Responses to KERP Remediation Technology Questions

Presented below are responses to questions raised by attendees during the Environmental Remediation Workshop and in subsequent emails. Contractor questions of a similar nature are presented once below. Please note that these responses are for information only and are not to be considered with respect to contract tenders or contractual works.

Question 1

What is the remediation target concentration for TPH?

Response 1

Although the remediation target criteria (RTC) was originally set at a TPH level of 5,000 mg/kg, discussions with stakeholders have been ongoing to revise this RTC based on risk assessments. For example, the RTC for areas requiring excavation may be increased to 10,000 mg/kg or higher depending on the agreed risk-based approach. The proposed RTC for TPH will be based on carbon fractioning and therefore values will be provided for at least 3 carbon band ranges.

Question 2

What is the range of TPH concentration expected to be treated with remediation technologies?

Response 2

Engineered remediation technologies are expected to treat a TPH concentration range of approximately 50,000 mg/kg (5%) to 100,000 mg/kg (10%). Bioremediation technologies are expected to treat a TPH concentration range of approximately 20,000 mg/kg up 70,000 mg/kg (2 to 7 %). Given that the contamination is a heavily weathered crude oil there is a high percent of the TPH range which is the heavy end of the carbon range. The upper end of these ranges should not be considered a limit; the ability of a technology to treat TPH concentrations exceeding these the upper end of these ranges will be considered advantageous. Sludges exceed 600,000mg/kg

TPH. To economically treat sludges and provide the necessary throughput is considered a significant challenge for which proposed solutions are required.

Question 3

What is the expected volume of contaminated soil to be assigned to individual Contractors?

Response 3

The program is divided into two halves. Smaller volume projects put to market initially until UXO clearance activities and chemical data has been acquired. In the second half of the program large volume packages will be put to market. Minimum annual throughput to be achieved will be between 50,000 m3 and 100,000m3 per year initially for the first two years and then increasing this to several 100,000m3 as the program progresses.
The oilfields have been sub-divided into areas for which remediation packages will be let.

Question 4

If thermal treatment is proposed, will indirect thermal treatment be required prior to direct thermal treatment to recover oil and then ensure RTCs for polycyclic aromatic hydrocarbons (PAHs) are achieved?

Response 4

If thermal treatment proposed it has to be demonstrated that throughput rates can be achieved. Current targets are small projects of 100,000m3 per year which will increase through the program. Where recycled oil is a bi-product of the process then the contractor has to indicate the disposal/re-use route that is achievable. Achieving RTCs for PAHs will be a requirement and these will form part of the performance specification. In principle the RTC for PAH will be no greater than background concentrations in 'clean' desert soil.

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Question 5

Will KOC consider a risk-sharing contracting vehicle that would focus on successful remedial efforts at the lowest costs?

Response 5

KOC is evaluating multiple contracting strategies. Risk will initially be reduced by provision of good quality information to ensure appropriate design of plant/system for remediation. Development period will be allowed for treatment systems to optimise treatment throughput and success. Risk sharing to reduce treatment cost will be considered and as yet to be finalised.

Question 6

Is KOC interested in field-scale pilot tests to demonstrate the effectiveness of remediation technologies?

Response 6

The value of undertaking field trials/pilot tests is understood in achieving optimum treatment efficiencies, however the mechanism by which this can be achieved has still to be agreed. Stakeholders have requested further justification for validity in trials and therefore these may be undertaken at contractor's expense.

Question 7

If UNCC-awarded monies cannot be used for technology demonstrations, is KOC willing to fund field-scale pilot tests?

Response 7

To assist in providing justification for provision of budget for field trials we would request contractors provide an indication on likely scale and durations of field pilot trials plus the likely cost and whether they would be an appetite to absorb costs of trials.

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Question 8

Would KOC agree to Contractor-funded field-scale pilot tests?

Response 8

Contractor-funded field-scale pilot tests are of interest to KOC and have previously been discussed; however, issues related to having Contractor equipment and personnel in the oilfield without a contract are still to be decided. To assist in these decisions we request you provide an indication of scale of the pilot trial and amount of activity/personnel required.

