3074055
Renault-280DXT	Tipper crane	2008	3050055
Volvo-FH12	Hook lift	2002	30101555
Volvo-FH12	Hook lift	2002	30101655
Mercedes	Skip lift	1994	3060255
DAF	Tipper	1998	3080055
Volvo-FL12	Tipper	1993	3056955
Messi Ferguson	Tractor	1995	3069055
Messi Ferguson	Tractor	1996	3068755
Messi Ferguson	Tractor	1995	3068955
Fiat	Tractor	2000	3056755
Caterpillar 950G	Wheel Loader	2005	3244119
Caterpillar 950B	Wheel Loader	1987	3305019
Pop Cat	Skid loader	2000	3237219

Based on recent information from Municipality of Rafah there is around 150 Tons of municipal solid waste is transferred daily to El Fukhary dumpsite from Rafah Municipality, UNRWA, Shuka Municipality, Nasr Municipality, and El Fukhary Municipality.

3.4 Stakeholders Engagement

Public participation and consultation is an integral part of environmental and social management plan (ESMP) polices overall the words. The comprehensive stakeholder engagement in the projects allows the effective identification, assessment, and management of any environmental and social risks in advance. The public consultation and participation facilitate adequate public input for identifying issues, evaluating their significance and for deciding measures to avoid or mitigate impacts. It gathers support for the project and increase comfort level of decision makers. At the same time, the interested stakeholders are taking into account throughout the project lifecycle. Early involving of the public in the ESMP can result in several positive outcomes: public is better informed about the project proposal; different viewpoints of the project are brought forward early in the planning phase; issues and concerns can be analyzed and evaluated; and potential points of disagreement between parties are identified and considered. In the other side, public participation requires building partnerships between the public, the proponent, governments and other organizations related to the plan activities. The adequate public input into the decision-making process raises the level of comfort of decision makers.

The following chart summarizes the social engagement process that undertaken by the consultant and the full support of the MDLF, JSC KRM teams:



The main activities to ensure an adequate stakeholders engagement include but not limited to the following activities:

- Field Visits to the project area;
- Identify and engage with stakeholders, using participatory approach applied in the engagement with project-affected individuals, communities, as well as other relevant stakeholders;
- Documentation of information (by reports, documents, photos, video, etc.);

Organize stakeholder information and participation workshop where the project is presented to Al Fukhary community and there are opportunities for them to analyze it, raise their concerns, and participate in the proposal of mitigation measures. This workshop/participatory meeting is carried out in Al Fukhary Construction Camp-Meeting Hall on 28.09.2017.

3.5 Consultation Workshop with Local Communities

On 28 September 2017 the consultant in coordination with MDLF, JSC KRM and Al Fukhary municipality conducted a consultation workshop (Figure 26). The workshop attended by representatives of Al Fukhay Municipality, local community members, local farmers and land owners, local NGOs, MDLF staff, JSC KRM staff. The design consultant presented the design and operation sequences of the interim short-term cell. The ESMP presented the following issues:

- Conditions of project approval;
- The impacts within predicted or permitted limits;
- Action to manage unanticipated impacts;
- Ensure maximum environmental benefits;
- Learn from experience in order to improve ESIA process and practice;
- What is required? Identify the scope and components of the programme;
- Who will carry out the activities? Indicate the roles and responsibilities of key agencies and individuals;
- How will the programme be carried out? Specify the resources, expertise and arrangements necessary to give effect to ESIA follow up, and report results.

The participants discussed five thematic topics, the possible impacts, mitigation measures, Monitoring procedures, and responsible bodies were suggested for each topic. The five thematic groups are:

- Group 1: Public health and Workers Safety;
- Group 2: Water;
- Group 3: Roads and Transportation;
- Group 4: Soil;

- Group 5 Air pollution and Noise.

The results of the workshop presented in the following Scoping matrices:

Group 1: Public Health and Workers Safety			
Construction phase			
Impacts	**Mitigation**	**Monitoring**	**Responsible party**
• Noise from construction works. • Risks on workers safety (dust emissions, odors, excavation risks …etc)	• Reduce the implementation period. • closing the area with a fence, and prevent strangers to enter the construction area. • Workers to comply with wearing the protective equipment. • Limit work on day time only. • Safety training for workers	• Regular monitoring of dust, and noise by observation. • Workers compliance of wearing the protective equipment	• The Contractor • Supervision Team • JSC KRM • MDLF
Operational phase			
Impacts	**Mitigation**	**Monitoring**	**Responsible party**
• Odor • Dirt, dust • Epidemics diseases (Chest, skin, eye) • Water Pollution • Injuries of workers	• Workers to comply with wearing the protective equipment. • Monitoring groundwater aquifer • Spraying water in the route of trucks to decrease dust emissions. • Close the area with fence.	• Regular monitoring of odor and dust. • Workers compliance of wearing the protective equipment	• The Contractor • Supervision Team • JSC KRM • MDLF

Group 2: Water			
Construction phase			
Impacts	**Mitigation**	**Monitoring**	**Responsible party**
• none	• none	• none	• none
Operational phase			
Impacts	**Mitigation**	**Monitoring**	**Responsible party**
• Pollution of groundwater from the leachate	• Installation of leachate collection system and protective compacted clayey layers under the waste. • Testing the groundwater aquifer periodically.	• Monitor the water quality results • Monitor the installation of protective area and leachate collection system.	• Contractor • Supervision Team • JSC KRM • MDLF
Group 3: Roads and Transportation			

During the construction phase			
No traffic impacts are expected during the construction of the short-term cell due to the following reasons: - The required construction vehicles are very limited, and they will not leave site during construction period. - The construction site is far from the residential area; - The transported materials will be imported in limited time.			
During the operational phase			
Potential impact	Mitigation measures	Monitoring	Responsible Authority
• Dusts results from the trucks movement.	• Spraying water in the bath of vehicles. • Determine the speed of vehicles.	• Monitor the speed of vehicles • Monitor compliance with water spraying frequently	• Contractor • Supervision Team • MDLF • JSC-KRM
• Noise result from the vehicles during transferring the solid waste	• Determine Working time during the day. • Organizing receiving of waste from municipalities, and from the reshaping wastes to fade the congestion that causes noise. • Regular Vehicle maintenance	• Identify clear work plan and specific dates and time for the start of the combination receive of waste to avoid congestion at the same time. • Determine periodic maintenance plan	• Municipality of Rafah and UNRWA • Contractor • Supervision Team • JSC KRM • MDLF
• Waste Blowing Out from the Vehicle and Odor	• Cover the trucks that carry wastes in case of receiving complaints.	• Accept complaints from the population	• Rafah Municipality • Contractor • Supervision Engineer • JSC KRM • MDLF

