SFD Lite Report

Kabarto 1 IDP Camp
Kurdistan Region of Iraq

This SFD Lite Report was prepared by GOPA Infra

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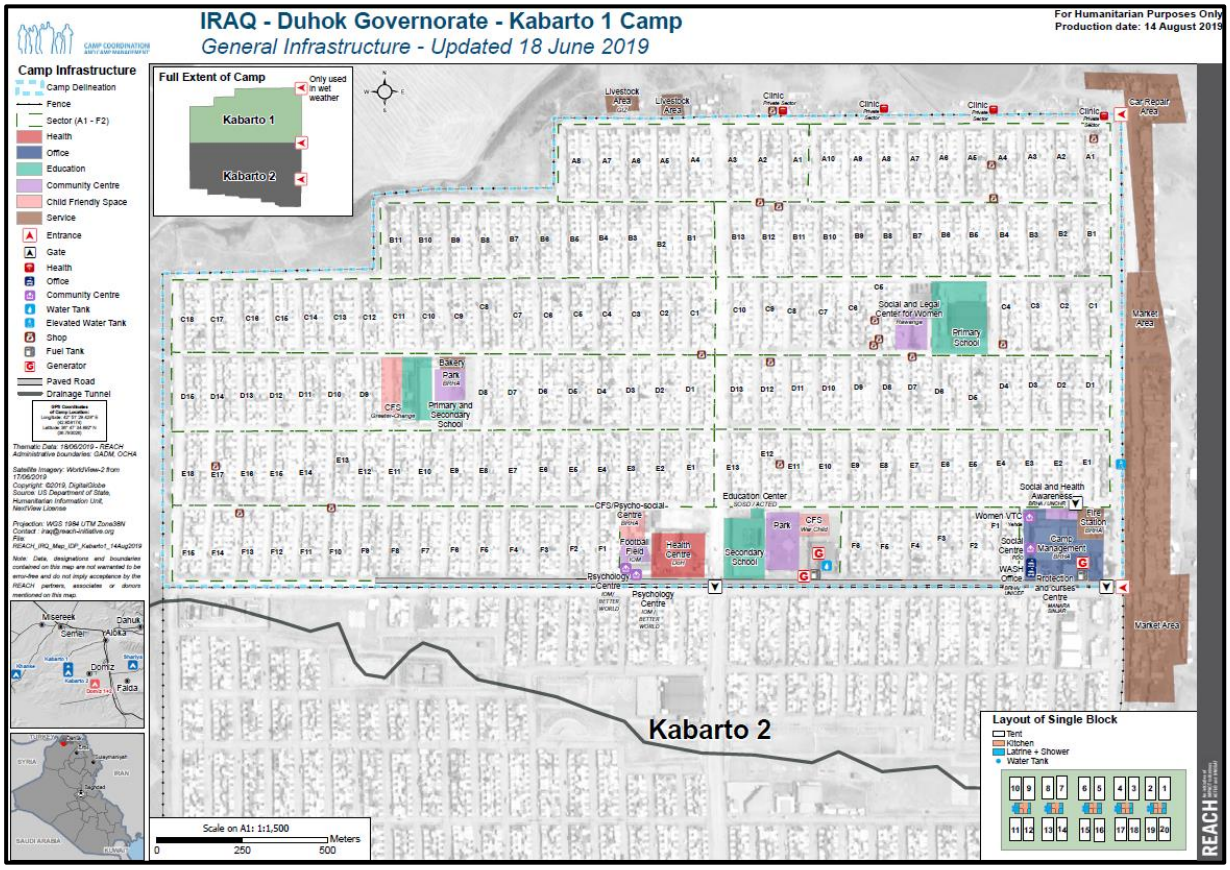


Cover Map: Kabarto 1 Camp General Infrastructure – Source: CCCM Cluster Iraq - Reliefweb

