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4.5 Noise and vibration

Baseline noise surveys were conducted over ten days in September 2012 and April 2013, and updated over seventeen days in May/June 2014 to determine baseline noise conditions at the communities of Gorayk, Ughedzor, Saralanj, Saravan, Gndevaz, Kechut and Jermuk, focussing on the residential receptors within affected communities.

4.5.1 Methodology for Noise Assessment

All measurements have been undertaken using Cirrus Research CR811C and CR821C, Type 1 integrating sound level meters. Copies of the calibration certification documentation are contained in Appendix 4.5.1. The sound level meter was mounted vertically on a tripod 1.2-1.5 m above the ground and more than 3.5 m from any other reflecting surfaces. The sound level meter was field calibrated to a reference level of 94 dB at 1 kHz with no drift in calibration noted. A-weighted L_{eq}[1] and L_{90}[2] noise levels were measured at each location covering several day and night time periods in order to obtain representative data in accordance with IFC noise guidelines.

4.5.2 Noise Baseline

Baseline noise conditions for the affected communities are shown in Table 4.5.1 and Table 4.5.2. Noise monitoring locations are shown in Figure 4.2.1, and photographs showing each monitoring position are presented in Figure 4.5.1 through Figure 4.5.7. Full monitoring results are contained in Appendix 4.5.1.

The communities of Kechut and Jermuk, to the northwest of the Project, are situated off and to the west of the H-42 public highway (see Figure 4.2.1). Jermuk is a commercial and tourist location with numerous hotels and two water bottling factories. The noise environment is quiet and rural in nature, with the main source of noise from traffic and community related activity within the built up area (see Table 4.5.1). The noise monitoring location was within a residential area to the south of the town in an area of open ground adjacent to residential apartments (see Figure 4.5.1).

[1] L_{eq} Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.

[2] L_{90} The noise level which is exceeded for 90% of the measurement period (often referred to as 'background').

Figure 4.5.1: Monitoring location in Jermuk
(looking north - towards residential apartments)

Kechut, is located to the south of Jermuk and apart from the community related activities associated with the kindergarten and school, the built environment is quiet and rural (see Table 4.5.1 and Table 4.5.2). The noise monitoring location was located to the south east of the village within an area of open ground, which has a view towards the Project (see Figure **4.5.2**).

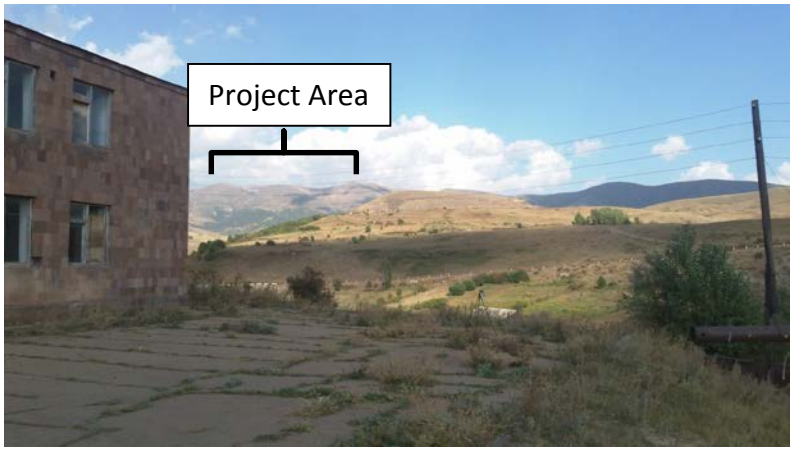

Figure 4.5.2: Monitoring location in Kechut
(looking southeast – towards Project area)

Within the villages of Gndevaz, Saravan, Saralanj and Gorayk the main occupation is agriculture with the baseline noise environment influenced by the presence of animals and the operation of agricultural machinery (tractors). Within the region, there is little evidence of remote individual farmhouses. Instead local farming families live in village houses and their garden or yard is often occupied by chickens, ducks, dogs and sometimes cattle. Baseline

noise monitoring was, therefore, undertaken in residential garden areas within these villages, as representative of residential receptors.

The village of Gndevaz is located to the west of the Project and also to the west of the H-42, with the majority of the village at a lower elevation than the road located with the Arpa River valley to the west. The noise monitoring location was to the east of the village in an orchard within a residential garden (see Figure 4.5.3). The noise environment was quiet, because the residential areas are sufficiently distant from the H-42 diminishing the influence from traffic noise (Table 4.5.1 and Table 4.5.2).

Figure 4.5.3: Monitoring Location in Gndevaz
(looking east – within a residential orchard/garden)

There is a poultry farm located on the edge of the village and to the north, off the H-42, however this is currently closed and is not a source of noise.

The villages of Saravan, Saralanj and Gorayk are all adjacent to the M-2 public highway. Saravan and Saralanj have residential areas adjacent to the M-2, with associated commercial retailers selling a range of fruit, vegetables and consumables. The monitoring location in Saravan was to the south of M-2 and the village settlement within an area of open space next to residential housing that is typical of the village (see Figure 4.5.4). The noise environment was influenced by traffic on the M-2 and agricultural operations as previously identified (see Table 4.5.1 and Table 4.5.2).

