



SUPPLEMENTARY E&S ASSESSMENT

CHISINAU SOLID WASTE PROJECT





TYPE OF DOCUMENT (VERSION) PUBLIC

**PROJECT NO. 70016813
OUR REF. NO. 014**

DATE: MARCH 2018

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Final			
Date	March 2018			
Prepared by	Scott Beaton Karen Phillipson Andrew Moore Rachael Bailey			
Signature				
Checked by	Scott Beaton			
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Project number	70016813-014			
Report number	Version Draft			
File reference	E09/projects 17/ESG			



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EXECUTIVE SUMMARY

The European Bank for Reconstruction and Development (EBRD) is considering extending a senior loan of up to €10.5 million to Regia Autosalubritate, a municipal solid waste management company that is 100% owned by the City of Chisinau. The loan will be guaranteed by the City and is expected to be co-financed by a loan of up to €10.5 million from European Investment Bank (EIB) and a capital grant of up to €5 million from an international donor. The proceeds of the loan and the grant will finance the following priority investments in Chisinau's solid waste management system:

- I. Rehabilitation of the existing Tintareni landfill and upgrade to EU compliance;
- II. Rehabilitation of an alternative access road to the landfill;
- III. Closure of a temporary dumpsite in Ciocana, Chisinau;
- IV. Renewal of the Company's vehicle fleet; and
- V. Refurbishment of the existing transfer station and investment in a waste sorting plant.

An Environmental and Social (E&S) assessment of the project as detailed in Section 1.2.2 below has already been undertaken. As part of this work an Environmental and Social Impact Assessment (ESIA) and other supporting documents have been developed and disclosed as part of a 120 day disclosure period (that commenced in early August 2017 and was scheduled to end in December 2017, but has since been extended to April 2018). The project is classified as a Category A project.

However, prior to receiving the potential EBRD investment, the Ciocana dumpsite in Chisinau has now closed and the Tintareni Landfill has re-opened and started to accept waste. A supplementary E&S review (as covered in this report) has been undertaken as the original intention was that the Tintareni Landfill would only re-open after the investment, with the design, construction and operations meeting the required standards as detailed below. Therefore, the purpose of this report is to complete a review of the current landfill operations and the implications on the EHS impacts / mitigation measures as detailed in the existing project disclosure documentation, specifically the Environmental and Social Action Plan (ESAP). The focus of this report is on the Tintareni Landfill only.

The scope of work for this supplementary E&S Assessment was to undertake a site visit to the Tintareni Landfill and to prepare a summary report for the EBRD that would provide an update of the current situation at the site. In particular, the implications of the newly started waste disposal operations on the previously identified E&S impacts and on Regia Autosalubritate's ability to achieve compliance with EBRD policy requirements were considered. The existing Environmental and Social Action Plan (ESAP) has been reviewed and updated, in order to identify which actions have been implemented or progressed by Regia Autosalubritate prior to re-opening the landfill and those that remain outstanding. In addition, new or modified actions have been identified, where necessary, to allow the site / Regia Autosalubritate to meet EBRD PRs and EU standards in the future. Key areas that have been strengthened in the ESAP include:

- Development of a medium-term investment programme for a separate waste / recyclable collection system and a waste minimisation, recycling and re-use scheme. Alternative waste treatment methods such as mechanical-biological waste treatment should be considered;
- Obtaining permits from the Ministry of Environment for the discharge of treated leachate from the proposed leachate treatment plants at both the Ciocana dumpsite and Tintareni landfill site. A permit for the reopening of Tintareni landfill should also be obtained;
- Development of health and safety measures for the current activities and for when the site is constructed in the future, as operational activities will take place adjacent to construction activities;
- Development and implementation of waste acceptance procedures as soon as possible;
- In the construction traffic management plan inclusion of measures to regulate the flow of construction and waste vehicles;
- On-going monitoring should commence as soon as possible (not currently undertaken but reported that the Ministry were attending site at the end of November 2017 to undertake monitoring for the first time

- since the landfill reopened);
- Ensure the new leachate treatment plants at Ciocana and Tintareni meet the necessary water quality standards for their effluent discharges after treatment;
 - As part of Detailed Design, review of the need to strengthen the dam and dam slope as new waste is now being accepted; and
 - As part of Detailed Design, review of the conceptual design to cover management of leachate separate from surface water, landfill liner engineering and landfill gas extraction.

The original ESAP has been updated and disclosed a separate document with this report. A review has also been undertaken of whether the existing Stakeholder Engagement Plan (SEP) and Livelihood Restoration Framework (LRF) should be updated. It is considered that the SEP should be updated but not the LRF as the Ciocana dumpsite is now closed and waste pickers are no longer at the site. Some of the waste pickers have applied to work at a private company and secured employment. The SEP has therefore been updated and also disclosed separately.

This report, the ESAP and the SEP are disclosed as an addendum to the ESIA package of documents previously disclosed.

1 INTRODUCTION

1.1 PROJECT BACKGROUND

The European Bank for Reconstruction and Development (EBRD) is considering extending a senior loan of up to €10.5 million to Regia Autosalubritate, a municipal solid waste management company that is 100% owned by the City of Chisinau. The loan will be guaranteed by the City and is expected to be co-financed by a loan of up to €10.5 million from European Investment Bank (EIB) and a capital grant of up to €5 million from an international donor. The proceeds of the loan and the grant will finance the following priority investments in Chisinau's solid waste management system:

- VI. Rehabilitation of the existing Tintareni landfill and upgrade to EU compliance;
- VII. Rehabilitation of an alternative access road to the landfill;
- VIII. Closure of a temporary dumpsite in Ciocana, Chisinau;
- IX. Renewal of the Company's vehicle fleet; and
- X. Refurbishment of the existing transfer station and investment in a waste sorting plant.

The above constitutes "the Project" which will contribute to an improved level of solid waste services and improve the environmental situation in Chisinau.

An Environmental and Social (E&S) assessment of the project as detailed in Section 1.2.2 below has already been undertaken. As part of this work an Environmental and Social Impact Assessment (ESIA) and other supporting documents have been developed and disclosed as part of a 120 day disclosure period (that commenced in early August 2017 and was scheduled to end in December 2017, but has since been extended to April 2018). The project is classified as a Category A project.