1 The SFD Graphic

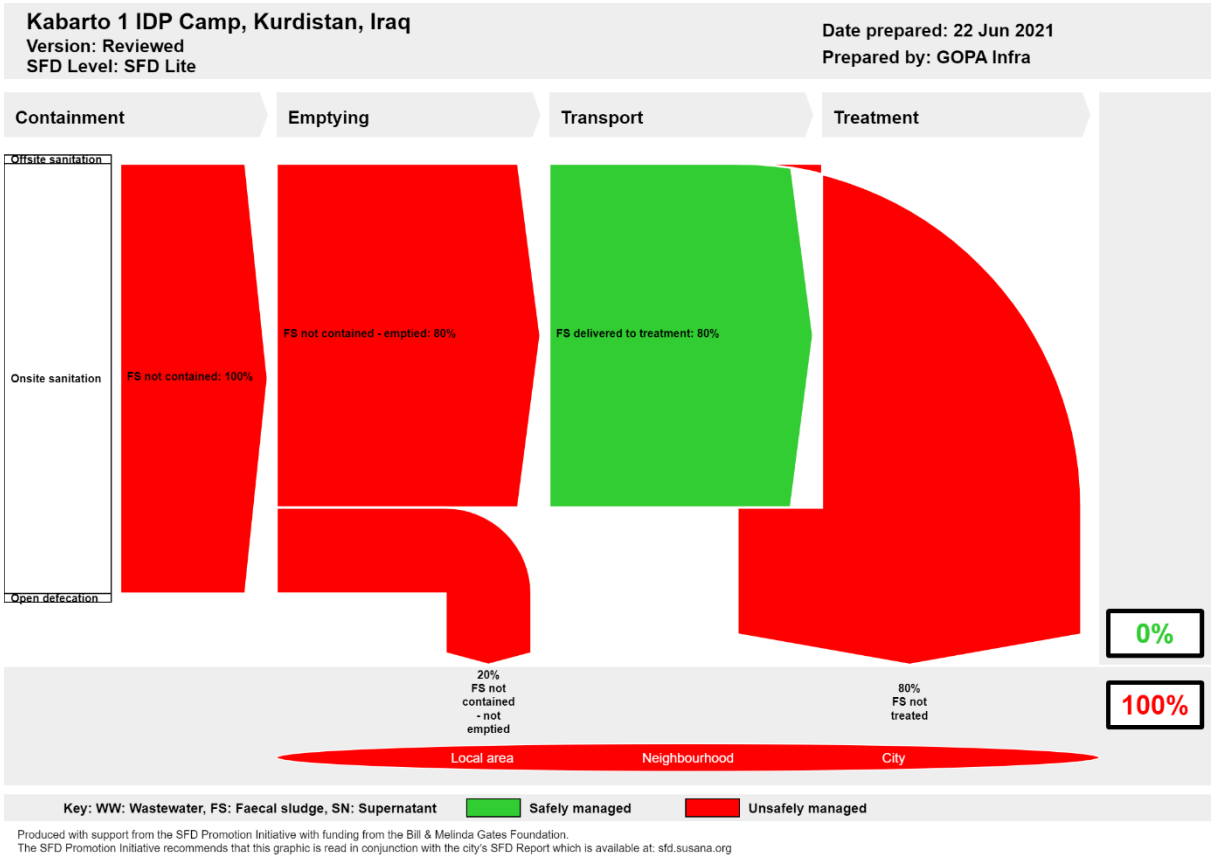


Figure 1 - SFD Graphic for Kabarto 1 IDP Camp

2 SFD Lite information

Produced by:

- GOPA Infra, Duhok, Kurdistan Region of Iraq
- GOPA Infra (GI) have been implementing a project through GIZ funding which is intended to provide technical assistance and programming to various Directorates in the Duhok area of the Kurdistan Region of Iraq (KRI). Part of this project is to assist in capacity development of key partner staff, who are tasked with the management and delivery of sanitation services, within these Directorates. Through these activities GIZ wishes to introduce the concept of smart sanitation to this capacity development and to introduce these staff to the SFD process.

  GI, in supporting GIZ in its efforts to introduce the concept of smart sanitation, is engaged in the development of three SFD Lite for the geographic target areas of Internally Displaced People (IDP) camps at Kabarto 1+2, plus the community of Sharya Town.

  Through this work, GI have recognised the importance of involving Directorate staff in the process of creating the above mentioned SFDs, which will give them familiarisation with, and experience in the use of SFD tools and templates, as well as producing the SFD based on their direct input. These Directorate staff are key stakeholders in collecting and refining the information used in creating the SFD Lite and GI wishes to acknowledge their time and support in participating in the process.

- The GI contributing team were Dr Lück, Andreas H., Mr Hameed Doski, Mr Ibrahim Dana, Mr Mustafa Abdulkhaliq, Mr Aza Hani Shukri, Dr Nashwan Shawkat, Mr Maen Quda and Mr Martin O'Malley.

Collaborating partners who attended the Stakeholder Workshop on 22 June 2021:

- General Directorate of Municipalities in Duhok (GDoMs) – Mr John Shamoon, Mr Waheed Jameel, Mr Heeve Ali, Mr Majid Ali, Mr Dilovan Farid, and Mr Kamiran Mohammed.
- Directorate of Water Outskirt Duhok (DoDOW) – Mr Khalid.
- Directorate of Migration and Crisis Response (DMCR) – Ms Jowan Naif.
- Environmental office in Duhok (EoD) – Mr Hassan Mohammed.
- Directorate of Sewerage (DoS) – Mr Younis Jano, Mr Sinan Shaba, Mr Haval Ezat and Ms Avin Kamal.
- General Directorate of Water and Sanitation (GDoWS) - Erbil – Mr Imad Omer and Mr Hawkar Azeez.
- Kabarto 1 Camp Management – Ms Jiyar Hameed Abdullah.
- Kabarto 2 Camp Management –Mr Hakar Muhammed Ameen and Ms Havrist Sardar Rasheed.
- KURDS NGO – Mr Hishyar Shaban, Ms Shavin Tahseen, Mr Dilshad Shawkat and Ms Elbra Edward.
- University of Duhok (Guest) – Dr Shawkat Ahmed Yaseen.

This workshop was held after the initial round of Key Informant Interviews, data collection online and review of the various reports available on the Kabarto 1 & 2 camps. Not much online information was available on Sharya Town. The workshop provided the opportunity to get all the stakeholders together to work through the information collected on Sharya Town and Kabarto 1. Through the information collected prior to the workshop, it was clear that Kabarto 1 & 2 were reasonably similar and so in the interests of saving time at the workshop, which was for 3.5 hours, only the information on Kabarto 1 was presented and discussed. The intention being that GOPA Infra would then update the SFD for Kabarto 2 and share this with the attendees for confirmation, which subsequently happened. Therefore, while only Kabarto 1 and Sharya Town were discussed on the day, the agreed intent was to use as much of the same information as possible to develop the Kabarto 2 SFD.

The second purpose of the workshop was to use the agreed information to work with the stakeholders through the SFD process, introducing the SFD Users Guide and online tools and aiming to give confidence in using these tools later by working through the two examples well known to the attendees. It provided the stakeholders with a forum in which to discuss the usefulness and relevance of the smart sanitation and the SFD to their own situation and how it can be used to highlight the need for funding or other assistance through the visual representation of the SFD.