Figure 4.5.4: Monitoring location in Saravan (adjacent to residential dwelling)

The monitoring location in Saralanj was to the north of M-2 and on the edge of the village settlement with an outlook towards the Project (see Figure 4.5.5). The noise environment was similar to that experienced in Saravan, and also tends to be influenced by traffic on the M-2 and agricultural operations as previously identified (see Table 4.5.1 and Table 4.5.2).

Figure 4.5.5: Monitoring location in Saralanj

The village of Gorayk is to the north of the M-2 and set back from the road so that vehicle and pedestrian access is via a circular route through the residential part of the village. A milk factory and gas station are the only industry in Gorayk and road traffic flow is very low (see Section 4.18, for further details on the baseline traffic flow). The noise monitoring location was in the west of the village settlement, with Arshak in the background. The meter was situated within a residential plot between homes and agricultural outbuildings (see Figure 4.5.6). The photograph illustrates the agricultural activity that takes place close to the

property and this is reflected in the baseline noise environment (see Table 4.5.1 and Table **4.5.2**).

Figure 4.5.6: Monitoring location in yard of house in Gorayk (Amulsar in background)

The village of Ughedzor is a settlement of houses occupied for up to 7 months of the year (May to November) by nomadic cattle herder families. The settlement is accessed via an unpaved track off the M-2 highway. Because Ughedzor is occupied on a temporary basis it has been identified as a sensitive noise receptor and the baseline noise environment has been defined in Table 4.5.1 and Table 4.5.2. Outside of summer, the settlement has virtually no sources of anthropogenic noise, except for the distant sound of occasional Heavy Goods Vehicles (HGVs) on the M-2. In summer, when occupied, the majority of residences look towards the Project. The noise monitoring location was situated in a garden area within the settlement, see Figure 4.5.7.

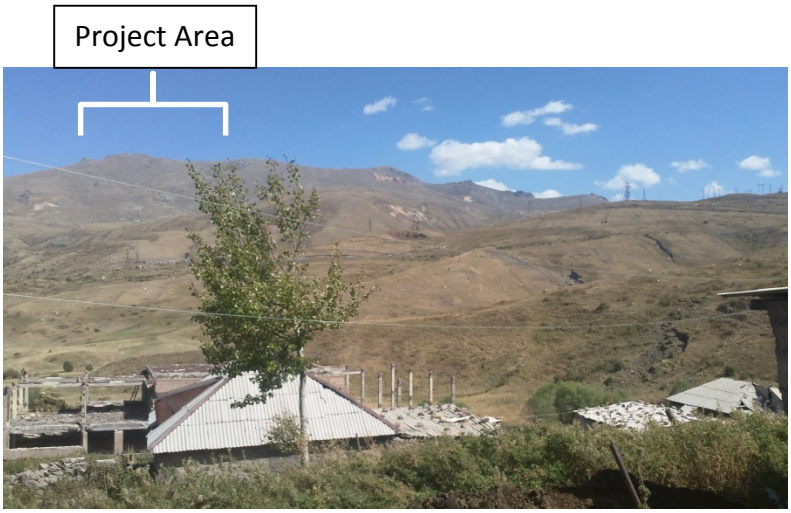

Figure 4.5.7: Monitoring location in Ughedzor (looking north-east towards Mt Amulsar)

Surveys have been carried out in Ughedzor both during periods of occupation and vacancy. The noise levels monitored at Ughedzor (when unoccupied) are considered to be representative of the wider rural area with little or no anthropogenic noise emission. The measured noise levels from Ughedzor (unoccupied) have also been used to assess potential impacts of noise on breeding birds and mammals.

Table 4.5.1: Daytime Baseline Noise Conditions

Community	Measured Noise Level LAeq (dB)	Measured Noise level LA_{90} (dB)
Kechut	43	35
Jermuk	50	38
Gndevaz	40	34
Saravan	48	36
Saralanj	49	38
Ughedzor (occupied)	46	39
Ughedzor (unoccupied)	42	30
Gorayk	47	32
Notes: Measurements made September 2012,April 2013 and May/June 2014		

Table 4.5.2: Night-time Baseline Noise Conditions		
Community	**Measured Noise level LAeq (dB)**	**Measured Noise level LA_{90} (dB)**
Kechut	36	31
Jermuk	42	35
Gndevaz	38	33
Saravan	40	34
Saralanj	43	32
Ughedzor (occupied)	47	42
Ughedzor (unoccupied)	37	28
Gorayk	38	30
Notes: Measurements made September 2012, April 2013 and May/June 2014 See Appendix 4.5.1 for the baseline data obtained for each year		

Vibration and Air Overpressure

Vibration is transmitted through the ground, particularly rock strata and can result from three main sources:

- Instantaneous events such as blasting or a seismic event;
- Some construction activities involving impacts at or within the ground, such as piling; and
- Movement of heavy goods vehicles on roads, especially if travelling at speed.

Baseline vibration monitoring is useful when significant sources of vibrations are present. At the time of the baseline data collection, there were no significant blasting or heavy construction activities in the Project area (see Figure 4.2.3). Therefore, no vibration baseline was required for the ESIA.

Summary

Several noise monitoring surveys have taken place near to residential property in the communities around the Project-affected area to establish the baseline conditions. Generally, low levels of noise were recorded during the day and night time periods; the levels are typical of the rural setting of each community, with no significant road traffic or industrial sources within the baseline conditions. In addition, there are no known, or significant sources of vibration in or near the Project-affected area.