Group 4: Soil			
During Construction phase			
impacts	**Mitigation**	**Monitoring**	**Responsible party**
• Landslides during the construction process. • Waste erosion from the existing dump site	• Ensure the cohesion of the soil during excavation and construction • Ensure a buffer zone is enough far from the existing dump site. • Closing the construction area	• Monitor the excavation activities. • Monitor compliance with wearing protective equipment	• The Contractor • Supervision Team • MDLF
• Oils spills resulting from heavy machinery	• Regular maintenance and prevent oil spills.	• Monitor the oil spills.	• The Contractor • Supervision Team • MDLF
• Waste from construction camp	• Waste to be stored in containers and dumped in the dumpsite.	• Monitor the site clearance.	• Contractor • Supervision Team
During Operational phase			
impacts	**Mitigation**	**Monitoring**	**Responsible party**

• Leakage of leachate into the soil	• Installation of protective compacted clayey layer and leachate collection system.	• Monitor the installation of protective layer • Monitor the effectiveness of leachate system	• Contractor • Supervision Team • JSC KRM • MDLF

Group 5: Noise and Air Pollution			
At the construction phase			
Potential impact	**Mitigation measures**	**Monitoring Programs**	**Responsible Authority**
• Noise due to Constructions.	• Limit the speed of vehicles • Determine Working time during the day	• A permanent and regular supervision, inspection and monitoring of all construction activities.	• Contractor • Supervision Team • MDLF • JSC-KRM
• Dust and air pollution	• Spraying water frequently • Determine Working time during the day • Cover the trucks that carry wastes in case of complaints		
• Construction Wastes	• Prevent waste burning • Collect wastes and carry it to landfill		
At the operational phase			
Potential impact	Mitigation measures	Monitoring Programs	Responsible Authority
• Dusts results from the trucks.	• Spraying water frequently • Determine the speed of vehicles.	• Ensure trucks route safety and it's cleanliness • Monitor the speed of vehicles	• Rafah Municipality • Contractor • Supervision Team • MDLF • JSC-KRM
• Noise result from the vehicles	• Determine Working time during the day. • Vehicle maintenance.	• Monitor the Working time • Monitor Vehicle maintenance	

Figure 26. Photos of the consultation workshop/meeting with the local communities and stakeholders

4. POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS DURING CONSTRUCTION AND OPERATION PHASES

4.1 Methodology

The environmental, social and health impact identification procedure followed in this report was based on identifying the key environmental and social features from the baseline information. The key physical, biological, socioeconomic and human valued receptors were identified. The potential positive and negative changes resulting from the defined project activities are then described using an impact identification matrix through which aspects and factors are correlated to find interactions that would potentially result in impacts. The predicted impacts are then evaluated using a significance ranking process based on the importance of the impact. Each valued receptor was categorised in terms of its perceived environmental, social and health value.

The impact significance is used to determine whether the impacts are low, medium, high or no impacts is associated. The following categories are assigned to impacts magnitude and the impacts time scale based on the following:

- Time scale:
  1. Short term ($\leq$ 1 month)
  2. Medium Term (1 month $\leq$ duration $\leq$ 1 year)
  3. Long term (more than 2 years)
- Magnitude:
  1. Low: the impacts have low effects on the physical, biological, socioeconomic and health.
  2. Medium: the impacts have limited effects on the physical, biological, socioeconomic and health.
  3. High: the impacts have severe and significant effects on the physical environment, biological, socioeconomic and health.

4.2 Identification and Analysing of Cumulative Impacts

According to the site visits and stakeholder meetings the consultant identified many cumulative impacts of the construction and operation of Interim ST cell and its extension. There would be many impacts on social and environmental aspects. During construction phase, there is concerns of increasing noise and dust emissions due to construction work and excavation. Impact from dust and litter spreading as a result from movement of heavy machinery, waste cut and backfill, soil excavation during construction works will lead to inconvenience of the local community. More potential impacts could happen during the operational phase such as soil and groundwater contamination by leachate. Potential impacts on health and welfare of the neighboring residents represented by spreading insects, flies and other vectors. Also, dust, air pollution and waste falling during the traffic movement from/to the site would be among the potential impacts. However, the interim ST cell and its extension would have positive impacts on the area where they will solve the problem of scattered waste in Cell 1A and Cell 1B, and will eliminate the dangerous severity of instability of the existing dumpsite sides. Moreover, the construction and operation of the ST cell and its extension will create new job vacancies in the local community in the short term.

The alternative design proposed in “scenario 3” will take into consideration the key potential impacts and it will propose mitigation measures to decrease the potential impacts.

Table 4. Potential Environmental and Social Impacts during Construction phase

POTENTIAL IMPACTS DURING CONSTRUCTION PHASE			
Potential Impact	**Description**	**Timescale**	**Magnitude**
Physical Environment			
Climate	- No significant impacts on the climate is expected from the construction of the temporary dump site - However, both methane and carbon dioxide produced from the existing landfill are greenhouse gases where methane has significant impacts on global warming.	Short term	Medium
Geology, Geomorphology and Soil	- Transfer the soil to other locations - Soil erosion - Soil contamination with leachate migration from the landfill	Short term	Medium
Topography and landscape	- Changing the topographic features of the area	Short term	Medium
Surface water and Groundwater	- Hydrological changes linked to excavation - Changing water drainage properties which could divert surface water drainage streams to un-preferred locations - Water quality impacts from excavations or from pollutant spillages during construction. - The migration of the landfill gas through the soil could cause acidification of the groundwater due to the reaction between carbon dioxide in the landfill gas and the water to produce carbonic acid, especially that carbon dioxide is relatively dense gas that tends to move downwards.	Short term	Low