Question 9

If issues related to having a Contractor with equipment and personnel in the oilfield without a contract are resolved (e.g., insurance), would KOC provide support such as power, water, sewage, or other welfare?

Response 9

KOC typically does not provide any support such as utilities or welfare.

Question 10

What is the best/approved means of contacting KOC?

Response 10

KOC have contracted AMEC Foster Wheeler to perform as Program Management Consultant (PMC) for KERP. Please contact Ed.Fahnline@Amecfw.com or Gary.Connor@amecfw.com with requests for information.

Responses to KERP Remediation Technology Questions

Question 11

Which analytical test methods have been used to characterize TPH concentrations in contaminated soils from KOC oilfields?

Response 11

The following TPH analytical test methods have been used in limited soil characterization – late 2014:

Name	Test Method	Fractionated
TPH	EPA 9071B (hexane extraction method)	No
GRO-DRO-RRO	EPA 8015B / 8260B	Yes
SARA	IP 469/01 (2006)	Yes
TPHCWG PERF Modification	EPA 8015B/8260 MAMTCA ECY97 602	Yes

The CIC site investigation data (year 2003) were based on TPH using EPA 9071B (hexane extraction method).

Question 12

Which TPH analytical test method will be required to demonstrate that the RTC for TPH has been achieved?

Response 12

Post treatment verification testing for TPH has still to be agreed, however will be dependent on the carbon band ranges that are agreed. This may be PRO/DRO/RRO or similar fractionation. It may also include EPA 9071B and SARA testing.

Question 13

Is water chemistry data available for Arabian Gulf sea water, recovered / separated formation water, and groundwater?

Response 13

Water chemistry data is available and is being tabulated for distribution.

Question 14

Is it possible to obtain wet oil lake sludge samples?

Response 14

KOC and PMC are evaluating the logistics of obtaining wet oil lake sludge samples to provide to contractors. Similar to the soil samples provided during the Workshop, the cost for shipping or testing the sludge samples from KOC would be incurred by the Contractor.

Question 15

Will remediation Contractors be allowed to extract and use shallow groundwater for their remediation process?

Response 15

Shallow groundwater underlying KOC oilfields is brackish water. Extraction of shallow groundwater (from any depth) requires a permit. Other potential sources of water such as reuse of KOC Operations waters are also being assessed but may need pre-treatment due to high salinity, etc. As per response 13, additional water data will be tabulated and released when available.

Question 16

The salt concentration of KOC soils (based on the range of observed conductivity, appears to vary greatly. Depending on the source of water used, some remediation technologies may increase the salt concentration of remediated soils. Has an upper limit been established for the salt concentration of remediated soils?

Response 16

An upper limit for the salt concentration of remediated soils has yet to be established. Post treatment soil condition shall be capable of supporting plant establishment and growth.

Question 17

The weight of processed (i.e., treated) soil will vary depending on the technology used. For example, water-based soil washed soil will have a greater weight after processing whereas thermally treated soil will have a much lower weight per unit volume after treatment. Has KOC considered using the weight of soil feedstock as the metric for payment for treating KERP soils?

Response 17

Initial design volumes derived through site characterisation and presented as m3. The anticipated metric for payment of treated soils will be based on pre-treatment weight.

Question 18

Will remediated soil be returned to the same location from which it was excavated?

Response 18

Depending on soil condition the soil will be returned to its location where practical. Bioremediation will likely have soils returned to their original locations. Treatment processes where stock piling is required will be placed in areas based on risk assessed concentrations.

Question 19

The average thickness of Layer 2 soils has been reported as approximately 0.25 meters and the thickness of Layer 2 soils can be highly variable across very short distances (<1 meter). Additionally, it is generally not possible to visually distinguish the depth at which Layer 2 TPH concentrations decrease below 3 percent. From a practical perspective, how does KOC envision the excavation of soils to be performed

without removing soils with TPH concentrations less than 3 percent or leaving soils in place that exceed 3 percent?