Date of production: 22/06/2021

3 General city information

3.1 Location

Kabarto 1 IDP Camp is situated in the KRI and located in the Sumel District, which is part of the Duhok Governorate administration, and it lies approximately 13km southwest of Duhok, as per Figure 2. Access to the camp is off the main Mosul-Duhok Road, but it can also be accessed via dirt road from Domiz town.

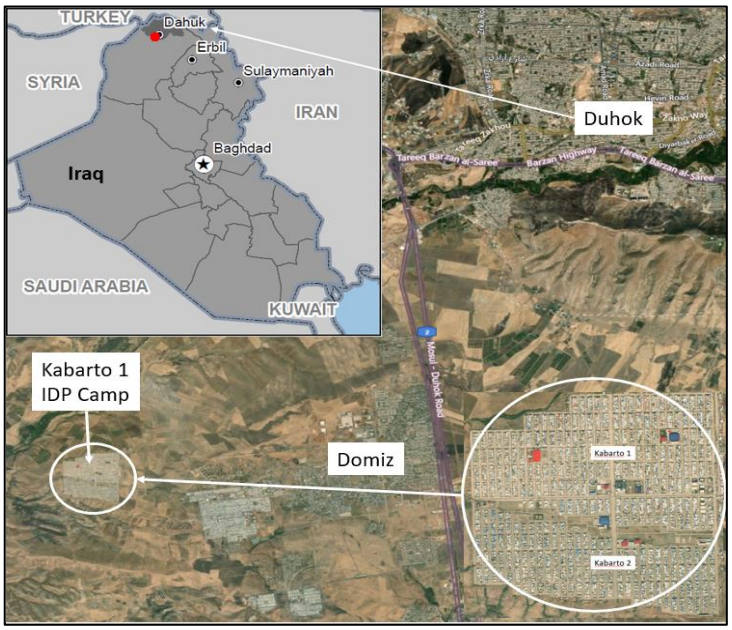


Figure 2 - Kabarto 1 IDP Camp (Source: Bing Maps 2021 & REACH CCCM Cluster Iraq 2019)

The area around the camp is generally arable land, growing one grain crop per year, mainly wheat. Grazing of the land occasionally occurs by nomadic herds of goats and sheep, that are controlled by a shepherd.

The topography of the area generally slopes from Domiz Town to the northeast of Kabarto 1, southwest towards the Mosul Dam, with the land being reasonably flat, but with wadis (dry creeks) that take the runoff from the surrounding land during rain events. A wadi runs next to Kabarto 1 camp, along its boundary with Kabarto 2 IDP camp. The southern end of the Kabarto 1 camp slopes downhill towards this wadi. According to the Kabarto 1 Camp Manager, there have been some localised flooding events in the camp, but nothing significant and it appears to be more ponding of rainfall, rather than flooding is the issue. The access road to the camp was washed out during a flood in 2019.

3.2 Background

According to the “Report on the IDP Camps in Duhok, June 2015 by Board of Relief and Humanitarian Affairs (BRHA)”, the Kabarto 1 IDP camp was established, along with many others in KRI, in late 2014 in response to the influx of displaced people from Mosul City, Ninewa Plain, Zummar and Sinjar areas of northern Iraq, caused by the conflict and violence around the Islamic State of Iraq and the Levant (ISIL) campaign. The report states that between June and August 2014, more than 500,000 people were displaced from these areas and sought protection in the KRI.

The vast number of people arriving at the same time overwhelmed the local authorities and supporting humanitarian agencies in their ability to provide accommodation and support within the existing communities. As stated in the above referenced BRHA report, establishing camps to deal with population movements is the least preferred option, but in this case, owing to the large number of people and short timeframe of arrivals, it was considered by the Duhok Governorate to be the only viable way to stabilise the situation as quickly as possible, according to the report.

Kabarto 1 camp construction commenced in October 2014, through the “camps construction committee” in the Duhok Governorate and it was officially inaugurated on 22 November 2014, with families being accommodated in the following month of December. The camp is populated primarily by Yazidis, originating from the Sinjar area, owing to their connections to the area and by a smaller number of Muslim Kurds, according to the BRHA report. The total number of people in the camp has

fluctuated over time, but recently the numbers are staying relatively steady (see Section 3.3 below), as ongoing conflict or concern over security in their homeland of Sinjar is proving to be a deterrent to returning, though some have been, but came back because of this, according to the camp manager.

3.3 Population

Kabarto 1 IDP camp has space for 3,000 plots for tents, which in theory can provide shelter for approximately 2,800 families, according to the "Report on the IDP Camps in Duhok, June 2015 by BRHA". Each tent is designed to hold up to 5 people, but many of the families present have larger numbers and therefore they were allocated two plots, side by side. According to the Kabarto 1 Deputy Camp Manager, Ms Jiyar Hameed Abdullah, the average number of people per family used in 2021 is 6 people.

Since the camp was established, the total population present has decreased, with some moving to locations where they have relatives, but with significant numbers immigrating to other countries, as part of a relocation assistance programme, as described by the camp manager. The population figures are managed by the camp management on behalf of the Directorate of Migration and Crisis Response (DMCR) and, the population present at the time of the key informant interview with the camp manager, in early June 2021 is presented in Table 1.

Table 1 - Kabarto 1 Population 2014 & 2021 (Source: BRHA Report 2015 & Camp Manager 2021)

Year	HH No.	Individuals No.
2014	2,359	14,119
2021	2,224	11,783

Estimating the growth rate in the camp is difficult due to the nature of the camp, where families may leave the camp and other families then enter to utilise the space. According to camp management the accepted population growth figure is 2.8% per year from births in the camp.