However, prior to receiving the potential EBRD investment, the Ciocana dumpsite in Chisinau has now closed and the Tintareni Landfill has re-opened and started to accept waste. A supplementary E&S review (as covered in this report) has been undertaken as the original intention was that the Tintareni Landfill would only re-open after the investment, with the design, construction and operations meeting the required standards as detailed below. Therefore, the purpose of this report is to complete a review of the current landfill operations and the implications on the EHS impacts / mitigation measures as detailed in the existing project disclosure documentation, specifically the Environmental and Social Action Plan (ESAP). The focus of this report is on the Tintareni Landfill only.

1.2 OBJECTIVES AND SCOPE OF WORK

1.2.1 OVERALL OBJECTIVES

The specific objective of the overall assessment was to undertake a compliance review of the proposed project against relevant best practice, corporate, national, EU standards and EBRD Performance Requirements (PRs), specifically the EBRD Environmental and Social Policy¹ which presents the PRs, listed as follows:

- PR 1: Environmental and social appraisal and management;
- PR 2: Labour and working conditions;
- PR 3: Pollution prevention and abatement;
- PR 4: Community health, safety and security;
- PR 5: Land acquisition, involuntary resettlement and economic displacement (there was no involuntary resettlement, although land acquisition and economic displacement were considered);
- PR 6: Biodiversity conservation and sustainable management of living natural resources;
- PR 7: Indigenous people (none present in the project location);
- PR 8: Cultural heritage;
- PR 9: Financial intermediaries (not applicable); and
- PR 10: Information disclosure and stakeholder engagement.

¹ Environmental and Social Policy, European Bank for Reconstruction and Development, May 2014.

As part of the above, the project proposals were assessed against key EU requirements, including the Industrial Emissions Directive² and the Landfill Directive³. The ESIA that was developed was structured to meet both national and international requirements, i.e. EBRD PR's and current EU EIA legislation⁴ (updated in 2014), and also the Birds Directive⁵ and Habitats Directive⁶.

1.2.2 PREVIOUS SCOPE OF WORK

In line with the objectives above, the previous scope of work included the preparation of the following deliverables:

- An ESIA Scoping Report;
- An ESIA that includes an Environmental and Social Management Plan (ESMP) and is structured to meet both national and international requirements;
- A Stakeholder Engagement Plan (SEP);
- A Non-Technical Summary (NTS);
- A Hydrogeological Risk Assessment (HRA);
- A Livelihood Restoration Framework (LRF); and
- An Environmental and Social Due Diligence (ESDD) Audit Report that includes an EBRD Compliance Summary Table and a stand-alone Environmental and Social Action Plan (ESAP).

1.2.3 SUPPLEMENTARY E&S ASSESSMENT SCOPE OF WORK

The scope of work for this supplementary E&S Assessment was to provide:

- A description of the current and planned operations related to the acceptance of waste to Tintareni Landfill (quantity and volume of waste that has been deposited to date, areas of site storage, the rate of fill anticipated / planned and timelines until the new designed landfill may be operational);
- A description of operational and EHS procedures being employed;
- A description of (on-site and off-site) monitoring being employed;
- The implications of the newly started waste disposal operations at Tintareni Landfill on:
 - E&S impacts associated with the current and planned operations;
 - Design and operational changes/amendments that may be required and mitigation measures to be taken to achieve compliance with EBRD policy requirements (PR's);
 - Other issues including land agreement, community benefits and recent stakeholder activities; and
 - Cost and time implications (to the extent possible).
- A summary of the status of the national Environmental Impact Assessment (EIA) approval and site permitting;
- A description of the new leachate treatment plant that is proposed to be installed soon;
- An update of the current disclosed ESAP to reflect the findings of the review with additional or modified actions as may be required to meet EBRD PRs and EU standards in the future; and
- An update of the current EBRD PR compliance table and, if the extent to which new waste has been deposited suggests that full compliance with the EBRD PRs cannot be achieved, for this to be reflected in the PR compliance table.

In addition, a review has been undertaken to determine if the current SEP and LRF should be revised. Commentary is provided in this report, although the revised SEP is provided separately. The LRF is not required to be revised as it is no longer applicable since the Ciocana dumpsite is now closed and waste pickers are no longer at the site. Some of the waste pickers have applied to work at a private company and secured employment.

² DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Recast)

³ Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste

⁴ DIRECTIVE 2014/52/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

⁵ DIRECTIVE 2009/147/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 November 2009 on the conservation of wild birds (codified version)

⁶ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora



1.3 AUDIT TEAM AND AUDITEE INVOLVEMENT

The WSP project team conducted the in-country visit from the 16 – 17 November 2017. The visit to undertake the assessment is based on observations in the field, documentation review and interviews / meetings. During the visit, interviews and discussions were held with Victor Serghienko, the Deputy Technical Director of Regia Autosalubritate.

1.4 SITES VISITED

The sites visited were the Tintareni landfill and also the Ciocana dump site and its transfer station.

1.5 LIMITATIONS

The work undertaken provides a good overview of the company's (Regia Autosalubritate) current waste management operations but is necessarily limited by the amount of time allocated to the site visit and the staff available during the time in-country.

WSP has based its conclusions and recommendations on the information available, visual observations and the auditee responses. WSP does not and cannot guarantee that the sites audited have no environmental or health and safety or social issues or liabilities beyond those observed during the audit. It may be necessary to modify the findings or conclusions presented in this report if additional information becomes available to WSP at a later date. WSP has reviewed reports and considered written records as part of this audit, however, WSP has not verified the content or accuracy of this information and suggests that the company does this separately if required.

This report has been compiled as a report version for public disclosure, and as an addendum to the ESIA package of documents previously disclosed. This report is not intended to be relied upon by third parties without prior written authorisation by WSP.

1.6 REPORTS AND OTHER INFORMATION CONSULTED

Prior to the visit, a questionnaire was issued to Regia Autosalubritate to allow for documents to be compiled and written responses to be provided for inspection.

2 SITE STATUS AND FUTURE DEVELOPMENTS

2.1 KEY ISSUES

The acceptance of waste at the Tintareni Landfill prior to receipt of the proposed investment funds raises a number of concerns with regard to the potential future investment from ERBD in a landfill to be designed and operated in compliance with EU standards. This assessment addresses the implications of the newly started waste disposal operations in Tintareni Landfill on the exiting disclosure documentation and a future designed landfill.

2.2 WASTE OPERATIONS AT TINTARENI LANDFILL

2.2.1 OVERVIEW

The landfill in Tintareni (Anoii Noi District) has an area of approximately 25 ha and is located about 30 km to the south-east of Chisinau and 5 km from the villages of Crețoaia and Tintareni. The landfill was designed and built to Soviet standards during the period 1984-1991. Construction started in 1987 and the site became operational in 1991. The landfill is classed as an engineered landfill but not a sanitary landfill. The landfill ceased operations in 2010 due to complaints from the villages regarding the alleged pollution of groundwater.