Response 19

The Response to Question 1 discusses cleanup criteria. The results of the Site Soil Characterization Project (currently under tender development) will provide additional delineation of the aerial and vertical extent of TPH concentrations. Contaminated soil excavation and verification approaches for the active remediation projects are being assessed (further characterisation by remediation contractors, field test kits, etc.). Soil excavation for contaminated soil disposal at the North Kuwait landfill is stated to begin in late 2015 and will provide a much clearer understanding of the optimal approaches for soil excavation for the active remediation contracts.

Question 20

Treating Layer 1 soils for the purpose of oil recovery will substantially lower the TPH concentration and reduce volume; however, it will be very difficult to reduce the TPH concentration of the treated soils below 3 percent. Will secondary treatment be required to reduce TPH concentrations to the RTC or will these soils be allowed to be disposed of in the landfill?

Response 20

Oil recovery is not a priority unless it can demonstrated to be cost-effective. It is generally agreed that Layer 1 soils / materials have an intrinsic value. A market research study is being undertaken to identify end-users and quantify that value. It is anticipated that any value realized from Layer 1 soils / materials will only subsidize or offset the cost of excavation, recovery, and/or transport to the end-user. Secondary treatment or landfill of any primary treatment waste stream is not likely to be cost effective unless proven otherwise.

Question 21

What is the relationship between the Remediation Technology Demonstration Project and the Remediation Project with respect to treated material, cost, and time?

Response 21

See the answer to question 6 regarding field trials. The Remediation Technologies Demonstration Project (as envisioned during 2014) is unlikely to be executed as a standalone project. Remediation Contractors deemed to have the greatest chance of success (based on numerous factors) will be awarded contracts.

Question 22

We believe to have a viable technology; however, we anticipate our process will require tuning / adjustment to achieve the required COC reduction, throughput, and cost. Will the contract allow for this period of tuning / adjustment?

Response 22

A startup period including process tuning / adjustment is expected as part of the Contractor design and feasibility; however, one of the criteria for Contract award will be past soil remediation experience under similar conditions. The remediation contracts are anticipated to be performance-based; therefore, an extended startup period will negative impact schedule and profitability.

Question 23

Will new and/or innovative technologies be considered for award?

Response 23

The United Nations Compensation Commission (UNCC) Advisory Panel has intimated that funds are not intended for un-proven technology demonstrations. However, KOC under its own research program is assessing other potential options to demonstrate that a new technology could add significant benefit to the KERP program. This may include contractor funded trials (see Response 8).

Question 24

Will the remediation Contractor be responsible for excavation of the soils assigned to them?

Response 24

Various scenarios have been discussed; however, it is generally agreed that it would be less problematic if each remediation Contractor excavated their own soils for conditioning and treatment. Due to the size and complexity of the anticipated remediation contracts, contractors are encouraged to discuss teaming/subcontracting arrangements to provide soil excavation and treatment.

Question 25

How will the contaminated area be subdivided for assignment to the remediation Contractors?

Response 25

The current approach is to assign each remediation contractor a specific area with estimated volume / weight of soil to be excavated and treated. The areas that will be assigned to remediation Contractors are typically subdivided by roads and pipelines.

Question 26

Will KOC split the contract award into firm-fixed-price or lump sum amount for mobilization and startup with subsequent remuneration on a per unit treated basis?

Response 26

Various Contract strategies are currently under evaluation.

Question 27

Will the remediation Contractor be responsible for or have control over UXO detection and clearance?

Response 27

It is currently planned that UXO Survey, Detection, Retrieval, Transport, and Disposal will be performed by KOC Category 77A/B, Pre-qualified Contractors under a separate contract and will result in the issue of a Clearance Certificate for the remediation areas. In accordance with KNFP Procedures and Protocols for Commercial Explosive Ordnance Disposal Operations in KERP, no work may commence prior to the issue of a clearance certificate. In the unlikely event of discovery of any suspect items post issuance of the Clearance Certificate, procedures for the collection and disposal of any such items will be in accordance with KOC SA. 025 – Procedures for Handling of Explosive Materials, Substances and EOD.