POTENTIAL IMPACTS DURING CONSTRUCTION PHASE			
Potential Impact	**Description**	**Timescale**	**Magnitude**
Noise emissions	- Noise emissions due to construction work and trucks movements - Excavation and building works. - Movement of trucks carrying excavated soil and trucks bringing construction materials to the site. - Operation of standby-generators.	Short term	Medium
Ambient air quality	- Dust emissions from construction and trucks movement - Litter emissions from reshaping works when cutting and backfilling and when removing scattered waste - Gas (CO, CO2, H2S, CH4, Mercaptans) smokes emissions from reshaping works when cutting and backfilling and when removing scattered waste - Dust emissions from Earthworks, including excavation and construction of peripheral embankments; - Action of the wind on stored construction materials; - Emissions from road works; - Site facility construction; - Vehicle movement around the site on unfinished roads - Operation of standby-generators.	Short term	High
Odor	- The reshaping works will result in migration of offensive odors due to waste degradation - The odor of the transferred scattered waste	Short term	High
Biodiversity			
Flora	Only Olive and Aloe Vera trees at El-Fukhary site. At the surrounding agricultural some types of vegetables and fruits were observed and need to be protected from possible dust and litter during construction works.	Short term	Low

POTENTIAL IMPACTS DURING CONSTRUCTION PHASE			
Potential Impact	**Description**	**Timescale**	**Magnitude**
Fauna	The construction work will have low effect on some fauna in the area such as birds and dogs.	Short term	Low
Economic Issues			
Direct employment and income	Construction will create a low number of new jobs. Purchase of limited quantities of construction material and rent of construction equipment.	Short term	Low
Indirect/induced employment and income	- Very limited indirect employment and income impacts as the project duration will be short	-	Low
Sources of supplies, materials and services	- Very limited impacts	Short term	Low
Infrastructure	- If the leachate is not properly collected from the landfill body it could form stress on the base lining system, and raise the risk for loss of containment. - Damage to road infrastructure from excavations, construction traffic and heavy machineries. - The absence of water and wastewater networks as the project area is not urban area, so no impacts are expected	Short term	High
Indirect/induced economic development	- Indirect economic development will not be affected as: - The temporary dumpsite is located in isolated area that will not negatively affect the economic development. - The construction phase is limited and expected to have limited positive effects on industrial, agricultural, commercial development.	- Short Term	Medium

POTENTIAL IMPACTS DURING CONSTRUCTION PHASE			
Potential Impact	**Description**	**Timescale**	**Magnitude**
Social Elements			
Demographic change	The residential areas are more than 1 km from the dumpsite, so it will not affect the demographic distribution in the area.	-	No effects
Transportation and traffic	- Limited increase of traffic volume by transfer trucks - Traffic induced by exportation of excavated soil off-site - Probability of accidents	short term	Medium
Social support	- The surrounding community is very limited; however, they may have some concerns: odors, litter.	Short term	Medium
Community stability, cohesion and well being	- Minimum impact will be on the community stability, cohesion and wellbeing since the nearest residential area is far more than 1 km.	Short term	No effects
Cultural and Heritage Aspects			
Antiquity Objects	- Based on the available information from Ministry of Tourism and Antiquities (MoTA), no effects are expected. - However, the extensive excavation that will be carried out, up to 20 meters, could lead to finding any antiquity or culturally valuable object.	Short term	Low
Human Health			
Local community health	- Direct impact from dust, odors, litter resulted from movement of heavy machinery	Short term	Low

POTENTIAL IMPACTS DURING CONSTRUCTION PHASE			
Potential Impact	**Description**	**Timescale**	**Magnitude**
Worker health and safety	- The Methane gas when present in air with concentrations between 5-15% it could have an explosion potential which causes a safety risk. - The CO gas generated by internal fire starts and contained within smokes emitted may potentially be critical for heavy machinery drivers when cutting waste for reshaping existing dumpsite or transferring the scattered waste from cell 1 onto ST cell. - Landfill gas migration to the air with concentration of Methane, CO2 and H2S. - Physical hazards from falling and injuries. - Risks from movement of heavy machinery. - Physical hazards from contact with waste or leachate.	Short term	High

Table 5. Potential Environmental and Social Impacts during Operation phase

POTENTIAL IMPACTS DURING OPERATION PHASE			
Residual Impact	**Description**	**Timescale**	**Magnitude**
Physical Environment			
Climate	- Both methane and carbon dioxide produced in the nearby landfill are greenhouse gases where methane has significant impacts on global warming.	Long term	Low
Geology, Geomorphology and Soil	- Reception of the soil to cover cells - Soil contamination with leachate migration from the landfill	Long term	Medium

POTENTIAL IMPACTS DURING OPERATION PHASE			
Residual Impact	**Description**	**Timescale**	**Magnitude**
Topography and landscape	- Changing the topographic features of the area - Permanent loss of existing small scale agricultural areas at locations.	Long term	Medium
Surface water and Groundwater	- Water quality impacts from excavations or from pollutant spillages during dumping waste. - Infiltration of the leached to aquifer. - Polluted storm water that accumulates in the winter season in the landfill area, that could infiltrate to the groundwater. - The migration of the landfill gas through the soil could cause acidification of the groundwater due to the reaction between carbon dioxide in the produced landfill gas and the water to produce carbonic acid.	Long term	Low
Noise emissions	- Noise emissions due to operational work with heavy machinery - Movement of trucks carrying soil to cover the cells. - Increased levels of noise from the movement of vehicles	Long term	Medium
Atmospheric emissions and Ambient air quality	- Dust emissions from construction and trucks movement. - Earthworks, including excavation and construction of peripheral embankments; - Vehicle movement around the site on unfinished roads - Operation of standby-generators. - Landfill gas passive migration to the air with concentration of Methane, H2S, CO2, CO, CH4, NH3, NOx, PM - The flaring/combustion of landfill gas causes air emissions of CO_2, CO, NOx, PM, and trace gases that impact the air quality in adjacent areas.	Long term	High

POTENTIAL IMPACTS DURING OPERATION PHASE			
Residual Impact	**Description**	**Timescale**	**Magnitude**
Odor	- The odor of the transported, cut and backfilled waste - The impact of odors is normally considered a mere annoyance, as foul smells can rarely harm health directly - The odor impacts could be the cause of public opposition	Long term	Medium
Biodiversity			
Flora	- Only Olive and Aloe Vera trees at El-Fukhary site. At the surrounding agricultural some types of vegetables and fruits were observed and need to be protected from possible contaminants migration	Long term	Low
Fauna	- The operation work will impact on the presence of some fauna in the area such as birds, mammals and reptiles.	Long term	Low
Economic Issues			
Direct employment and income	- The operation phase will have minimum impacts on the jobs creation.	Long term	Low
Sources of supplies, materials and services	- No impact	-	-
Transportation and Traffic	- Disruption of traffic movement. - Probability of accidents	Long term	Medium
Infrastructure	- If the leachate is not properly collected from the landfill body it could form stress on the base lining system, and raise the risk for loss of containment. - Damage to road infrastructure from movement of vehicle.	Long term	High
Time value	- The use of the temporary dumpsite will increase the lifetime of the existing landfill - Reducing the trip time by reducing the dumping time - Will provide enough time for appropriate design of the planned landfill.	Short term	Medium