There is a landfill gas collection and utilisation system on part of the site, which was installed and has been operated by JSK BioGasInter since 2008. It comprises 56 gas collection wells, of which 30 were previously reported to be extracting landfill gas to three sub-stations, from which there is a single pipe that feeds the landfill gas utilisation plant to generate electrical energy that is fed into the grid. There is also a flare for back-up purposes or to burn any residual gas which is not used by the utilisation plant. The contract between Chisinau Mayorality and BioGasInter and their Italian partners (Unendo Energia EpA) to construct and operate the plant for the collection of landfill gas was signed in 2004 and reportedly expires in December 2018. The landfill gas plant ceased working over a year ago as the contracted company faced financial difficulties. Regia Autosalubritate does not have any firm plans currently as to how best manage landfill gas at the site, either from the old waste, the waste which is currently being accepted or the new waste following construction of the Landfill Directive compliant landfill. Although they are in discussions with the contracted company to try to resolve the issue and to extend the gas collection system. However, it is not clear what the future outcome will be in this regard, taking into account that the contract will soon expire in a year and with waste currently being accepted to site.

There is no leachate treatment plant. Leachate is collected and stored in six underground tanks with a capacity of 330 m³. Leachate continues to be continually recirculated by collection from the underground tanks into road tankers with the contents emptied at the top of the landfill.

2.2.2 PREVIOUS OPERATIONS

Prior to the site closing in 2010, a single large waste cell had been operated with approximately 20 million m³ of waste being disposed of in an area of 16.13 hectares. There is a low permeability compacted clay liner with a thickness of 100 cm at the base of landfill. The previously deposited waste was reportedly covered with 40-50 cm of low permeability soils as an informal capping material.

2.2.3 NEW OPERATIONS

The overall design capacity of the site (as originally designed) was 44 million m³ and the landfill site has previously received 20 million m³ of non-compacted waste. Due to the preparatory works (re-profiling, an interim sealing layer, use of daily cover and final capping), it was previously estimated⁷ that if the site recommenced landfilling operations, the remaining lifespan of the site would be a maximum 7 years based on the capacity available. The total remaining disposal volume was estimated at 2.750 million m³.

The Tintareni Landfill was re-opened for the acceptance of waste on 6th July 2017. It was reported that approximately 700 tonnes per day (equivalent to 490 m³ per day based on a ratio of 0.7 tonnes per m³) is currently being received for disposal. The site operates six days per week (Mon-Sat) and, therefore, at this

⁷ Moldova: Chisinau Solid Waste Project Feasibility Study, Fichtner Management Consulting, Final Report, June 2017

rate of infilling, it is estimated that by the end of the 2017 around 105,000 tonnes or 73,500 m³ (non-compacted) of new waste will have been deposited since re-opening the site. It is unlikely that a new operational Tintareni Landfill designed to EU standards would be ready before the end of 2019, as key requirements would involve funding approval and disbursement of finances followed by tendering, landfill design and construction. If the current landfill operations were to continue, by the end of 2019, it is estimated that around 541,800 tonnes or 379,000 m³ (non-compacted) of new waste would have been deposited. Regia supported the view that the lifespan of the site was around 7 years prior to accepting new waste and therefore by the time the site is an engineered and designed site to EU standards, the lifespan would have reduced.

However, a recent report has been issued by Fichtner⁸ to update the original project technical feasibility study, as waste has started to be accepted and site conditions have changed. This provides a new technical implementation concept of the landfill upgrade taking into account waste that has started to be deposited and covers the construction of waste cells, interim lining, leachate management, surface water management, landfill gas management, costs etc. Based on this implementation concept, a total capacity of 11 years for the landfill has been calculated from July 2017 when waste started to be deposited at the landfill. The increase in remaining capacity from the previously estimated 7 years is due to a number of factors including reduced incoming waste quantities (previously a figure of 1000 tonnes per day was used), a refined conceptual design for the site and the assumption that an increased waste density will be achieved for future operations once a compactor is available on site. The only preparatory works that have been undertaken by Regia Autosalubritate prior to the re-opening of Tintareni Landfill have been the reported replacement of 50% of the low permeability surface soils (informal capping material) and the construction of a tipping platform. The latter is necessary as the trucks currently used to bring waste to the site cannot safely access the active landfill disposal area and so they deposit the waste from a raised platform and then waste is then spread using a bulldozer on the landfill itself (see Photo 1 in Appendix C).

At the time of the site visit, a second tipping platform was being built (see Photo 3 in Appendix C). The site has been divided into four quarters; the first quarter is almost full to the agreed final levels and waste will start to be accepted in the second quarter soon. As yet, waste is not being deposited in the areas of the site where gas collection pipes have been installed, however, it is likely that waste disposal in this part of the site will commence soon. From observations on site, the height of waste appeared to be around 8-10 metres high in places (see Photos 6 and 7 in Appendix C). There is no compaction of waste taking place. There appeared to be some daily cover of the waste, reported to be 25 cm of soil, although a large area of exposed waste was observed (see Photos 2 in Appendix C).

The original Fichtner feasibility study provided an initial conceptual design covering leachate treatment, interim waste lining, dam stability and gas utilisation system, however, following the November 2017 site visit, it was recommended that this should be reviewed in light of the current waste management operations at the landfill and the potential issues identified. Fichtner has since provided an updated feasibility study as detailed below.

The new conceptual design proposed by Fichtner allows for a certain amount of waste to continue to be landfilled in the current area of the site whilst the remainder of the site is redeveloped and constructed to EU complaint standards. The construction phase is expected to take up to two years. When the construction is complete, the area where waste is currently being deposited will be closed and rehabilitated and waste will only be accepted in the newly constructed area.

It is recommended that landfill design specialists are instructed to provide a detailed design for the site with solutions identified in the Fichtner project update report that take into account the new waste that will have been deposited and will continue to be deposited during any construction works. A new topographical survey will need to be undertaken. Specific elements to be considered in the detailed design are recommended in the revised ESAP.

2.2.4 DAM EMBANKMENT

A bund (also referred to as a 'dam') forms a retaining structure to the main waste body. It has had a history of softening within the landfill mass due to leachate and some failure. As a result, it was reinforced by

⁸ Project Update: Current Status and Implementation Concept Report for Tintareni Landfill, Fichtner Management Consulting, February 2018

construction of a number of berms outside the waste mass. Fichtner have assessed the stability of the new bund arrangement for the completion of the site and have recommended works to ensure its long term stability.