Camp management estimate that up to 60% of the population of the camp exit during the day to take up employment, study or to seek healthcare in other locations. During the summer period from March through September, people leave the camp to take up work, mostly agricultural related jobs. Generally, however, there are no significant changes in population during the week/weekends. The main religious event is the Jama Pilgrimage during August, where people do leave the camp for the purpose of attending the pilgrimage.

3.4 Spatial & Boundary Information

Kabarto 1 IDP Camp has an overall area of 0.42km^2, based on the Camp Coordination Camp Management (CCCM) Cluster map, produced by REACH in 2019. The camp structure, as presented on the cover map, is laid out around blocks of tent plots, with space for twenty tents per block, as indicated in Figure 3. The layout of these blocks is intended to use the topography to the best advantage for the sanitation services, where the grey and black water can be drained from the shelters and toilet/kitchen areas to the lowest point at the end of the block. If the topography further allows, then the grey

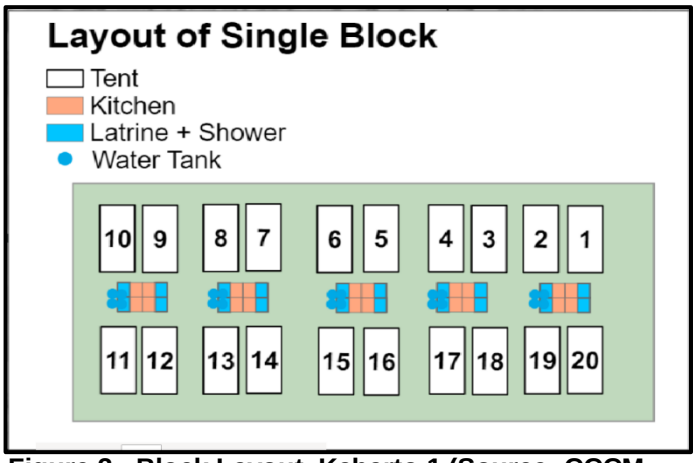


Figure 3 - Block Layout, Kabarto 1 (Source: CCCM Cluster Iraq, 2019)

water is carried away from the other blocks and into the natural drainage system that deals with stormwater from rainfall events. Where the greywater cannot be diverted into the natural drainage, it is added to the “septic tanks” (these are detailed further in Section 4: Service outcomes). The blackwater is added to the “septic tank” at this location and as such, the sanitary conditions of the camp are kept in reasonably good order by diverting this waste away from the dwelling areas.

An example of the layout of the blocks is provided in figure 4, where you can see that each tent is established on its own plot and these can then develop over time as the family expands the shelter to take up more space on the plot and make it more comfortable, as the likelihood of returning to their place of origin becomes less likely in the near future.

Figure 4 - Kabarto 1 Block (Source: Author, 2018)

In each of the blocks, tents are established on plots that are usually 12m x 7m = 84m^2. The space allocated for each household is thus smaller than the average of 200m^2 in the host community, but much bigger than the recommended minimum of 30m^2 per household for camp settings from the emergency shelter handbook, according to Mr Ali Mobasher of UNHCR. The tent size provided on the plot is generally 4.6m^2 per person, compared to the minimum recommended of 3.5m^2 per person, as explained by UNHCR.

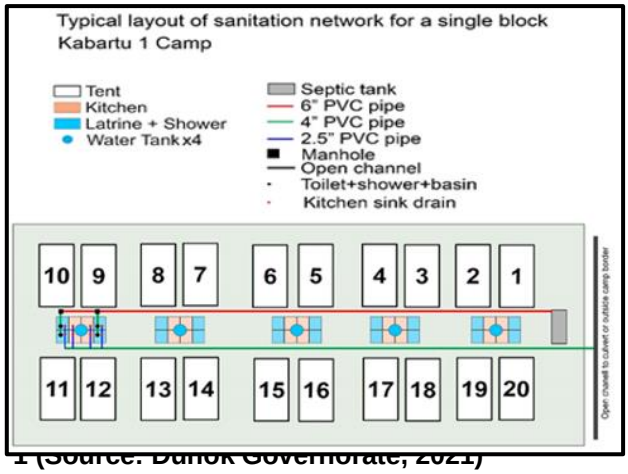
In figure 4, the stormwater channels that have been constructed around the plots are obvious. These have been constructed from concrete to prevent erosion and to ensure that runoff from roads is channelled around the tent plots, thereby minimising the opportunity for flooding from rainwater.

4 Service outcomes

The sanitation service chain in Kabarto 1 IDP is based on onsite sanitation systems used throughout the camp, though it is a little different, owing to each plot not having its own containment, rather containment for the whole block of twenty is provided. This is detailed in the following sections:

4.1 Collection

Collection of faecal waste is via a squat toilet, which is based on the principle of using water to flush the toilet contents and providing a water seal to prevent odour from the containment system returning to the building. This collection system collects faeces, urine, water for anal cleansing and flush water, which collectively are called blackwater. The typical design figure that has used per person for blackwater is 20 - 25l per day, as used in the nearby Domiz camps and is supported by assessments carried out in the Domiz 1 Refugee camp,



1 (Source: Duhok Governorate, 2021)

nearby. (Ref – Sanitation Assessment & Concept Options Report, 04 June 2019).

The blackwater collection system consists of a small diameter pipe that connects the household toilet to a bigger, collector pipe that then transports the waste to a tank, which is the containment system. As shown in figure 5 and figure 6, the system collects from the 20 shelters. In this case it is referred to as a "septic tank", though as will be pointed out later, this is not the containment system present.

