CONCLUSIONS

The present field and GPR based study along the active fault zones of Kachchh has led to the following conclusions.

1. The KMF zone is marked by high relief north facing range bounding fault scarps with typical basin and range setting. The scarps are developed in steeper northern limb of the flexures. The KMF is a strongly segmented fault and is divisible into six morphotectonic segments bounded by transverse faults. From west to east these are- the Nirona-Jhura segment (segment-I), Kunaria-Lodai segment (segment-II), Lodai-Jawaharnagar segment (segment-III), Jawaharnagar-Khirsara segment (segment-IV), Khirsara-Devisar segment (segment-V) and the Amarapar-Sikra segment (segment-VI). The height of the fault scarp gradually decreases towards the east and finally disappears at the eastern margin of Segment-V. The segment-VI includes the eastward extending part of the KMF mapped in the present study through field and GPR investigations.

2. The KMF is well exposed between Khirsara and Devisar as a near vertical north dipping lithotectonic contact between the steeply dipping Mesozoic rocks in the south and the Tertiary (Neogene) rocks to the north. Except this part, the KMF is buried below the thick continuous Quaternary sediment cover that overlap the fault zone and abut against the north facing rocks.

3. The Quaternary sediments comprise colluvio-fluvial deposits, aeolian and valleyfill miliolite and coarse to fine grained alluvial deposits. OSI dating suggests that the sediments of the KMF zone date back to ~100 ka. The major neotectonically controlled aggradational phases in various segments are correlatable. The sediments appear to become progressively thinner, stratigraphically younger and finer towards the east.

4. The GPR investigations has revealed that the KMF is mostly vertical to steep north dipping fault in all the segments. However, the fault plane is found become reversed in the vicinity of the transverse faults. The present study infers that the KMF has been characterised by differential uplift whereby the southern block is uplifted more in comparison to the northern block.
PART-G Interpretation and synthesis

5. The SWF zone is characterised by continuous cover of Quaternary sediments, mostly aeolian miliolites followed by alluvial sediments. The fault shows south facing range bounding fault scarps with intermediate relief similar to basin and range setting. The fault is exposed in patches in the eastern part.

6. The SWF is divisible into segments due to the presence of transverse faults. The GPR studies have revealed the vertical to steep south dipping fault plane of the SWF which marks the tectonic contact between the Mesozoic rocks to the north and the Tertiary (Neogene) rocks to the south.

7. The Samakhiali-Lakadia plain is actively deforming, evidenced by geomorphic and drainage anomalies, in response to the continued tectonic activity along the KMF and the SWF under compression. The plains show a prominent zone of upwarping that has resulted in drainage disruption in the Samakhiali plain and increased incision in the Lakadia plain further east. The upwarping is attributed to the rising up of the Northern Hill Range due to eastward lateral propagation of the KMF.

8. The Gedi Fault (GF) zone is also buried under a continuous Quaternary sediment cover. The sediments are mainly aeolian miliolites and alluvial sediments. The fault is expressed as a low relief scarp as it is almost completely overwhelmed by the Quaternary deposits.

9. The Gedi Fault (GF) is also a segmented fault due to the transverse faults cutting across the E-W trending fault line. The GPR studies have revealed that the GF is high angle north dipping reverse fault which becomes vertical at depth.

10. The IBF is geomorphologically expressed as high relief precipitous E-W trending escarpments at the northern margins of the islands. The IBF is buried under a thick pile of marine sediments of the Great Rann and is presumed to be a vertical fault in conformity with the other E-W trending faults.

11. The Pachham, Khadir and Rela islands reveal active southward tilting due to movements along the IBF. Raised marine erosional features at the base of the escarpment suggest tectonic movements along the IBF in the recent past. Southward tilted raised Rann sediments along margins, pockets of colluvio-fluvial and alluvial deposits on backslopes also indicate neotectonically active nature of the IBF.
PART-G Interpretation and synthesis

12. The surface and shallow subsurface characteristics of the active faults with prominent geomorphic expression in the Kachchh Seismic Zone worked out in the present study reveal variable intensity of neotectonic activity along different faults in compressive stress environment. The KMF shows highest intensity of neotectonic activity followed by IBF, SWF and GF. This broadly correlates with the observed level of historic seismicity and the post-2001 aftershock activity except the IBF along which there is no documented evidence of high magnitude seismic events.

13. The present detailed study did not reveal any evidence of surface rupturing events from the exposed Quaternary sediments along the active fault zones studied. However, this sharply contrasts with the available record from the Katrol Hill Fault (KHF) zone where three major surface faulting events with reverse movements are reported during the last ~30 ka with the last one occurring at 3 ka BP (Patidar et al. 2008; Kundu et al. 2010). In view of the lack of any discernible differences in the surface geological conditions, it is hypothesised that the occurrence of earthquakes at deeper crustal levels may be the main cause for the absence of any record of surface faulting along active faults of the Kachchh seismic zone.

14. Based on the present study and the available data, it is estimated that the KMF is capable of generating high magnitude seismic events, followed by the IBF. In comparison, the possibility of the high magnitude events occurring along the SWF and GF is low.