The current location of the new waste is not near to the bund arrangement. The waste will represent some additional loading but, at this time, it is unlikely to affect the stability of the bunds. However, it may affect stability if it approaches the bund location or it is of sufficient height to provide significant additional loading. The waste should not be placed near the bund until there has been an assessment of the recent waste deposits.

Sealing and stabilisation works are recommended for the bunds which may not be possible if waste infilling encroaches to the northern boundary of the waste cell. It is recommended that future operations are planned so that any improvements are still possible i.e. adequate construction space is maintained and short term stability calculations are conducted for the waste body while works are undertaken. These recommendations are provided in the revised ESAP.

2.2.5 WASTE ACCEPTANCE

As discussed above, it was reported that since re-opening the site currently accepts in the region of 700 tonnes of waste per day. A number of waste deliveries were observed during the site visit and it appeared that the waste vehicles drove straight to the tipping platform and deposited their waste in the landfill cell without any waste acceptance checks being performed. Furthermore, there is currently no weighbridge on site. It was confirmed that the vehicle company contracted to collect municipal waste uses its own weighbridge in Ciocana prior to arriving at the landfill site and Regia Autosalubritate is in the process of trying to procure a weighbridge for the site.

In addition to the municipal waste stream from Chisinau, Regia Autosalubritate confirmed that the landfill site receives waste from other sources. This includes waste from private companies and industrial sources and it was reported that up to 30% industrial waste is received. In addition to 38-40 trucks per day of municipal waste the site receives, there are 10-15 smaller trucks from these additional sources.

One of the key issues raised during stakeholder consultation and reported in the ESDD report was that when the site was previously operational there were insufficient / robust waste acceptance procedures. Also the nature of the wastes that were previously accepted was not fully understood with claims that hazardous / dangerous materials might have been accepted e.g. animal carcasses. Regia Autosalubritate reported that industrial / hazardous waste is a significant problem and the revised ESAP recommends options and solutions for the segregation and management of hazardous waste.

Accordingly, one of the ESAP items was to implement a system of operating procedures in line with the requirements of the Landfill Directive, to include waste acceptance criteria. This requirement has not been implemented to date. The mixing of hazardous waste with non-hazardous waste is prohibited under the Landfill Directive and it is therefore essential that Regia Autosalubritate implement the necessary operating procedures identified in the ESAP; including waste acceptance criteria and procedures for waste characterisation, handling, inspection and rejection / quarantining.

The majority of the waste which is received at the landfill site comprises mixed municipal waste. Limited waste segregation takes place; residential and commercial properties are provided with colour-coded bins for recyclables but the quality of recyclables collected is generally poor due to contamination. As such, further sorting is required prior to landfilling and a private operator (ABS) has now opened a waste sorting plant in Chisinau. In addition to the Landfill Directive requiring waste to be treated prior to landfill, it is a requirement of the Waste Framework Directive that the waste management hierarchy is applied and it sets targets for recycling and recovery. With this in mind it is recommended that Regia Autosalubritate prepares and adopts a medium-term investment programme for developing a separate waste / recyclables collection system and a waste minimisation, recycling and re-use scheme. They should investigate alternative waste treatment methods, such as mechanical-biological waste treatment. These recommendations are provided in the revised ESAP.

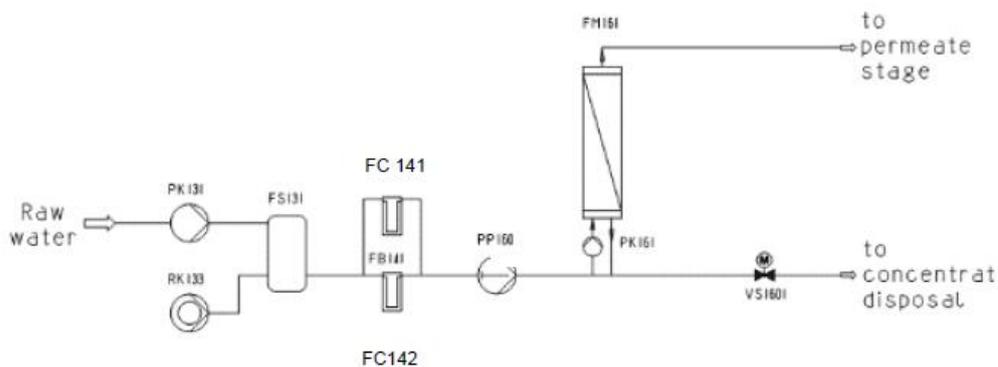
2.2.6 LEACHATE MANAGEMENT

A new leachate treatment plant has been delivered to the Ciocana dumpsite in Chisinau which will be installed there imminently, (see Photo 10 in Appendix C). It was reported that a new leachate treatment plant is also planned to be installed at the Tintareni landfill that will be delivered, installed, commissioned and become fully operational in 2018 (see Photo 9 in Appendix C for the proposed location of the leachate treatment plant).

Both leachate treatment plants will use the same technology and it was reported that the performance of the plant at the Ciocana dumpsite will be evaluated prior to installation of the same but larger plant at Tintareni landfill site. The capacity of the plant at Tintareni will be for 150m³/day as opposed to the capacity of the plant at Ciocana dumpsite that will be 55m³/day. The technology employed will be Reverse Osmosis (RO) technology. At Tintareni Landfill approximately 20% of the concentrated leachate will be continually recycled within the landfill with 80% treated water discharged via a concrete channel to the environment (adjacent fields). It is not known what the performance of this plant is, e.g. the contaminant removal efficiency or target emission limit values, and whether the discharge will meet the necessary environmental / water quality standards. An evaluation should be conducted to determine the performance required to meet the environmental / water quality standards, with a leachate treatment plant specified accordingly and once installed, regularly monitoring of the discharge should be undertaken to demonstrate compliance with the standards. These recommendations are provided in the revised ESAP.

For the Ciocana dumpsite, a tender was developed including parameters and the German company Klarwin was awarded the contract to procure and build the plant with the design provided by the German company Grimm and Wulff. It is proposed that the same company will be used for the procurement of the treatment plant at Tintareni Landfill. The tender was in Romanian, although an operation manual⁹ in English was provided. The system consists of a First Stage (or Leachate Stage) system for leachate treatment, a Second Stage (or Permeate Stage) system and an integrated tank system. The leachate stage is shown in Figure 1 and the permeate stage in Figure 2 below.