Question 28

Will the remediation Contractor have control treated soil storage (short-term) and backfilling?

Response 28

Each remediation Contractor will have control over the short-term storage of treated soil and will be responsible for backfilling treated soil. Note that the remediation Contractor may be directed by KOC to place treated soil at an alternate location that is similar distance from the treatment site than the area from which the soil was excavated.

Question 29

Will KOC provide or make available electricity, potable and process water, fuel, sewage, land for accommodation, offices, or transportation?

Response 29

KOC will provide a suitable size area of land as close as practicable to the assigned remediation area to accommodate plant, equipment, and personnel. All work is to be conducted within an operational oilfield; the remediation Contractor is responsible for supplying all utilities, fuel, potable water, sewage, personnel and office accommodations, and transportation. As for the process water for potential use for the remediation technologies additional information will be forthcoming. Additionally, the

remediation Contractor is responsible for obtaining all necessary permits and approvals related to the acquisition and introduction to and use of these items within KOC oilfields.

Question 30

Are the working hours limited or may work proceed on a 24 hour per day basis?

Response 30

It will be possible for the remediation plant to operate 24 hours per day; approval will be required. During non-summer months (September through May), excavation and backfilling may proceed on a 24 hour per day basis; however, during the summer months, non-working hours extend from 11:00 am until 4:00 pm. For any works beyond normal working hours, Contractor must submit in writing a request to the Superintendent of Contract for approval for such hours along with a justification and other details (i.e. HSE measures, number of workforce, number of shifts, description of activities to be carried out, etc.).

Question 31

Are field data from the Limited-Scope Site Soil Characterization conducted in November 2014 (e.g., boring logs, analytical test results) available in Excel or suitable (.svg) instead of .pdf?

Response 31

Tabulated boring and analytical laboratory data in a MS Excel file will be available soon on KOC's website.

Question 32

If our company bids with one or more subcontractors or a partner, will our subcontractor(s) or partner need to be pre-qualified?

Response 32

Subcontractors are not generally required to be pre-qualified unless the contract specifies that a specialized/specific work needs to be subcontracted to a Category of Work listed under the KOC List of Approved Contractors. In this case, only those that are pre-qualified and listed in the specified Category 58 is acceptable to the Company. If your company's partnership with another Contractor is in the form of a joint venture (JV) or a consortium, that JV or consortium will be required to be pre-qualified as a JV or consortium, respectively.

Question 33

Please provide information regarding the soil samples provided at the January 2015 Workshop.

Response 33

The soil samples were collected at:

Latitude 28.905934 N
Longitude 47.992225 E

The samples were collected from Layer 2. The immediate area from which the samples were collected was covered with approximately 5 cm of dense, black Layer 1 material with an observed high concentration of weathered crude oil. The interface between Layer 1 and Layer 2 was damp with a film of highly viscous crude oil present. The undulating base of Layer 2 at this location resulted in a varying thickness over very short distances; <0.5 meters. The area is broadly categorized as Dry Oil Lake; the sample area visually appeared to have burned Layer 1, which is supported by the positive detection of PAHs in the sample.

Question 34

Is KERP able to offer any assurance that an application from a new entity for pre-qualification to Category 58 (Soil Remediation) submitted by the end of March 2015 will be approved by KOC prior to the issue of the first tenders for remediation? We are aware that obtaining pre-qualified status is currently taking in excess of 15 months.

Response 34

Assuming that your company meets the requirements for Category 58 pre-qualification and your application is complete, the typical approval process is less than 6 months and we are working on expediting this process. It is likely that a qualifiable application submitted by the end of April 2015 will be approved prior to release of the first tender for remediation.

Question 35

Given that non-Kuwait registered companies have been pre-qualified, will KOC enter a contract with a non-Kuwait registered company?