POTENTIAL IMPACTS DURING OPERATION PHASE			
Residual Impact	**Description**	**Timescale**	**Magnitude**
Indirect/induced economic development	- The temporary dumpsite is located in isolated area that will have impacts on the economic development unless if the development activities are in similar fields such as wastewater treatment plant. However, it will have impacts on industrial, agricultural, commercial and residential development.	Long term	Low
Social Elements			
Demographic change	- The residential areas are more than 1 km from the dumpsite, so it will not affect the demographic distribution in the area.	Long term	Low
Transportation and traffic	- Limited increase of traffic volume by transfer trucks - Disruption of traffic movement. - Indirect impacts from disturbances from movement of vehicle. - Waste spillage from vehicles. - Traffic congestion on/at site. - Vehicle accidents at site.	Long term	Medium
Social support	- The temporary dump site will positively affect the social support for the municipality since it will improve the services of the overall solid waste management project in the area.	Long term	Low
Community stability, cohesion and well being	Minimum impact will be on the community stability, cohesion and wellbeing since the nearest residential area is far more than 1 km.	Long term	Low
Heritage Aspects			
Antiquity Objects	- No impacts	-	-
Human Health			

POTENTIAL IMPACTS DURING OPERATION PHASE			
Residual Impact	**Description**	**Timescale**	**Magnitude**
Local community health	- Ammonia, VOCs and hydrogen sulfide cause nuisance to surrounding areas. - Indirect impact from movement of heavy machinery on public safety - The presence of pathogens, vectors and insects may increase the health risk - Risks from movement of vehicle. - Indirect impacts on groundwater quality from accidental discharge/disturbance. - The presence of pathogens, vectors and insects may increase the health risk	Long term	Low
Worker health and safety	- Reduction of the negative safety impact due to implementation of the technical note design - The methane gas when present in air with concentrations between 5-15% it could have an explosion potential which causes a safety risk. - Physical hazards from falling and injuries. - Risks from movement of heavy machinery. - Physical hazards from contact with disturbances - The presence of pathogens, vectors and insects may increase the health risk - impacts on human health from contact with toxic substances within leachate and waste	Medium	High

5. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN DURING CONSTRUCTION AND OPERATION PHASES

The ESMP table summarizes the impacts and the suggested mitigation measures, monitoring activities, responsible parties and frequency of monitoring during the construction and operation phases. The following tables show the ESMP of Technical Note Design for Interim ST Cell in both Construction and Operation phases, and the monitoring plans.

5.1 Methodology

An Environmental and Social Management Plan (ESMP) translates the recommended mitigation and monitoring measures into specific actions that will be carried out. The ESMP involves the identification of feasible measures that may avoid or reduce potentially significant adverse environmental impacts to acceptable levels. The ESMP will need to be adjusted to the terms and conditions specified in all project approvals and permits.

5.2 Environmental and Social Management Plan during construction phase

During the construction phase, several negative impacts and other positive impacts are anticipated. The negative impacts are expected to be temporary. During the construction phase, it is the construction contractor responsibility to take into account all construction mitigation measures of construction activities. The following tables summarize the potential impacts, suggested mitigation measures, monitoring activities, responsible parties and frequency of monitoring during the construction phase for project sites.

5.3 Environmental and Social Management Plan During Operation Phase

During the operational phase, several impacts are anticipated. It is the Operation contractor and JSC-KRM responsibility to take into account all operation mitigation measures to alleviate the consequences of the negative impacts of operational activities. The following tables summarize potential impact, suggested mitigation measures, monitoring activities, responsible parties and frequency of monitoring during the operation phase for project site.

5.4 Grievance Redress Mechanism:

Grievances mechanism will be activated for the local community to receive any complaints related to Short-Term cell either during the construction phase or the operation phase, For the whole project, GRM will be activated for the local community to receive any complaints related to Short-Term cell and the project at large. The system includes different channels, most importantly:

1- The complaint box: A complaint box will be installed in all the JSC facilities; these boxes will be supplied with an instruction board and hard copies of grievances application to be filled when there is a grievance to be submitted.
2- Using the Facebook page: by inviting the people to send their complaints using the JSC Facebook page since the website is still under construction, and the Facebook

page will be announced in all the public meetings and on a board located besides the complaint box at the landfill camp.

3- Phone calls and emails: the instruction board above the complaint box will contain phone numbers of the JSC-KRM (Telephone: +97082076001, Fax: +970820776008) and the mobile number of the social specialist (+970597652008) and email address of JCKRM (jsckrm2014@gmail.com) and the email address of the social specialist (eqandeel.jsckrm@gmail.com). Those will also be disseminated to the public through the Project Facebook page and in community meetings.
4- Online application: a website for the JSC is under construction and it will contain a link to an online grievance application to be filled by the different communities all the time.

Acknowledgment for receiving the complaint will be offered to complainant in 2 business days from receiving and then 5 business days will be taken to resolve and close the complaints under the direct control of the projects and the contractors. Longer period might be needed to address complaints that are not under the direct autonomy of the project and in such cases, the complaint will be diverted to the concerned parties and feedback will be offered to the complainant accordingly.

As soon as the grievance received the following steps will be followed to apply the process:

1- Sort and process: the grievance will take a serial number. The compliant urgency will be checked using the priority sheet.
2- Acknowledge and follow up: the complainant will receive a confirmation SMS that his/her complaint was received and is being handled using the GRM process.
3- Verify, investigate and act: the PDSU-MDLF, and TOU-JSC teams will verify and investigate about the grievance in the field and send a reply back to the complainant to inform about the response and the solution, this will be according a certain time plan for every action as mentioned above.
4- Monitor and evaluate: the JSC-KRM social specialist will check the satisfaction of the complainant through monitoring plan and then record all the process in the monthly report.
5- In case, the complainant can declare about his/her dis-satisfaction with the response of the tier one channels mentioned above, and submit another complaint for a higher level in the JSC-KRM. The social specialist will report about the problem, its solution, the person/the department who contributed in solving the problem and then the comments of the complainant on the provided solution. The executive manager of the JSC-KRM will receive the report and investigate it, then take an action, and report it to r the chairman of JSC-KRM, to be involved in the action.