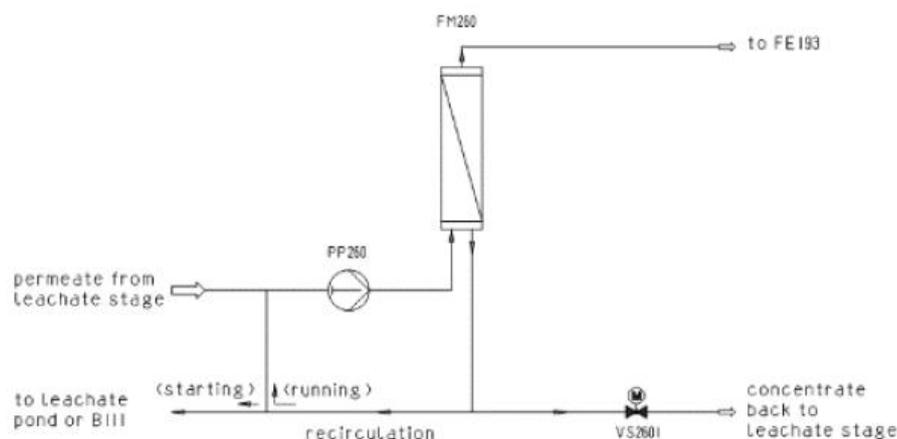
Figure 1 – Leachate Stage



The raw water to be treated is pre-filtered with a sand filter and four cartridge filters (FC14xx1). Reverse osmosis then takes place in the module blocks. The produced permeate then enters the permeate stage for further treatment. The produced concentrate is directed for disposal.

⁹ Manual, Landfill Leachate Treatment Plant ROAW 9134 DTG 22/4, Grimm & Wulff

Figure 2 – Permeate Stage



The permeate from the leachate stage is directed to the permeate stage for further de-concentration. A new concentrate is then produced, which is fed back to the leachate stage. The permeate from the permeate stage flows to a permeate storage tank with an installed aeration system to reduce the pH.

There are no other stages of treatment proposed. The manual provides the raw water parameters and concentrations but not the levels that will be achieved after treatment. A technical specification document in Romanian presents performance in terms of removal of Ammonium at a pH 6.5 at > 99% and removal of organic compounds with a high molecular weight at >99.9%.

At permit is not in place for the discharge of treated leachate for either Ciocana dumpsite or Tintareni landfill site. Regia Autosalubritate stated that they will apply for a permit to discharge treated leachate from the Ministry of Environment. It is recommended that a permit is in place before treated leachate is discharged and this is included in the ESAP.

The original ESAP made recommendations for leachate monitoring and required a detailed design for the leachate treatment plant to be developed, including a full Best Available techniques (BAT) assessment. No leachate or water monitoring has been undertaken to date, i.e. prior to or since re-opening the landfill. This would have been useful to provide a baseline prior to the re-commencement of landfilling. It was stated that the Ministry of Environmental was coming to site at the end of November to undertake the necessary monitoring and that the results are expected by the end of December 2017. Whilst a design for the proposed leachate treatment plant is available, no BAT assessment has been undertaken.

Considering the above, a number of additional recommendations have been proposed and incorporated into the revised ESAP that include:

- Undertake an assessment of the proposed treated leachate quality and compare against relevant Moldovan and EU Environmental Quality Standards / Water Quality Standards;
- If Environmental Quality Standards / Water Quality standards will not be met, assess additional treatment stages required;
- Apply for permits to discharge treated leachate from both Ciocana dumpsite and Tintareni landfill site; and
- Under regular monitoring of the treated discharge.

2.2.7 LANDFILL GAS MANAGEMENT

A landfill gas extraction system is installed in part of the original landfill site, however, as discussed above it has not been in operation for over a year due to financial difficulties experienced by the contracted company. Furthermore, it has been reported that even when the gas extraction system was operational it did not collect gas efficiently due to the absence of an adequately sealed landfill surface (cap) and the presence of high (or perched) leachate levels within the gas wells.

The collection of landfill gas is a requirement of the Landfill Directive for all sites accepting biodegradable waste. To control the potential risks associated with gas migration and emissions, landfill gas must be removed from the waste, treated and, to the extent possible, utilised. Accordingly, an appropriately designed gas collection system for Tintareni Landfill should be planned to:

- Prevent migration;
- Minimise emissions; and
- Optimise utilisation (where possible).

The original Fichtner feasibility study proposed that the current gas collection and utilisation system be extended, improved and upgraded in order to manage the landfill gas generated from both the old and new waste deposited. However, following the November 2017 site visit, it was recommended that this should be reviewed in light of the current waste management operations, the status of the current gas collection system and the potential issues identified. The current infilling with new waste may damage or render the future collection of gas through the current system difficult, so a proposal for protection of this system or its abandonment and a new system will need to be provided.

The conceptual design in the updated Fichtner report proposes that the current gas collection and utilisation system will be abandoned due to its inefficiency. A new landfill gas management system comprising gas extraction wells, transportation lines, sub-stations and a flare system will be installed as part of the construction works for the engineered new landfill (Phase 2, Section 1). However, in the interim period until construction commences, it recommends that the existing system is re-commissioned, plus other measures as necessary to reduce the risks from landfill gas.

The original ESAP made recommendations for landfill gas monitoring. No monitoring has been undertaken to date, i.e. prior to or since re-opening the landfill. This would have been useful to provide a baseline prior to the re-commencement of landfilling. It was stated that the Ministry of Environmental was visiting the site at the end of November to undertake the necessary monitoring and that the results are expected by the end of December 2017.

2.2.8 IMPLICATIONS ON FUTURE DESIGN AND OPERATION OF TINTARENI LANDFILL

The key risks and issues relating to landfill engineering and control of leachate and gas emissions from observations from the site visit are presented as follows:

Hydrogeological Risk Assessment

The placement of a new waste deposit directly over the temporary capping of the old waste introduces a new source of leachate. The waste types are similar to the old waste types. As a result, leachate generation will be extended in time and overall the time taken for leachate contamination to pass peak conditions will be extended. The WSP modelling of the landfill before the new waste import considered worst case conditions that exceed the scenario of new waste being added. As a result, it is not considered necessary to remodel the landfill for hydrogeological risk. The conclusions of the modelling are not expected to change.