Response 35

The Company will enter into a contract with non-Kuwaiti companies as follows:

a) non-Kuwaiti companies registered in their country of origin with the registrar of companies and/or under the relevant prevailing laws that apply to the registration of companies and represented by a Kuwaiti agent; or

b) with non-Kuwaiti companies registered as in paragraph (a) above who are in partnership with a Kuwaiti registered company.

Question 36

We understand that tenders valued at >KD 5 million may be determined by the Central Tenders Committee which maintains its own list of pre-qualified contractors. Does CTC involvement introduce additional requirements for pre-qualification?

Response 36

For remediation tenders, KOC will select a category of work which is available in the KOC List of Approved Contractors such as “Category 58 – Soil Remediation Services”. Where the estimated Tender cost is more than KD 5 million, the approval to issue such tender will go up to the Central Tenders Committee (CTC) but CTC involvement does not introduce additional requirements for pre-qualification.

Responses to KERP Remediation Technology Questions

Question 37

Will the financial data submitted for pre-qualification approval influence which tenders the pre-qualified party may be invited to tender for?

Response 37

No.

Question 38

The Workshop focused on a volume of 26 million m^3 of contaminated materials. Is there an additional volume (over and above the 26million m^3) with a lower degree of contaminant impact that will be the focus of later contracts, possibly focusing on bioremediation?

Response 38

The objective of the project is to remediate 26 million m^3 identified as priority areas identified in the UNCC claims. Further volumes to be treated are not yet considered.

Question 39

Given the goal of completion by 2020, can KERP provide any guidance on the likely timing of issue, and required treatment volumes within forthcoming remediation tenders?

Response 39

The program schedule has been agreed by stakeholders as 2024. A schedule with to meet the volume requirements is currently under review and will be posted on the KOC website when available.

Question 40

What are the estimated dates for RFP and tender release?

Response 40

Our intention is to start the tendering process for the first active remediation project by mid-2016.

Question 41

What is the range of salt concentration in soils to be remediated and what are the expectations for salt concentration in remediated soils?

Response 41

The measured soil electrical conductivity for soil samples collected during the 2014 Limited-Scope Site Soil Characterization varied between 96 µS/cm and 104,100 µS/cm indicating salt concentrations from <0.1 to 6.6 percent. The highest salt concentrations were detected in soil samples collected from low lying areas (e.g., wadis) that accumulated salt water from firefighting efforts and ephemeral terminal lakes that receive water only during significant precipitation events or from shallow groundwater influx. An upper limit for the salt concentration of remediated soils has not been established. It is anticipated that salt concentrations that do not render the soils sterile to native vegetation will be acceptable.

Question 42

Will re-vegetation be included in the scope of work under the remediation contracts?

Response 42

It is proposed at present that re-vegetation will not be performed under the remediation contracts. The upper soil layer or treated material layer; however, must be capable of supporting native vegetation.

Question 43

Is the particle size distribution in the soil samples provided at the January 2015 Workshop representative of the overall site?

Response 43

Soils gradings quoted at the workshop were generalised and based on a small number of samples. Further sampling is required to determine variability across the oilfields. Silt and fine sand can be a large proportion of the Kuwait desert sands and therefore contractors are requested to make themselves aware of these conditions prior to process design. More information is available at the KISR website on Kuwait soil properties.

Question 44

What analytical test method was used to analyze the black carbon fraction?

Response 44

Black carbon was not analyzed during the 2014 Limited-Scope Site Soil Characterization Project.

Question 45

What were the energetic (calorimetric) values for the sludge and oil contaminants?

Response 45

A total of 11 sludge and highly-contaminated soil samples were tested (ASTM D5468) for Gross Calorific Value under the 2014 Limited-Scope Site Soil Characterization Project. The values ranged from 2.3 Mj/kg to 37.2 Mj/kg. Note that no phase-separated hydrocarbon samples (i.e., crude oil with little to no sediment) were analyzed. The quality of the sludge is considered to be highly variable and to date very few samples have been acquired for analysis due to UXO issues.

Question 46

What were the TPH analytical test methods performed for the 2014 limited scope Site Soil Characterization.