Where possible, waste from kitchens, showers, wash hand basins and baths, called greywater, are all directed away from the onsite containment system and to the nearest surface water route, usually that is a kerbside drain in a road, beside the plot. This practice uses the rain and stormwater system to allow the greywater to be removed from the vicinity of the plot on which it originated. This is standard practice in all the towns and cities in Kurdistan, as observed by the author and confirmed by UNHCR Duhok staff. According to KURDS NGO there is a separation of grey and black water in 20% of the camp and in the other 80% of the camp the grey and black water is mixed and goes to the "septic tank".

Figure 6 - Collection pipes from individual toilets (Source: Duhok Governorate, 2021)

There is no reliable information on the greywater volumes produced in Kabarto 1 IDP Camp. However, assessments carried out in the Domiz 1 Refugee camp, nearby, (Ref – Sanitation Assessment & Concept Options Report, 04 June 2019), estimated the greywater figure at 65l per person per day, based on an average water consumption of 100l per person per day. According to the KURDS NGO, the estimated water supplied to each of the Kabarto 1 camp residents is 64l per person per day. While this is lower than the Domiz 1 figure, it is based on measuring the bulk water supply and so does not take account of people buying water from private tankers. Based on this comparison, the author assumes that the likelihood is that the greywater production in Kabarto 1 will be significantly less, based on the reported water consumption and when compared to Domiz 1 water supply.

No open defection occurs in the camp, according to the Engineer from KURDS NGO.

4.2 Containment

As described by KURDS NGO staff, in 80% of the camp the grey and black water goes to a containment structure. This is referred to as a septic tank in figure 5 and sometimes referred to locally as a holding tank. Though neither description is accurate, based on the SFD Manual.

The containment system consists of a blockwork wall, constructed directly on the ground, without any base slab or foundation.

Figure 7 - Kabarto 1 Blackwater Containment, 1 of the total of 150. (Source: Duhok Governorate, 2021)

A concrete slab is poured over the top of the “tank”, to provide a cover and support its own weight. The intention of the containment system is to let as much liquid as possible infiltrate into the ground, through the permeable walls and the open bottom. This system requires regular desludging, as with twenty households connected to it, there is more liquid being added than what usually can infiltrate into the ground. It reduces the amount of desludging that must happen, thereby minimising the cost, but that does mean that untreated liquid is permeating into the ground from every containment system in the camp (150 in total), which creates a potential risk for groundwater. As described in the SFD manual, the material that is removed from the containment system is called faecal sludge (FS).

In the SFD manual, this type of containment is referred to as “Lined pit with semi-permeable walls and open bottom”. During the workshop with stakeholders in which the SFD graphic was created, there was much discussion in relation to the type of containment, but in the end, all agreed that the lined pit was the most appropriate, based on the descriptions in the SFD manual.

The engineer from KURDS NGO stated that some of these containment systems are prone to getting stormwater inflow during wet weather and that this increases the amount of desludging needed, otherwise the pits will overflow. In winter the ground is also more saturated from the rain and so there is less permeability for the contents of the pit, also resulting in increased desludging requirements. Other than emptying these systems, no other planned maintenance is currently carried out.

4.3 Emptying

This is carried out by 10,000l vacuum trucks, provided by the municipality and they can also be provided by private contractors, where needed for extra capacity or to cover breakdown of the municipality trucks according to KURDS NGO. Their staff monitor the various pits within the camp and direct the desludging service to the various locations when it is required to prevent overflow. KURDS NGO carry out camp surveys at least annually and gauge people’s satisfaction with the various services provided and in general there is satisfaction with the emptying of the pits, though people do comment that in winter some pits overflow, as already mentioned.

Figure 8 - 10,000l Contractor Vacuum Truck (Source: Author, 2018)

These vacuum trucks are widely used in the area and they come with a flexible suction hose that is inserted into the containment pit in order to vacuum the FS out. As noted in the Sanitation Assessment & Concept Options Report, 04 June 2019, there is difficulty in completely emptying these types of pits, owing to the narrow opening in the roof slab and the flexible hose, which often results in solids being left in the corners of the pit, away from the opening in the roof slab, reducing the working volume and thus increasing the frequency of desludging.

4.4 Transportation

The same vehicles that are used for emptying the onsite containment systems are also used for transporting the FS to either the treatment or discharge sites. As will be described in the next section, there is a treatment plant in Kabarto 2 IDP Camp. At the time of carrying out the assessment for this SFD, the treatment plant was not operational, because of some maintenance issues and therefore the desludged material was being removed to the dedicated dumping site for the Domiz camps, 2km away, according to GOPA Infra staff in Duhok. This is pictured in figure 8 and unfortunately it is purely a dumping site, with no treatment carried out.

4.5 Treatment

In 2017 GIZ funded the design and construction of greywater treatment plant at a site in the Kabarto 2 IDP camp, next to Kabarto 1 camp. The plant, a sequencing batch reactor (SBR), was designed to treat greywater from both Kabarto camps, as well as that from the Domiz 1 Syrian refugee to the east of the location that is at the source of the wadi which runs along the edges of both Kabarto camps. The plant was designed by a company called KBN and constructed using direct labour from the camps and managed by the local municipality. No design report or operation and maintenance manual was provided by the company, or at least none was able to be found during the current and previous assessments for SFD. However, based on the plans shown in figure 9 below, it is stated as being a greywater treatment plant, rather than a wastewater treatment plant.