The Fichtner study included installation of down hydraulic gradient boreholes and groundwater quality analysis be obtained. This data was used within the hydrogeological model to help calibrate it to real conditions. It had been anticipated that further baseline monitoring would be achieved before the deposit of new waste (over a landfill liner) to further calibrate the model. This opportunity has been lost as the waste import has started without further groundwater analysis. WSP understand that some monitoring and analysis is programmed to be undertaken in November 2017 and this should form the first in a regular groundwater quality monitoring schedule as proposed in the ESIA.

The new waste is not contained so any leachate produced may be being mixed with surface water. Also, leachate recirculation, as described to us by the operator, is the practice of spraying leachate over the old waste area to encourage evaporation. Any leachate that does not evaporate may also mix with surface water. It is recommended that a system of managing the separation of leachate from clean surface water is implemented. These recommendations are provided in the revised ESAP.

Landfill Engineering

Fichtner recommended in their original feasibility report for the site, some engineering improvements which may be affected by significant ongoing infilling, these include:

- An interim lining system was proposed for surface sealing of waste cell 1 (the old waste deposit is referred to as 'Cell 1') and base sealing of waste cell 2 (new waste) to comply with the EU Directive, and achieve technical viability. The original design assumptions were based on waste cell 1 having been completed in 2010 and having achieved a certain amount of initial settlement. The placement of fresh waste over Cell 1 introduces a waste layer that has little compaction and will take time to achieve the same level of compaction as the waste below it. It may be considered by the landfill designer, that the new waste is

unsuitable as a formation layer for the proposed geosynthetic lining system. No evidence of compaction of the waste during deposit was observed during the site visit.

- The introduction of waste has meant that there is a lost opportunity for preparing some (or all if filling continues) of the cell 1 area for the proposed liner.
- The landfill designer should be consulted to ensure that the proposed leachate collection layer and extraction system can still be achieved over wastes that are likely to significantly settle. Without treatment of the wastes to induce settlement it is possible that the proposed system will not be able to achieve the aims of the design.

As recommended, the above issues have since been considered in Fichtner's updated feasibility report.

However, further consideration of these recommendations and potential issues, i.e. lining and drainage specifications, are identified in the revised ESAP as part of the detailed design for the site.

Gas Extraction

The landfill gas extraction system was not operational during the visit and is understood not to have been operational for around one year. It is a requirement of the Landfill Directive to control gas emissions. The current infilling with new waste may damage or prevent the future collection of gas through the current system. WSP recommended a proposal for protection of this system or its abandonment and a new system to be provided. As recommended, Fichtner's updated feasibility study considers this issue and makes recommendations for the future landfill gas collection system. As detailed in Section 2.2.7 above, the conceptual design in the updated Fichtner report proposes that the current gas collection and utilisation system will be abandoned due to its inefficiency. A new landfill gas management system comprising gas extraction wells, transportation lines, sub-stations and a flare system will be installed as part of the construction works for the engineered new landfill (Phase 2, Section 1). However, in the interim period until construction commences, it recommends that the existing system is re-commissioned, plus other measures as necessary to reduce the risks from landfill gas.

Revised landfill gas generation rates for the site have been estimated considering landfill gas from both Phase 1 and 2 of the site and, based on the results, two different concepts for landfill gas management have been proposed. Concept A involves the immediate installation and operation of a gas collection system with construction taking place in two stages: Stage 1 comprising immediate measure works for landfill gas management in Phase 1 and Stage 2 comprising the main contract works to install landfill gas management in Phase 2 of the site. Concept B on the other hand would involve installation and operation of the complete landfill gas management system as part of the main contract works. This approach would require the existing landfill gas system to be utilised in the short-term, albeit with a low efficiency, until Phase 2 of the landfill site has been constructed.

Acknowledging that landfill gas needs to be managed in such a way so as to minimise the risk to the environment and human health, and considering that there are advantages and disadvantages of both concepts, the updated Fichtner report concludes that concept B is the preferred option. One of the key reasons is that Concept A is dependent upon the new leachate treatment plant being up and running in advance, in order to ensure that leachate within the landfill site does not hinder gas extraction. Whereas Concept B is also dependent upon the leachate treatment plant, there would be a longer lead time available to install and operate the plant and other implementation works at the site, prior to installation and operation of the gas extraction system.

A recommendation for the development of a detailed design for the landfill gas collection system (considering the concept design measures proposed by Fichtner) is provided in the revised ESAP.

Key Design Considerations

It is assumed that the waste deposited before any future landfill improvements proposed by Fichtner will stay in place. Therefore, the introduction of waste over the existing waste body has potentially significant implications for the proposed landfill liner and leachate extraction system to be installed over the historic waste body. A review of the original design and operational solution was therefore necessary in order to determine if it required modification or a different solution altogether. Also, there could have been additional works required, not previously considered, to prepare the waste for installation of the liner. As recommended, Fichtner's updated feasibility study considers this issue and makes recommendations for the future landfill design and engineering systems considering the waste already deposited (since July 2017).

The conceptual design in the updated Fichtner report proposes that the waste currently being deposited will be kept in a small area of the landfill while a new EU compliant area will be constructed. The construction phase is expected to take up to two years. When the construction is complete, the area where waste is currently being deposited will be closed and rehabilitated and waste will only be accepted in the newly constructed area.

The design for the interim lining proposed between Phase 1 and Phase 2 Section 1 (i.e. the future waste post 2020) remains unchanged from the original conceptual design. No interim lining can be installed between Phase 1 and Phase 2 Section 2.

The additional waste has not significantly altered the assumptions made in the WSP Hydrogeological model so no revision of that document is envisaged. However, monitoring is highly recommended and the hydrogeological model can be improved with this data.

Monitoring and Other Site Plans

As discussed above no monitoring has been conducted to date. The ESAP recommends that monitoring plans should be developed. Within plans to be developed the following should be considered as well as the relevant mitigation measures included in the ESIA which should be formalised as part of the environmental management system.

A Litter Control Plan should be developed with measures that include good site management practices to reduce the visual impact associated with the operational works; operational procedures including compacting litter and covering with soil at regular intervals, to minimise windblown litter; minimising open/working areas; reinstatement of completed landfill cells with suitable planting of grass / wildflower / shrubs as soon as the cell becomes filled and non-operational; and suitable establishment and on-going maintenance of any woodland tree planting, hedgerow and hedgerow trees to maintain screening properties.