***Note**: the chairman of the JSC-KRM is a Mayor who had authorization to take any action in the southern and middle governorates with cooperation with any other entity (municipality, governmental associations, NGOs,..), so involving the chairman will ensure the fairness of the solution.*

5.5 Implementation and Reporting Arrangements

The implementation of mitigation measures will be the responsibility of the contractor in the construction phase, whereas PDSU and TOU will monitor the compliance with mitigation measures and they will report to the Bank. In the operational phase, JSC-KRM will be responsible in cooperation with Rafah Municipality to comply with the

required mitigation measures, while EQA and MDLF will monitor the operational works and compliance with the mitigation measures. PDSU will report regularly to the bank. Qualified environmental and social specialists are assigned in the PDSU and JSC to be in charge of the monitoring of the compliance with the ESMP.

Table 6. Summary of the Environmental and Social Management Plan for Interim ST Cell during construction phase

ENVIRONMENTAL AND SOCIAL ASPECTS	IMPACTS	MITIGATION MEASURES	IMPLEMENTATION RESPONSIBILITY
Physical Aspects	Soil erosion and land take by spoil storage	1. 1. Storage of soil spoils in flat area close to landfill, away from drainage pattern.	Contractor
		2. Ensure that the staging areas used are fenced and marked prior to construction activities	Contractor
	Deterioration of air quality by dust, caused by construction works and vehicles	3. Spraying of water before excavations during strong winds and dry periods.[1]	Contractor
		4. Wet of cover securely stockpiles of materials during windy or rainy conditions	Contractor
		5. Issue site workers with appropriate dust masks and safety requirements	Contractor
	Noise impacts caused by construction machinery	6. Regular maintenance of construction machines and trucks	Contractor
		7. Fixed equipment and loading and unloading, stockpiling areas should be located far from sensitive receptor	Contractor
		8. Limiting construction works to daytime working hours	Contractor
	Environmental impacts of	9. Domestic waste should be stored in containers and disposed when fill up.	Contractor

[1] **Source of water**: The water will be transferred by tanker vehicle from the nearest municipal water well (3 km distance). The used quantity of water is not significant and it will not affect access to water.

ENVIRONMENTAL AND SOCIAL ASPECTS	IMPACTS	MITIGATION MEASURES	IMPLEMENTATION RESPONSIBILITY
	construction camp	10. Sewage tanks should be periodically checked, emptied, and sewage should be taken to the WWTP.	Contractor
		11. Used oil, filters, spoiled textiles and others waste generated by level 1 on-site maintenance of heavy mobile equipment are separately stored in containers located in the camp workshop.	Contractor
		12. Retention concrete reservoir of the fuel tanks allow checking potential leakages of the fuel tanks	Contractor
		13. Restriction the access of unauthorized people	Contractor
Biological Aspects	Loss of agricultural land	14. Prevent use of agricultural soil for filling, excavating, trenching or stockpiling of materials	Contractor
	Impact on the Flora and Fauna during the construction works	15. Install fencing around the project area	Contractor
Human Health Aspects	Side stability risks of the constructed Interim ST Cell beside the existing dumping site	16. Refer to the technical note detailing action plan phasing and all design parameters contributing to geotechnical short term and long term stability of the existing dumpsite.	Contractor
	Health of Contractor's and subcontractor's workers	17. Use of safety wear and masks by workers	Contractor
		18. Fence the work area, and install warning signs	Contractor
		19. Vaccination against leptospirosis and tetanus of all workers assigned on site	Contractor

ENVIRONMENTAL AND SOCIAL ASPECTS	IMPACTS	MITIGATION MEASURES	IMPLEMENTATION RESPONSIBILITY
		20. Availability of first aid kits	Contractor
		21. Conducting safety training for workers	Contractor
		22. Expand the new sanitary landfill emergency plan to include the Interim Short-Term cell and its extension	Contractor
		23. Welcome procedure set up for control of age, qualifications of new workers assigned. Presentation of safety rules, emergency plan.	Contractor
		24. Control procedure of new mobile equipment mobilized on site: insurances, mandatory periodical compliance verification certificates.	Contractor
Social and Economic Aspects	Social impacts related to interactions of workers with communities	25. The Contractor is to hire workers from local community.	Contractor
		26. Restrict the communication between workers and the surrounding local community.	Contractor
		27. No camp for accommodation at the night except for the camp guard.	Contractor
		28. A code of conduct of the workers should be prepared and implemented for all workers in the construction camp.	Contractor
	Lack of acceptance to the project from the side of the local communities	29. Continue the consultations with the communities and the coordination with the municipalities to ensure the level of acceptance for the project is increasing.	JSC KRM and MDLF

ENVIRONMENTAL AND SOCIAL ASPECTS	IMPACTS	MITIGATION MEASURES	IMPLEMENTATION RESPONSIBILITY
	Inconvenience to local community due to Noise, Dust, Litter, traffic …etc	30. Restricting construction works during certain hours in the day	Contractor
		31. Full restriction from access to the site: Guardians assigned 24/24 h ; 7d/7d for site surveillance.	Contractor
		32. Use workers from the local community as much as possible	Contractor
		33. Grievance uptake Channels to be created in the site for any coming complaints during construction by ensuring significant number of indicative signs around the project site (including contact information, project description, etc.) and using the complaint box located at the landfill camp.	Contractor
		34. Information sharing with the community, and forming a committee from the local residents for monitoring the construction of TS	JSC-KRM
		35. 35. Sort and process the received complaints	JSC-KRM
		36. Acknowledge and follow up the complaints	JSC-KRM
		37. Verify, investigate, and act to determine the validity of received grievance	JSC-KRM
		38. Monitor, evaluate and provide feedback	JSC-KRM
		39. Ensure documentation for any received compliant	Contractor, JSC-KRM