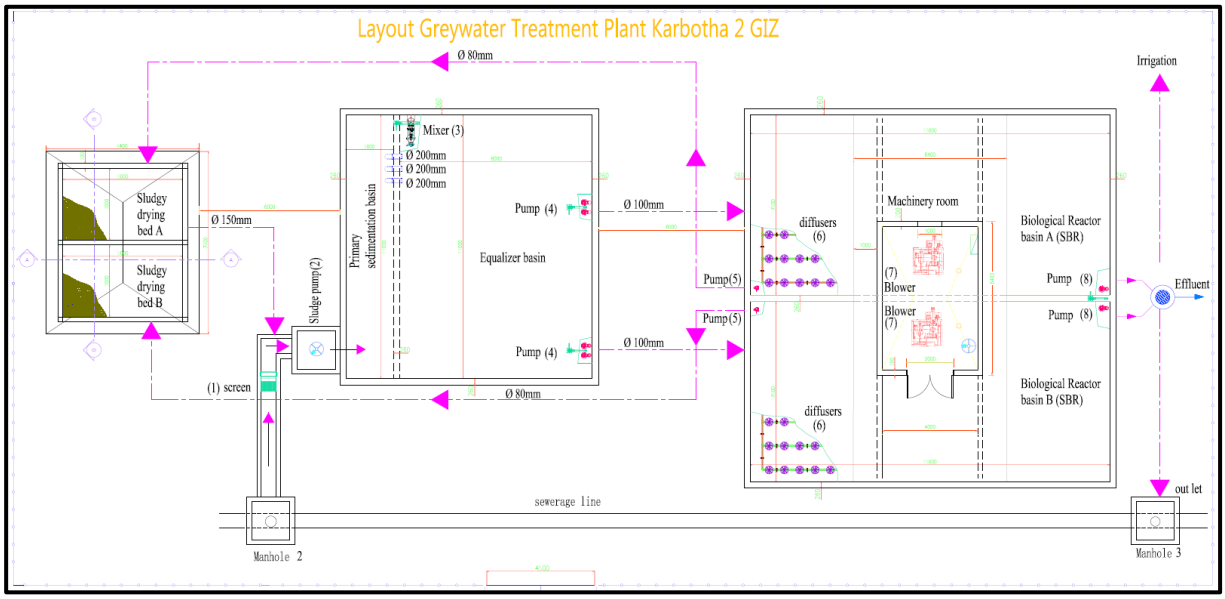


Figure 9 – Kabarto 2 Sequencing Batch Reactor Layout (Source: Duhok Governorate, 2021)

As can be seen above, the flow from the wadi is directed into the plant at Manhole 2, using a valving arrangement and from there the flow gets screened to remove debris, before entering the primary sedimentation basin. Based on the authors experience of SBR's in other areas, the design of this plant appears different, in that there are no obvious supernatant return lines for seeding the incoming flow and the final effluent appears to be pumped from the bottom of the tanks, rather than decanted off the top, which would reduce the opportunity for solids to exit the plant in the decanted liquid. However, without the design report or operation manual, the exact design philosophy is not understood

The final effluent is pumped out of the biological reactor basin and returns to the wadi beside the plant location, at Manhole 3. It is intended that at some point, when the treated effluent is at an acceptable standard for reuse, the final effluent can be used for irrigation in the surrounding area. This would add

a final stage of treatment, where any remaining nutrients in the treated effluent would be taken up by the soil and plants and therefore using them beneficially.

While this system has been designed for greywater, blackwater from the camps has been added to the plant in the past and put through the treatment process, but no detailed testing of the final effluent was carried out to ascertain the plant performance with this material added. Engineer Hassan from the Directorate of the Environment stated that the treatment was sufficient, but as mentioned, there are no tests to support that. At the time of writing this report however, the treatment plant is not in operation and so neither the grey nor blackwater from Kabarto 1 IDP camp are being treated. At the time of writing this report it is not clear when the plant will be running again as some parts are unavailable locally and the Directorate of Municipalities could not confirm when these will be obtained.

4.6 Disposal/Reuse

As mentioned, with the plant not currently in operation the greywater continues to run to the wadi and on through the natural drainage, which eventually drains into the Mosul Dam. The blackwater is being discharged to a designated dumping location, 2km away, pictured in figure 8, which also flows into the natural drainage channels towards the dam, also. This is the same designated dumping site for Domiz 1 and 2 Syrian Refugee camps

Because the blackwater in the containment system does not stay for very long and thicken over time, it was previously described to the author that this material was not liked by farmers for spreading on the land as it did not have the same qualities as material that thickens and breaks down over time in the pits, which reportedly provides a better fertiliser. This information was advised during the 2019 assessment in Domiz 1, from the then camp manager and is believed to still be the case as the material is in the same condition as described in 2019.

4.7 SFD Matrix

The SFD graphic for Kabarto 1 IDP Camp was compiled at a stakeholder workshop on 22 June 2021 and through discussions with the Camp Manager and staff of KURDS NGO in early June 2021. The following are the steps undertaken and the reason for selecting them: -

- For Step one in the graphic, the participants used the selection grid and as already mentioned, chose “Lined pit with semi-permeable walls and open bottom”. The next task is to determine the “risk of groundwater pollution”, based on a series of questions in the SFD tool. At the workshop and, following the guidance from the online tool, the participants selected the “low risk of groundwater pollution” option. This was based on answering the questions relating to depth of groundwater, soil type and proximity to containment systems. In the Kabarto area the boreholes are between 134m and 237m deep, therefore very much greater than the maximum 10m in the tool. Fine sand, silt and clay was selected as the soil type by the participants. Based on the same feedback, there are no water sources close to the camp. When all of these are entered into the online tool, the output was that the overall risk to groundwater was low.
- However, after the workshop, some more detailed observation of borehole logs for the area was carried out and these indicate that the ground water is reasonably shallow around Kabarto 1. While the bores themselves are quite deep in the 7 bore logs observed, the Static Water Level across all of them is between 5m and 17m below ground, with the Dynamic Water Level ranging from 70m to 142m below ground. This indicates that there is significant potential for any contaminants entering the shallow groundwater to be drawn deeper through the pumping of water. Because of this, the author considers the more prudent approach is to use the high-risk category, therefore selection of option T2A5C10.