A Surface Water (Run-on) Control Plan should be developed with measures that include inspection of the surface water drainage system to ensure no accumulation of surface water runoff is occurring, regular inspection of leachate storage tanks; wheel washing of vehicles and machinery before leaving the site; implementation of sediment and erosion control measures to reduce the transport of stockpiled soil by surface runoff. Surface water management should include:

- Surface water collection channel next to the perimeter embankment,
- Surface water collection channel, at the outer side of the perimeter road, and
- Surface water collection in waste sub-cells.

The ESAP requires the operator to develop monitoring plans for the site. Environmental monitoring should meet the Landfill Directive monitoring requirements and the following should be considered as a minimum in the development of the monitoring plans:

- Landfill gas from in waste gas wells and perimeter boreholes to be monitored on a monthly basis.
- Surface Water (River Bic) to be monitored on a quarterly basis.
- There are 6 existing boreholes BH1-6. A minimum of two additional boreholes are recommended to be installed at the downgradient landfill boundary. Groundwater boreholes to be monitored on a monthly basis.
- Leachate on a monthly basis with field measurements on a more regular basis as required.

Note that the above list is for the key landfill monitoring components and is therefore not an exhaustive list. For the full list of monitoring components refer to the ESAP.

2.2.9 REGULATORY APPROVALS

Permits

As far back as 2012, there is correspondence from the Ministry of the Environment insisting that the Tintareni landfill should be reopened as the capacity of the temporary dumpsite in Chisinau had been exhausted. Further correspondence was provided on the re-opening of the landfill although there was no permit provided or document that was provided that explicitly states that landfill can be reopened or acknowledges that the reopening of the landfill is approved by the authorities. According to the previous ESDD that was conducted, the Environmental Authorisation AE no. 0022 was valid from 2012.06.20-2017.06.20 and, as such, the site would require a new authorisation in order to operate beyond the expiry date. It is recommended that Regia Autosalubritate obtain their permit that allows the Tintareni site to currently accept waste. This has been included in the revised ESAP.

As previously discussed permits are required to be obtained from the Ministry of the Environment for the discharge of treated leachate from both the Ciocana dumpsite and Tintareni landfill site. This has also been included in the revised ESAP.

Status of the Local EIA

A report on the public consultation meetings that were conducted in September 2017 was submitted to the Ministry of Environment by the local sub-consultant on the 17 November 2017. This report is required in accordance with national provisions, as part of the process for approval of the EIA. It is expected that the report should be approved by end of December 2017.

The official response will be provided by the Ministry of Environment as part of its approval procedure. All required documentation has been submitted and it is understood that no further information should be requested by the regulator. However, it is not known what the views are of the regulator in relation to the EIA, as new waste is now being accepted.

3 REVIEW OF THE ESIA AND SUPPORTING DOCUMENTATION

3.1.1 ESIA REVIEW

The ESIA report prepared as part of the previous scope of work provided an assessment of the likely significant effects associated with both the construction and operational phases of the proposed project at Tintareni Landfill. The ESIA report included an ESMP, which set out the identified mitigation measures to reduce adverse environmental effects and enhance the social benefits of the project. These were also reported in the ESAP. The previous ESIA report and updated ESAP should be referred to for full details of the assessment undertaken and mitigation measures identified.

The baseline situation has changed as a result of the landfill starting to accept waste prior to the EBRD investment being secured. This section considers the implications of this change to the baseline, provides a high level review of the potential for this change to the baseline to result in further adverse effects and, where necessary, proposes additional mitigation measures for the ESAP.

The change to the baseline situation is unlikely to result in adverse operational effects on the environment due to the implementation of the project, as the conceptual design measures to upgrade the landfill to EU standards and the proposed mitigation remain unchanged. The operation of this project will commence once the landfill has been upgraded, although the capacity of the area that will be upgraded will be reduced due the waste that is currently being disposed at the site.

The change in the baseline situation does have implications for the construction stage. The site will now be accepting waste during the construction phase of the project. It is assumed that the scheme will be constructed in two phases, with a part of the site being upgraded to EU standards, while another part continues to receive waste. The main social implications are that the construction workers will be working in close proximity to an active landfill, and the landfill operatives will be working adjacent to a construction site.

The construction vehicles and waste trucks will be using District Way (L481) and the access road to the Tintareni Landfill at the same time, and the cumulative effects of vehicular traffic on the population who reside along the route will need to be managed.

A summary of the review of the ESIA and additional mitigation measures is provided in Table 1 below.

Table 1 – Reviews of ESIA and additional mitigation required for the ESAP

ESIA Topic	Potential Effects	Additional Mitigation for ESAP
Air Quality and Climate Change	There are increased risks of air quality effects, including bio-aerosols, on construction workers who will now be undertaking construction activities adjacent to an operational landfill.	The revised ESAP contains an amended action to ensure that the risk of air quality effects on construction workers is mitigated using the measures proposed for the landfill site operatives, including PPE and breathing apparatus.
	The current landfill gas extraction system and biogas plant is not operational. The reintroduction of waste over this system may be resulting in damage to the gas extraction system. The mitigation measures in the ESIA include the retention of this system to collect gas from the waste that has already been disposed at the site, prior to the implementation of the project to upgrade the site to EU standards.	The need for measures to retain or reintroduce the gas collection system in the waste that has already been disposed of at the site is included in the revised ESAP.
	The total number of vehicles using the access route during the construction phase will increase, due to the combination of waste vehicles using the access road to take waste to the site, and the construction traffic transporting material to and from the site. Residential properties near to the construction traffic routes have an increased potential to be affected by dust and human health effects during the construction period.	The revised ESAP contains an additional action to ensure that the Construction Traffic Management Plan includes measures to regulate the flow of construction and waste vehicles.
Noise and Vibration	The total number of vehicles using the access route during the construction phase will increase. There are approximately 40 residential properties within 50m of the access route, who have an increased potential to be subject to adverse noise effects.	The revised ESAP contains an additional action to ensure that the Construction Traffic Management Plan includes measures to regulate the flow of construction and waste vehicles.