ENVIRONMENTAL AND SOCIAL ASPECTS	IMPACTS	MITIGATION MEASURES	IMPLEMENTATION RESPONSIBILITY
	Workers' rights	40. Train the workers about safety and health measures	Contractor
		41. Provide all required safety protective equipment to workers, and provide first aid kits for any potential injuries	Contractor
		42. Provide insurance for all workers in the site (all risks insurance schedule policy and workmen compensation insurance policy extended to sub-contractors, supervisors, JSC staff assigned on site).	Contractor
	Equipment Safety	43. Provide insurance for all vehicles inside the site and updated compliance certificates (mandatory periodical verifications).	Contractor
		44. Provide first aid kits in each vehicle	Contractor
		45. Provide portative 5 gas detectors and thermal IR camera	Contractor
	Risks of damaging chance-find antiquities	46. Monitoring of site excavations	Contractor
		47. Immediate information sharing with concerned organization	Contractor

Table **7**. Summary of the Environmental and Social Monitoring Plan for Interim ST Cell during construction phase

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
Physical Aspects	1. Storage of soil spoils in flat area close to landfill, away from drainage pattern.	Visual observations	Once a week, Monthly for Same point vantage photographs	Supervision Engineer, JSC KRM and MDLF PDSU
	2. Ensure that the staging areas used are fenced and marked prior to construction activities	Visual observations	In the beginning of construction	MDLF
	3. Spraying of water before excavations during strong winds and dry periods.[2]	Visual observations, logbook	Twice a week during dry weather or strong winds	Supervision Engineer, MDLF, JSC KRM
	4. Wet of cover securely stockpiles of materials during windy or rainy conditions	Visual observations, site inspection	Daily during wet weather or strong winds	Supervision Engineer, MDLF, JSC KRM
	5. Issue site workers with appropriate dust masks and safety requirements	Visual observations, site inspection	Randomly (at least twice a week)	Supervision Engineer, MDLF, JSC KRM
	6. Regular maintenance of construction machines and trucks	Logbook, random physical checks	Daily (Contractor) Weekly (Supervision Engineer)	Contractor, Supervision Engineer
	7. Fixed equipment and loading and unloading, stockpiling areas	Visual observations	Daily	Contractor,

[2] **Source of water**: The water will be transferred by tanker vehicle from the nearest municipal water well (far about 3 km). The used quantity of water is not significant and it will not affect on the daily production.

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
	should be located far from sensitive receptor			Supervision Engineer, MDLF, JSC KRM
	8. Limiting construction works to daytime working hours.	Records of complaints, site inspections	Once a week	Supervision Engineer, MDLF
	9. Domestic waste should be stored in containers and disposed when fill up.	Visual inspections, logbook	Once a week	Contractor, Supervision Engineer
	10. Sewage tanks should be periodically checked, emptied, and sewage should be taken to the WWTP.	Visual observations, logbook	Once a week	Contractor, Supervision Engineer
	11. Used oil, filters, spoiled textiles and others waste generated by level 1 on-site maintenance of heavy mobile equipment are separately stored in containers located in the camp workshop.	Visual observations, logbook	Once a week	Contractor, Supervision Engineer
	12. Retention concrete reservoir of the fuel tanks allow checking potential leakages of the fuel tanks	Visual observations	Weekly	Supervision Engineer, MDLF, JSC KRM
	13. Restriction the access of unauthorized people	Visual observations	Weekly	Supervision Engineer, MDLF, JSC KRM

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
Biological Aspects	14. Prevent use of agricultural soil for filling, excavating, trenching or stockpiling of materials	Visual observations	Randomly (at least twice a week) during capping of dumpsite	Supervision Engineer, MDLF, JSC KRM
	15. Install fencing around the project area	Visual observations, photographic evidence	Once a week	Supervision Engineer, JSC KRM, MDLF
Human Health Aspects	16. Refer to the technical note detailing action plan phasing and all design parameters contributing to geotechnical short term and long-term stability of the existing dumpsite.	Visual observations	Daily	Supervision Engineer, JSC KRM, MDLF
	17. Use of safety wear and masks by workers	Visual observations.	Randomly (at least twice a week)	MDLF, JSC-KRM, Supervision Engineer
	18. Fence the work area, and install warning signs	Visual observations, photographic evidence	Once prior the construction phase	Supervision Engineer, MDLF, JSC-KRM
	19. Vaccination against leptospirosis and tetanus of all workers assigned on site	Audit	Random control	Supervision engineer
	20. Availability of first aid kits	Visual observations.	weekly	Supervision Engineer, MDLF, JSC-KRM
	21. Conducting safety training for workers	Visual observations, photographic evidence	Once prior the construction phase	Supervision Engineer, MDLF, JSC-KRM

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
	22. Expand the new sanitary landfill emergency plan to include the Interim Short-Term cell and its extension	Review the updated Emergency Plan	Once prior the construction phase	Supervision Engineer, MDLF, JSC-KRM
	23. Welcome procedure set up for control of age, qualifications of new workers assigned. Presentation of safety rules, emergency plan.	Attending and auditing this welcome procedure	Random control	Supervision engineer
	24. Control procedure of new mobile equipment mobilized on site: insurances, mandatory periodical compliance verification certificates.	Attending and auditing this control procedure	Random control	Supervision engineer
Social and Economic Aspects	25. The Contractor is to hire workers from local community.	Visual observation	Weekly	JSC-KRM, MDLF
	26. Restrict the communication between workers and the surrounding local community.	Visual observation	Daily	JSC-KRM, MDLF
	27. No camp for accommodation at the night except for the camp guard.	Visual observation	Weekly	JSC-KRM, MDLF
	28. A code of conduct of the workers should be prepared and announced for all workers in the construction camp.	Visual observations, log Book	Weekly	Supervision Engineer, MDLF, JSCKRM

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
	29. Continue the consultations with the communities and the coordination with the municipalities to ensure the level of acceptance for the project is increasing.	Results of the consultations Records of coordination between JSC and the municipalities	At different stages of the project.	MDLF, JSC KRM
	30. Restricting construction works during certain hours in the day	Visual observation	Weekly	Supervision Engineer, MDLF, JSC-KRM
	31. Full restriction from access to the site: Guardians assigned 24/24 h; 7d/7d for site surveillance.	Visual observation	Weekly	Supervision Engineer, MDLF, JSC-KRM
	32. Use workers from the local community as much as possible	Visual observation	Monthly	MDLF, JSC-KRM
	33. Grievance uptake Channels to be created in the site for any coming complaints during construction by ensuring significant number of indicative signs around the project site (including contact information, project description, etc.) and using the complaint box located at the landfill camp.	Logbook	Weekly	MDLF, JSC-KRM
	34. Information sharing with the community, and forming a committee from the local residents	Facebook posts, Forming committee, workshop	Four times per year	MDLF

