

TABLE OF CONTENTS

	Page No.
CHAPTER-1 INTRODUCTION	1-12
The rationale	1
Scope and objectives	5
Study area	7
Approach and methodology	10
CHAPTER-2 REGIONAL GEOLOGICAL SET-UP	13-21
Tectonic evolutionary history	13
Mesozoic stratigraphy	16
Tertiary stratigraphy	19
Quaternary sediments and neotectonics	21
CHAPTER-3 CONTROLS ON LANDSCAPE CONFIGURATION	22-47
Field based morphotectonic analysis	22
Northern Hill Range Fault Zone (NHRFZ)	24
Role of transverse faults	29
Morphotectonic analysis of Jara and Jumara domes	33
Interdomal saddle	36
The Jaramara scarp	39
Backslope over Jaramara scarp	41
Rugged topography over the Ukra intrusive body	41
The KMF scarp	43
Gugriana hill range	45
Central rocky plain	46
Great Rann	47
CHAPTER-4 TECTONIC CONTROLS ON FLUVIAL SYSTEM	48-62
Fluvial system of the Jara and Jumara domes	49
Nara river basin	54
Makdawali river basin	57
Longitudinal river profiles	59

CHAPTER-5 GROUND PENETRATING RADAR (GPR)	63-100
 INVESTIGATIONS ALONG THE KACHCHH	
 MAINLAND FAULT (KMF)	
Introduction	63
Ground penetrating radar (GPR) survey methodology	64
Ground penetrating radar (GPR) studies along Kachchh Mainland Fault (KMF)	65
Acquisition of geophysical data	66
Processing of GPR data	66
Velocity analysis	68
GPR amplitude analysis	69
GPR attribute analysis	72
GPR imaging interpretation	73
Shallow subsurface nature of the KMF	96
CHAPTER-6 GROUND PENETRATING RADAR (GPR) STUDIES	101-113
 ALONG VIGODI-GUGRIANA-KHIRASRA-NETRA	
 FAULT SYSTEM (VGKNFS)	
West Vigodi Fault (WVF) and associated subsidiary faults	101
Vigodi Fault (VF) and associated subsidiary faults	105
Gugriana Fault (GUF) and associated subsidiary synthetic fault	111
CHAPTER-7 STRUCTURAL CHARACTERISATION OF VIGODI-	114-143
 GUGRIANA-KHIRASRA-NETRA FAULT SYSTEM	
 (VGKNFS)	
Geological and structural setting	115
Methods	119
Paleostress analysis	119
Fundamental assumptions	120
Slickenside kinematic indicators	120
Field investigations and fault-slip analysis results	121
Sector 1	123

Vigodi Fault (VF) with reverse slip	123
Gugriana Fault (GUF) with oblique-slip	125
Sector 2	127
Vigodi Fault (VF) with changing slip-sense	128
Gugriana Fault (GUF) with reverse slip	129
Sector 3	131
Vigodi Fault (VF) with reverse slip	131
West Vigodi Fault (WVF) with reverse slip	135
Gugriana Fault (GUF) with reverse slip	135
Sector 4	135
Gugriana Fault (GUF) with reverse slip	136
Netra Fault (NF) and Khirasra Fault (KF) with reverse slip	137
CHAPTER-8 TECTONIC EVOLUTION	144-154
Derivation of relative timing of paleostress state	144
Older D1 deformation event, Late Triassic to Late Cretaceous ~NW directed extension	144
Relationship with the anticlockwise rotation of the Indian plate during Cretaceous	149
Younger D2 deformation event, Late Cretaceous to Quaternary fault reactivation under NNE-NE compression	149
Fault reactivation during basin inversion and its relation to Cenozoic Indian-Eurasian collision plate kinematics	150
Is the Vigodi-Gugriana-Khirasra-Netra Fault System (VGKNFS) really sensitive to the far-field stress?	151
Chi-Square Statistic	151
Regions illustrating maximum horizontal compression in VGKNFS and their relevance to the Indian plate motion	153
Congruence with the present-day stress state	154
CHAPTER-9 DISCUSSION	155-169
Fault systems	155
Kachchh Mainland Fault (KMF)- Uplift bounding fault	155

Conceptual model of colluvial wedge formation along KMF	156
Vigodi-Gugriana-Khirsra-Netra Fault System (VGKNFS)- Intra- uplift fault system	160
Development of erosional landscape	160
Geomorphic evidence of neotectonic uplift	162
Long-term morphotectonic evolution	164
CHAPTER-10 CONCLUSIONS	170-174
APPENDIX – A	175-176
APPENDIX – B	177-181
REFERENCES	182-206