ESIA Topic	Potential Effects	Additional Mitigation for ESAP
Biological and Ecological Resources	The current recommencement of landfill operations at Tintareni will be resulting in habitat loss and disturbance in an ecologically degraded site. The ecological baseline at the site is being further degraded by these activities, however, the proposed landscape planting, and vegetation reinstatement, and other mitigation measures in the ESIA are still expected to prevent the project having significant ecological effects.	No additional measures required.
Cultural Heritage	There may be an increase in the temporary effect on the setting of the tumulus directly west of the proposed access route, due to a larger number of vehicles using the access route during the construction phase.	The revised ESAP contains an additional action to ensure that the Construction Traffic Management Plan includes measures to regulate the flow of construction and waste vehicles.
Landscape and Visual	The current recommencement of landfill operations at Tintareni will have degraded the baseline environment for landscape. The landfill is more visually intrusive in the environment due to the removal of vegetation and visible presence of waste. The ESIA proposed measures to reduce the landscape effects during the construction and operation of the project, and these measures are still expected to prevent significant adverse landscape and visual effects.	No additional measures required.
Geology, Soils, Material and Waste	The construction and operation of the project is not expected to have an adverse effect on the geology, soils within the site, or those within the surrounding area, following the implementation of best practice measures in the Construction Environment Management Plan and the proposed operational mitigation. The current disposal of waste at the site will be reducing the capacity of the landfill and the volume available for the project, reducing the potential benefits associated with improved waste disposal.	The updated Fichtner feasibility report gives further consideration to the conceptual design of the site considering that there is currently new waste being disposed of at the site. The revised ESAP includes further recommendations for consideration at the detailed design stage for the site.
	The project includes measures to improve the stability of the dam. There is a risk that the acceptance of waste at the site, and the associated increase in the volume of waste being retained by the dam, may be increasing the pressure on this structure.	The revised ESAP recommends that the dam stabilisation measures are undertaken at an early stage in the project implementation.
	The reintroduction of waste disposal at the site using minimal compaction has implications for the conceptual design. The high level of settlement that is likely to occur in the relatively uncompacted waste may have implications for the geotextile membrane that will be located over the waste.	The updated Fichtner feasibility report gives further consideration to the conceptual design of the site considering that there is currently new waste being disposed of at the site. The revised ESAP includes further recommendations for consideration at the detailed design stage for the site.
Water Environment	The disposal of fresh waste at the landfill is likely to be increasing the concentration of contaminants within the leachate, and there is some potential for this to be adversely affecting the groundwater beneath the site. However, the Project includes engineering works and management controls to protect groundwater, which are expected to improve the current situation, including the leachate treatment plant.	No additional measures required
	The ESIA assumes that the treated leachate from the Leachate Treatment Plant will be disposed of to a Water Treatment Plant. We have since been advised that it will be discharged to the environment.	The revised ESAP specifies that the discharge must meet relevant Moldovan and EU Environmental Quality Standards / Water Quality Standards
Social Population and Human Health	The reintroduction of landfill operation, will mean that some of the operational employment opportunities at the site will have already been realised. However, there will still be construction employment opportunities and community benefits.	No additional measures required
	The construction workers will be working in close proximity to an active landfill, and the landfill operatives will be working adjacent to a construction site. Additional measures will be required to reduce the increased health and safety risks for the activities being undertaken on the site at the same time.	The revised ESAP requires the Construction Health and Safety Plan to incorporate additional measures for effective communication and management of health and safety across the whole site. Where possible, there should be segregation of construction activities and landfill activities, to reduce the health and safety risks

ESIA Topic	Potential Effects	Additional Mitigation for ESAP
		to all workers on the site.
	The company have agreed to, and started to provide, community benefits in Tintareni, as detailed in Section 3.3.	No additional measures required.
Transportation and Traffic	The company have hired new covered waste trucks to transport the waste to Tintareni. This is reducing the nuisance and littering the surrounding residents were subject to, when the company used the old waste trucks.	No additional measures required.
	The increase in the total number of vehicles using the access route during the construction phase, may increase effects on motorised vehicle users and cyclists on these routes during construction.	The revised ESAP contains an additional action to ensure that the Construction Traffic Management Plan includes measures to regulate the flow of construction and waste vehicles.
Cumulative Assessment	The construction vehicles and waste trucks will be using District Way (L481) and the access road to the Tintareni Landfill at the same time, which may result in an increased risk of cumulative vehicular traffic, noise, dust and air quality effects on the population who reside along the route.	The revised ESAP contains an additional action to ensure that the Construction Traffic Management Plan includes measures to regulate the flow of construction and waste vehicles.

3.1.2 ESAP REVIEW

As a condition of the financing by EBRD, the landfill site operator, Regia Autosalubritate, will be required to implement the ESAP. The ESAP contains many actions that the landfill operator has committed to implementing within a specified timeframe. These include improving institutional capacity and Environmental, Health and Safety (EHS) management of the solid waste management system; improving EHS performance of the landfill and other operational sites; and improving social and employment conditions.

The revised ESAP has been strengthened, with actions amongst others that include: health and safety measures to be developed for the current activities and for when the site is constructed in the future, as operational activities will take place adjacent to construction activities; waste acceptance procedures to be developed; and environmental monitoring to commence as soon as possible.

A number of previous actions have been completed and removed from the ESAP. These include:

- The previous disclosure of project documentation including the Non Technical Summary (NTS), the SEP and the LRF;
- The develop of formal employment (HR) policies;
- The implementation of measures for waste transportation to prevent risk to public with regards to dust nuisance, falling out litter and leakage of waste leachate from vehicles. Vehicle loads are now sheeted and dampening down of access roads is undertaken if conditions are dusty;
- The clean-up and closure of existing local dump sites in Tintareni area; and
- The negotiation and agreement of local benefits that have been introduced for the communities in Tintareni.

4 COMPLIANCE REVIEW

4.1 CONCLUSIONS

Prior to receiving the potential EBRD investment, the Ciocana dumpsite in Chisinau has now closed and the Tintareni Landfill has re-opened and started to accept waste. The landfill site has not received funding for a landfill designed, constructed and operated in accordance with EU standards and waste started to be deposited at the site on the 6th July 2017 and will continue to do so, as the Ciocana dumpsite is permanently closed and there are no alternative sites available.

In line with the scope of work for this supplementary E&S assessment, the ESAP have been updated and provided separately. The updates are based on recommendations that Regia Autosalubritate should implement in the interim, until a new EU compliant landfill is operational in the future and also in regard of the current operational practices that affect the actions in the ESAP and these have been modified or added to accordingly.



Appendix A

PHOTOGRAPHS



Photo 1: Waste being tipped



Photo 2: Waste with partial cover



Photo 3: New tipping platform under construction



Photo 4: Waste area with bulldozers in use



Photo 5: Litter netting that has been installed



Photo 6: Height of new waste layer



Photo 7: Advancing waste



Photo 8: Extent of waste coverage



Photo 9: Location for leachate treatment plant (Tintareni)



Photo 10: Leachate treatment plant delivered (Ciocana)



Photo 11: Transfer station at Ciocana dumpsite



Photo 12: Location for leachate treatment plant (Ciocana)



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