- In Step two, the correct onsite container must be selected, and the percentage estimated to be FS. Using Information button that opens another interactive Help Tool to help select the % of FS in the pit, this indicated that 100% could be used. This was used during the workshop, as the time pressure did not allow for more detailed interrogation.
- However, the participants also state the pits are designed to allow active infiltration of the supernatant from the container to the ground. Therefore, Variable group: S4 on page 106 of the SFD manual is considered to be more applicable and thus 80% of tank is FS emptied and 20% FS not contained and not emptied, infiltrate to ground. This allows for the fact that there is regular desludging, but there will always be a volume that infiltrates into the ground via the walls and open bottom and the assumption is that 20% of the material is infiltrated.
- The Proportion of the Population using this type of system was agreed at 100%. It was discussed by the participants at the workshop that all the shelters in the camp use this same type of containment system. It may be known by different names, but for the SFD completion, it's established as the lined pit with semi permeable walls and open bottom for all the community.
- Proportion of this type of system from which FS is emptied was also agreed at 100% of the population, as have these tanks emptied at some point. The timing differs from house to house, but, at some point, they all are emptied.
- Proportion of FS emptied which is delivered to treatment plants. With the Kabarto 2 treatment plant currently not in operation, all FS is being taken to the designated discharge site, as already described. However, to show that transportation is not a problem, with sufficient resources available, a figure of 100% FS being transported to the treatment plant is used and further elaborated on in the assumptions.
- Proportion of FS delivered to treatment plants, which is treated. This figure is 0%, based on the fact that the treatment plant is out of service and no FS is being delivered there at the time of writing this report.

Kabarto 1 IDP Camp, Kurdistan, Iraq, 22 Jun 2021. SFD Level: SFD Lite

Population: 11783

Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 8

Containment				
System type	Population	FS emptying	FS transport	FS treatment
	Pop	F3	F4	F5
System label and description	Proportion of population using this type of system (p)	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated
T2A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	100.0	100.0	100.0	0.0

Table 2: SFD Matrix for Kabarto 1 IDP Camp (Source: GOPA Infra – Stakeholder Workshop, June 2021)

4.8 SFD Graphic

The graphic produced by the methods, information and assumptions made and described above is felt to be an accurate summary of the sanitary situation in the Kabarto1 IDP Camp. On an ongoing basis the blackwater that enters the lined pits is not contained and, in fact, these pits are designed specifically so as not to contain the liquid, but rather let it infiltrate into the surrounding soil through the semi-permeable walls and open bottom. The risk to groundwater can be considered significant unless there is sampling, or analysis done to prove otherwise. But even in that case, owing to the density of population in the camp, it is more prudent to consider the risk significant on an ongoing basis, unless the method of containment changes.

The figure of 0% of the faecal sludge being safely managed and 100% unsafely managed is felt to be an unfortunate, but accurate assessment of the overall situation in Kabarto 1 IDP camp, based on the various factors described in this report.