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
	for monitoring the construction of TS			
	35. 35. Sort and process the received complaints	Logbook	Weekly	MDLF
	36. Acknowledge and follow up the complaints	Logbook	Weekly	MDLF
	37. Verify, investigate, and act to determine the validity of received grievance	Logbook	Twice a month	MDLF
	38. Monitor, evaluate and provide feedback	Logbook	Monthly	MDLF
	39. Ensure documentation for any received compliant	Excel sheets, Photographic evidence, logbook	Four times per year	MDLF
	40. Train the workers about safety and health measures	visual observations, photographic evidence	Monthly	Supervision Engineer, JSC KRM, MDLF
	41. Provide all required safety protective equipment to workers, and provide first aid kits for any potential injuries	Visual inspection	Weekly	Supervision Engineer, JSC KRM, MDLF
	42. Provide insurance for all workers in the site (all risks insurance schedule policy and workmen compensation insurance policy extended to sub-contractors, supervisors, JSC staff assigned on site).	Visual inspection	Monthly	Supervision Engineer, JSC KRM, MDLF

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
	43. Provide insurance for all vehicles inside the site and updated compliance certificates (mandatory periodical verifications).	Visual inspection	Weekly	Supervision Engineer, JSC KRM, MDLF
	44. Provide first aid kits in each vehicle	Visual inspection	Weekly	Supervision Engineer, JSC KRM, MDLF
	45. Provide portative 5 gas detectors and thermal IR camera	Visual inspection	Weekly	Supervision Engineer, JSC KRM, MDLF
	46. Monitoring of site excavations	Visual observations	Daily	Supervision Engineer, JSC KRM, MDLF
	47. Immediate information sharing with concerned organization	Visual observations, photographic evidence	On a daily basis during excavation works	Contractor, JSC KRM, MDLF.

Table 8. Summary of the Environmental and Social Management Plan for Interim ST Cell during operation phase

ENVIRONMENTAL AND SOCIAL ASPECTS	IMPACTS	MITIGATION MEASURES	IMPLEMENTATION RESPONSIBILITY
Physical Aspects	Accessibility to the Interim ST Cell and its extension, dumping risks.	1. A specific access road will be rescued on northern border for safe entrance of the incoming JSC SW vehicles. Contractor and sub-contractor vehicles will have separate access.	Contractor
		2. The access to the extension of ST cell will be granted by the central access ramp (7% slope) separating cell 1B from this extension cell. This access ramp is 10 meters' width, double way, and leads to a central turnover allowing dumping onto interim extension ST cell, cell 1B and cell 1A. An unloading metallic quay will secure dumping operations.	Contractor
		3. Restriction the access of unauthorized people	Contractor, JSC-KRM
	Contamination of Soil and groundwater by leachate Contamination of Soil and groundwater by leachate	4. Compacting of a 0.5-meter low permeability clayey layer (compaction every 25 cm) on the bottom of ST cell.	Contractor
		5. Compacting of 1.5 meters' low permeability clayey layer (compaction every 25 cm) on the bottom of the extension of ST cell.	Contractor
		6. Installation of a piezometer/monitoring well downstream of the groundwater	Contractor
		7. Sampling and testing from monitoring wells downstream of the groundwater flow	Supervision Engineer

ENVIRONMENTAL AND SOCIAL ASPECTS	IMPACTS	MITIGATION MEASURES	IMPLEMENTATION RESPONSIBILITY
		8. Installation of temporary lined Leachate lagoon for existing dumpsite and ST cell leachate.	Contractor
		9. Pump the leachate to the leachate lagoon, then to WWTP.	Contractor, JSC-KRM
			Contractor
	Wind caused littering during dumpsite reshaping and transferring the scattered waste	10. Avoid reshaping and waste moving during strong winds.	Contractor
Human Health Aspects	Deterioration of air quality by dust and litter caused by the operations of vehicles and by reshaping and transfer of the scattered waste	11. Water spray of the operation site	Contractor
		12. Implement preventive maintenance program for vehicles and promptly repair vehicle with visibly high exhaust	Contractor
		13. Strict application of personnel protective equipment and wear by Contractor's and sub-contractor's workers.	Contractor
	Risks during transferring the scattered waste	14. Prevent and/or stop burning of scattered waste by covering it with thin layer of sub-soil.	Contractor
	Risks during reshaping of steep slopes	15. Safe and stable (heavy) excavators, bulldozers and compactors should be used with appropriate crane, buckets, blades, sheep wheels.	Contractor
		16. Avoid the excavation just beside the existing dumpsite – Buffer zone 5m	Contractor
	Fires and explosions	17. Fire extinguishers to be available in the site all time and all mobile machinery	Contractor, JSC-KRM

ENVIRONMENTAL AND SOCIAL ASPECTS	IMPACTS	MITIGATION MEASURES	IMPLEMENTATION RESPONSIBILITY
	When reshaping	working on existing dumpsite equipped with extinguisher within the cabin.	
		18. Provide each heavy mobile machinery cabin with 5 gas detectors (GA 2000) for detection of rate of each gas and potential explosive atmosphere.	Contractor, JSC-KRM
	Health of Contractor's and subcontractor's workers	19. Vaccination of all workers assigned on site against leptospirosis and tetanus	Contractor, JSC-KRM
Social and Economic Aspects	Inconvenience to local community due to Noise, Dust, odor …etc Health of Workers	20. Restricting operation works during certain hours in the day	JSC-KRM
		21. Fencing the working area and control of its integrity	Contractor
		22. Grievance uptake Channels to be created in the site for any coming complaints during construction by ensuring significant number of indicative signs around the project site (including contact information, project description, etc.)	JSC-KRM
		23. Information sharing with the community, and forming a committee from the local residents for monitoring the construction of TS	JSC-KRM
		24. 35. Sort and process the received complaints	JSC-KRM
		25. Acknowledge and follow up the complaints	JSC-KRM
		26. Verify, investigate, and act to determine the validity of received grievance	JSC-KRM
		27. Monitor, evaluate and provide feedback	JSC-KRM

ENVIRONMENTAL AND SOCIAL ASPECTS	IMPACTS	MITIGATION MEASURES	IMPLEMENTATION RESPONSIBILITY
		28. Ensure documentation for any received compliant	JSC-KRM
		29. Strict instructions for the workers to wear the safety protective equipment	JSC-KRM
	Traffic Impact	30. Restrict transport trucks travel to the hours outside the rush hours.	JSC-KRM
		31. Strict monitoring to the road accidents as part of the monitoring plan	JSC-KRM
		32. Information sharing with the communities and establishments located by the road.	JSC-KRM
	Property Values	33. Strict Measures and best practices in managing the sites	JSC-KRM
		34. Assist Local communities in establishing community based monitoring committees	JSC-KRM

