CHAPTER-10

CONCLUSIONS

The present study carried out along the NSF zone in Gujarat is based on quantitative geomorphic analysis of landscape using remote sensing data and GIS techniques, sedimentological and stratigraphical studies of incised late Quaternary successions and geophysical surveys using GPR for delineating the shallow subsurface characteristics of the NSF. The study has led to the following conclusions.

1. The NSF is marked by ENE-WSW trending and north facing steep scarps. The scarps are developed in the trappean upland, Tertiary highland and Late Pleistocene sediments. The NSF is segment by the transverse faults trending in NW–SE to NNW-SSE direction which include Tilakwada Fault, Karjan Fault, Madhumati Fault and Rajpardi Fault. On the basis of transverse faults, NSF zone subdivided in four morphotectonic segments. From east to west, segment I is between Tilakwada Fault and Karjan Fault; segment II is between Karjan Fault and Madhumati Fault; segment III is between Madhumati Fault and Rajpardi Fault; segment IV lie beyond Rajpardi Fault.

2. The spatial variation in the landscape parameters along the length of the NSF in different segments is observed. The results of study suggest that the existing geomorphic set up of the study area is because of the differential uplift along the NSF in a compressive stress environment.

3. To the south of the NSF scarp, uplands are characterized by V-shaped valleys, narrow & deep gorge like channels, frequent knick points and waterfalls indicating youthful nature of uplands. To the north of the NSF scarp, alluvial plain characterized by steep northwards slope, incising parallel drainages, tight meander and convex longitudinal profiles indicating rejuvenated alluvial plain. These characteristics suggest neotectonic uplift of the NSF which resulted in the youthful nature of uplands and rejuvenation of alluvial plain.

4. The Late Pleistocene deposition of group of alluvial fans is identified in segment II. On the basis of fan morphology and pattern of sediment distribution, it is identified

as ‘bajada’ surface in the present study. The bajada surface confined between the Karjan Fault on the eastern side and Madhumati fault on the western side.

5. The bajada sediments are exposed in the incised cliff section of segment II. On the basis of sediment fabric and responsible flows that deposited the sediments, sediments are readily divisible into eight distinct sedimentary lithofacies; 1) matrix supported gravels; (2) clast supported gravel; (3) massive silty sand; (4) soil (5) erosional scour; (6) trough cross-bedded gravel; (7) horizontally stratified gravels and (8) massive brick red sand lithofacies.

6. The dominant factor behind the development of coarse gravelly lithofacies of bajada is tectonic activity attributed to the NSF, which uplifted mountains and led to sedimentation of coarse clastic debris and provided accommodation space for their deposition in a form of coalesced alluvial fan. It also controlled the volume and geometry of bajada and formed topographically elevated surface in segment II.

7. The role of climate is also identified in the compositional and temporal distribution of the bajada sediments. The sediments suggest two distinct climatic settings. Presence of semi-arid climate is represented by debris flow deposits, abundant rhizocretions and calc nodules within the basal matrix supported and clast supported lithofacies and sandy lithofacies. On the contrary, wetter, sub-humid climate represented by well developed pedoginized paleosols.

8. The geophysical surveys carried out in all four segments across the trend of NSF using Ground Penetrating Radar (GPR) have revealed variable subsurface characteristic of the NSF. The interpretation of the GPR profiles indicates that the NSF is mostly steep vertical fault at deeper level in the subsurface and becomes southward dipping reverse fault near the surface. However, in the GPR profiles of some locations, the NSF appeared as steep vertical fault. The reverse nature the NSF could be explained by the influence of compressive stress regime prevailing in the study area due to continuous northward movement of the Indian plate.

9. The results of the landscape analysis and field studies indicate that maximum intensity of neotectonic activity along the NSF occurred in segment II followed by segments III, I and IV.

10. The present study has delineated the segmented nature of the NSF and spatial variation in the magnitude of neotectonic activity. The segmentation of the NSF further suggests the active nature of the transverse faults which is because of continues northwards movement of the Indian plate and hence development of compressional stress regime. Thus, the pattern of neotectonic activity along NSF is more complex than the simple block uplift which is mainly because of the oblique movements along the transverse fault faults.