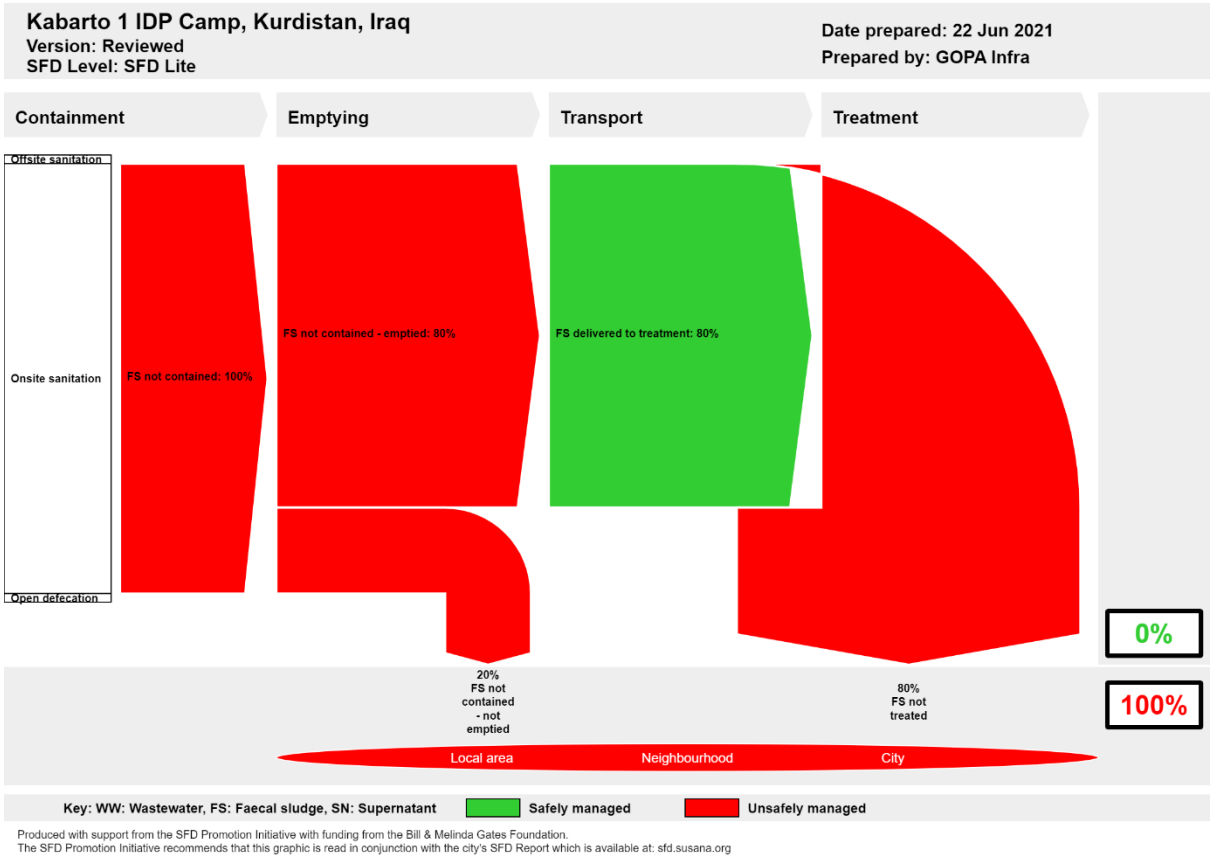


Figure 10: SFD Graphic for Kabarto 1 IDP Camp (Source: GOPA Infra – Stakeholder Workshop, June 2021)

5 Data and assumptions

Availability and accessibility of data:

- No “as constructed” service drawings were maintained after the camp was constructed and so this SFD relies on the design drawings for the services layout.

Identified data gaps:

- Limited information available on local Policy and Legislation around sanitation.
- It was not possible during the creation of the SFD to get regional or national levels policies either.
- Information on boreholes close to the Kabarto 1 camp could not be found and this would give a better understanding of the geology in the area.
- No water testing results from bores near the camp was available to confirm water quality. It was stated by KURDS NGO that there is testing done on the water supply system, but this is the one that comes from Duhok and so does not reflect the local ground conditions.

Major assumptions that were made:

- The assumption that there is a significant risk to the groundwater from the onsite sanitation systems in Kabarto 1 IDP Camp. There is no testing results or other data to support this but based on the limited information on boreholes available for the area and the fact that the containment systems are designed to infiltrate as much liquid as possible from the pit, it was felt that this was a reasonable assumption.
- That 20% of the FS that goes into the containment system infiltrates into the ground. This is based on the regular emptying of pit meaning that it’s unlikely that 50% is infiltrated, as per the SFD manual recommendation, and a more reasonable figure to use is 20%.
- For the column covering transportation to the treatment plant, 100% has been used to indicate that there are no logistical issues with the transportation of the faecal sludge. It is, as has been highlighted in the report, being taken to a designated dumping site rather than to a treatment plant. This point has been discussed in detail with various stakeholders and it is generally felt that having a high percentage reflects the reality of no transportation issues but is somewhat at odds with the literal meaning of the question and this is the assumption that is used.

6 List of data sources

- Reports and literature
  - Domiz 1 Syrian Refugee Camp Sanitation Assessment & Concept Options Report – 04 June 2019
  - Domiz 1 Syrian Refugee Camp SFD Final Report – 14 August 2019
  - Domiz 2 Syrian Refugee Camp SFD Final Report – 14 August 2019
  - SFD Lite Report Domiz Town Final Report – 29 July 2019
  - SFD Lite Report Shariya IDP Camp Final Report – 14 August 2019
  - IDPs Camps in Dohuk – June 2015 (Board of Relief and Humanitarian Affairs)
  - Considerations on Transitioning away from Emergency Shelter in IDP Camps in Duhok – July 2019 Shelter Cluster Iraq
  - SFD Manual Volume 1 & 2, Version 2.0, April 2018
  - SFD Preparation Workshop – Summary Report – 26 June 2021
  - Master Plan Duhok 2032 Land Use Plan – 16 January 2010
  - Kabarto 1 CCCM Cluster Map – REACH_IRQ_Map_IDP_Kabarto 1_14Aug2019
- Key informant interviews
  - Assistant Governor of Duhok – Mr Ismail Mohamed Waisy
  - Directorate of Water Outskirt Duhok (DoDOW) – Mr Khalid
  - Directorate of Migration and Crisis Response –
    - Mr Sabah - Camp Manager Kabarto 1
    - Mr Hakar – Camp Manager Kabarto 2
    - Ms Manal Bamarny – Director Duhok Office
    - Mr Awaz Eskandar– Duhok Office
  - Directorate of the Environment – Mr Hassan - Engineer
  - KURDS NGO – Mr Nizar – Care and Maintenance Kabarto 1 + 2
  - Directorate of Underground Water – Engineer Mr Naji Ibrahim
  - Directorate of Statistics – Director – Mr Giyavan Abdulrazaq
  - Directorate of Water in Domiz – Mr Khalid
  - United Nations International Children's Emergency Fund (UNICEF) – Engineer Mr Mohammed Barwary
  - United Nations High Commissioner for Refugees (UNHCR) – Engineers Mr Vaheel Quchan and Mr Ali Mobasher.
- Focus group discussions
  - SFD Preparation Workshop – Kabarto 1 and Sharya Town – 22 June 2021. The attendees are listed on page 2 of this document.

Kabarto 1 IDP Camp, Kurdistan Region of Iraq, 2021

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