Table 9. Summary of the Environmental and Social Monitoring Plan for Interim ST Cell during operation phase

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
Physical Aspects	1. A specific access road will be rescued on northern border for safe entrance of the incoming JSC SW vehicles. Contractor and sub-contractor vehicles will have separate access.	Visual observations	Daily	Supervision Engineer, JSC KRM, MDLF
	2. The access to the extension of ST cell will be granted by the central access ramp (7% slope) separating cell 1B from this extension cell. This access ramp is 10 meters' width, double way, and leads to a central turnover allowing dumping onto interim extension ST cell, cell 1B and cell 1A. An unloading metallic quay will secure dumping operations.	Visual observations	Daily	Supervision Engineer, JSC KRM, MDLF
	3. Restriction the access of unauthorized people	Visual observations	Weekly	Supervision Engineer, JSC KRM, MDLF
	4. Compacting of a 0.5-meter low permeability clayey layer (compaction every 25 cm) on the bottom of ST cell.	Visual observation, inspection reports, photographic evidence.	Twice a week	Supervision Engineer, MDLF, JSC KRM
	5. Compacting of 1.5 meters' low permeability clayey layer (compaction every 25 cm) on the	Visual observation	Once prior the construction phase	Supervision Engineer, JSC KRM, MDLF

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
	bottom of the extension of ST cell.			
	6. Installation of a piezometer/monitoring well downstream of the groundwater	Testing of: pH, COD, BOD, chloride, nitrate, TDS, TSS, ammonia, TOC, acidity and hardness	Twice a year, the first one before start dumping the waste in the cell	MDLF, EQA
	7. Sampling and testing from monitoring wells downstream of the groundwater flow	Visual observation, compare with the design, photographic evidence	weekly	Supervision Engineer, JSC KRM, MDLF
	8. Installation of temporary lined Leachate lagoon for existing dumpsite and ST cell leachate.	Visual observation, compare with the design, photographic evidence	weekly	Supervision Engineer, JSC KRM, MDLF
	9. Pump the leachate to the leachate lagoon, then to WWTP.	Visual inspection, Photographic evidence	weekly	MDLF, EQA
	10. Avoid reshaping and waste moving during strong winds	Visual observation	Daily	MDLF, Supervision Engineer
Human Health Aspects	11. Water spray of the operation site	Visual observations	Once a week	MDLF, JSC KRM
	12. Implement preventive maintenance program for vehicles and promptly repair vehicle with visibly high exhaust	Visual observations, inspection	Daily (Contractor) Weekly (Supervision Engineer)	Contractor, JSC KRM
	13. Strict application of personnel protective equipment and wear by	Visual observation	Randomly (at least twice a week)	Contractor, JSC KRM, MDLF

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
	Contractor's and sub-contractor's workers.			
	14. Prevent and/or stop burning of scattered waste by covering it with thin layer of sub-soil.	Visual observations	Daily during transferring the scattered waste	Supervision Engineer, MDLF, JSC KRM
	15. Safe and stable (heavy) excavators, bulldozers and compactors should be used with appropriate crane, buckets, blades, sheep wheels.	Visual observations	Daily	Supervision Engineer, MDLF, JSC KRM
	16. Avoid the excavation just beside the existing dumpsite – Buffer zone 5m	Visual observations, Compare with the design	Daily	Supervision Engineer, MDLF, JSC KRM
	17. Fire extinguishers to be available in the site all time and all mobile machinery working on existing dumpsite equipped with extinguisher within the cabin.	Visual inspection with thermal infra-red camera and portative gas analyzer.	weekly	Supervision Engineer, MDLF, JSC KRM
	18. Provide each heavy mobile machinery cabin with 5 gas detectors (GA 2000) for detection of rate of each gas and potential explosive atmosphere.	Inspection of cabins of mobile equipment.	Daily	Supervision Engineer, MDLF, JSC KRM
	19. Vaccination of all workers assigned on site against leptospirosis and tetanus	Audit	Random control	Supervision Engineer

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
Social and Economic Aspects	20. Restricting operation works during certain hours in the day	Visual inspection	Weekly	Supervision Engineer, MDLF
	21. Fencing the working area and control of its integrity	Visual observation, photographic evidence	Weekly	Supervision Engineer, MDLF
	22. Grievance uptake Channels to be created in the site for any coming complaints during construction by ensuring significant number of indicative signs around the project site (including contact information, project description, etc.)	Logbook	Weekly	MDLF, JSC-KRM
	23. Information sharing with the community, and forming a committee from the local residents for monitoring the construction of TS	Facebook posts, Forming committee, workshop	Four times per year	MDLF
	24. 35. Sort and process the received complaints	Logbook	Weekly	MDLF
	25. Acknowledge and follow up the complaints	Logbook	Weekly	MDLF
	26. Verify, investigate, and act to determine the validity of received grievance	Logbook	Twice a month	MDLF
	27. Monitor, evaluate and provide feedback	Logbook	Monthly	MDLF
	28. Ensure documentation for any received compliant	Excel sheets, Photographic evidence, logbook	Four times per year	MDLF

ENVIRONMENTAL AND SOCIAL ASPECTS	PROPOSED MITIGATION MEASURES	COMPLIANCE MONITORING APPROACH	MONITORING FREQUENCY	RESPONSIBILITY FOR COMPLIANCE MONITORING
	29. Strict instructions for the workers to wear the safety protective equipment	Visual observation	Weekly	JSC-KRM
	30. Restrict transport trucks travel to the hours outside the rush hours.	Visual observation	Weekly	JSC-KRM
	31. Strict monitoring to the road accidents as part of the monitoring plan	Visual observation	Weekly	JSC-KRM
	32. Information sharing with the communities and establishments located by the road.	Workshops, Facebook page, JSC website	Four times every year	MDLF
	33. Strict Measures and best practices in managing the sites	Visual observation	Monthly	MDLF
	34. Assist Local communities in establishing community based monitoring committees	Documentation, Photographic evidence	Monthly	MDLF

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ANNEX I: Attendance Sheet of the Public Consultation Workshop for ST Cell