Response 46

The following TPH analytical test methods were used for the 2014 Limited-Scope Site Soil Characterization project:

Name	Test Method	Fractionated
TPH	EPA 9071B (hexane extraction method)	No
GRO-DRO-RRO	EPA 8015B / 8260B	Yes
SARA	IP 469/01 (2006)	Yes
TPHCWG PERF Modification	EPA 8015B/8260 MAMTCA ECY97 602	Yes

The SARA and TPHCWG (PERF Modification) tests provided fractionated data that included asphaltenes.

Question 47

Will the remediation Contractors be allowed to use recovered oil (e.g., as a fuel) as part of their remediation process?

Response 47

If it can be demonstrated that this process is economically viable it is currently anticipated that remediation Contractors will be allowed to use recovered oil (see Question 48 and response).

Question 48

Can the oil generated during remediation be owned by the contractor?

Response 48

Currently, the oil is owned by KOC. The net worth (value after recovery, transportation, and any subsequent processing prior to end use) of recovered crude oil has not been established. The ownership of any positive net worth is under consideration and has not been agreed.

Responses to KERP Remediation Technology Questions

Question 49

Was the number of days included in the KOC contracting cycle schedule at the Workshop working days or calendar days?

Response 49

Calendar days.

Question 50

What is the role of Central Tenders Committee?

Response 50

In accordance with KOC Policies and Regulations for Contracts, KOC tenders whose estimated value is greater than KD 5 million, authority to issue and receive RFPs and award of contract is with the Central Tenders Committee. The Central Tenders Committee is the official State body which regulates the issue and awards of the said KOC Tenders.

Question 51

Can remediation Contractors use, rent or purchase KOC equipment.

Response 51

Remediation Contractors will be required to acquire any and all equipment required to execute the contract. KOC will not provide (for use, rent, or purchase) any equipment.

Question 52

Is the Remediation Technologies Demonstration Project (as envisioned during 2014) going to happen?

Response 52

The Remediation Technologies Demonstration Project (as envisioned during 2014) is unlikely at this stage to be executed as a standalone project. See also response to Question 6.

Question 53

What are the HAZOP / HAZID requirements with respect to equipment?

Response 53

Remediation Contractor equipment or treatment process HAZOP / HAZID will be the sole responsibility of the Contractor. The Contractor will be required to prepare HSE documents that address HAZOP / HAZID issues in accordance with KOC policies and guidelines, which will be provided prior to proposal preparation.

Question 54

Is the EIA part of the Contractor's scope or will KOC prepare?

Response 54

KOC will prepare the Initial Environmental Impact Assessment (IEIA). The remediation Contract will be responsible for preparing the Final Environmental Impact Assessment (FEIA) and obtaining approvals from KEPA during the mobilisation period. In addition, the remediation Contractor will be responsible for preparing the follow-up environmental monitoring plans and reports during execution to KEPA and prepare Quantitative Risk Analysis and Project HSE Review (PHSER) III, IV, V, and VI as per KOC policies and requirements.

Question 55

Describe remediation Contractor's contractual environmental liability.

Response 55

Remediation contractor's liability will be specified in the terms and conditions of the contract which has yet to be agreed and approved. The works will be carried out in such a way that there is no detrimental effect to the surrounding area, ensuring no impact to the existing environmental setting. The contractor will be expected to meet agreed clean-up standards, the results of which will be verified and approved by stakeholders and completing treatment of soil volumes to an agreed timescale.

Question 56

How and when will payments be made under the remediation contracts?

Response 56

Payments will be made based on the Contract Conditions and on agreed Progress Measurement System after Contract Award.

Question 57

What methodology will be used to perform the topographic land survey the area assigned to the remediation Contractor?

Response 57

The remediation contractor shall use its own methodology that meets specification requirements of the technical specification. Such methodology shall be submitted to the Company for approval prior for implementation to ensure that the requirements of the contract specifications have been adhered to.

Question 58

What are asphaltenes and how might they impact my company's remediation process?

Response 58

Contractors that have limited experience or knowledge on the composition of crude oil and remediation of oils will be excluded from tendering.