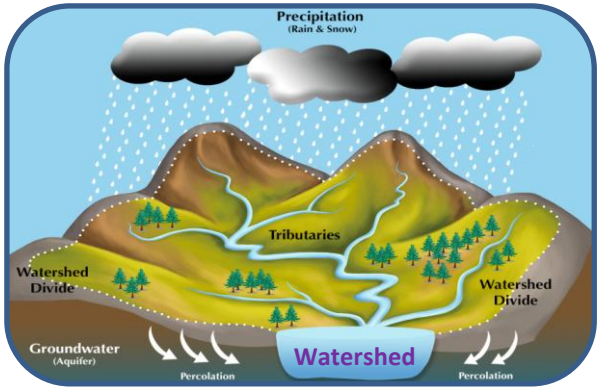
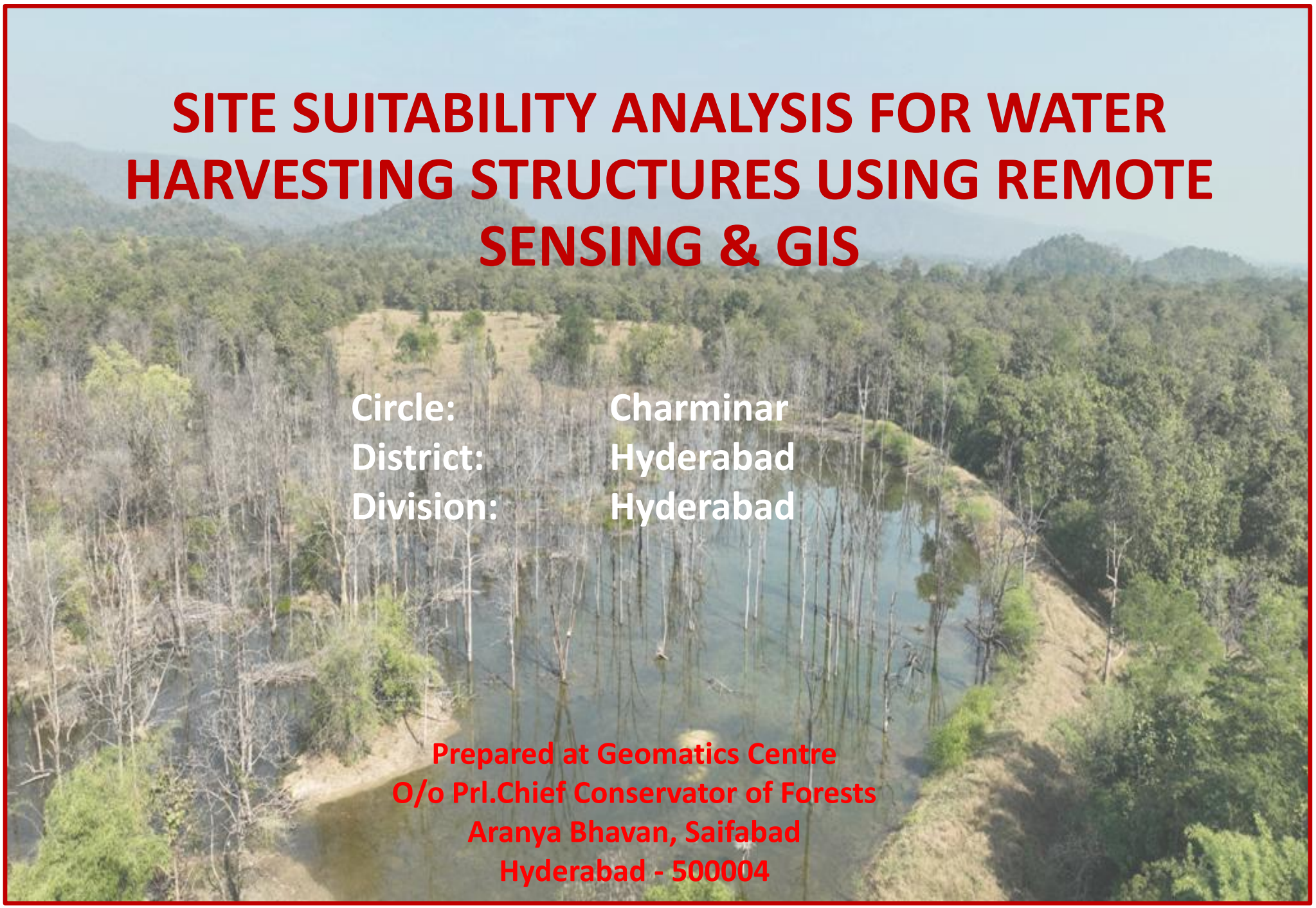
Government of Telangana – Forest Department

SITE SUITABILITY ANALYSIS FOR WATER HARVESTING STRUCTURES USING REMOTE SENSING & GIS



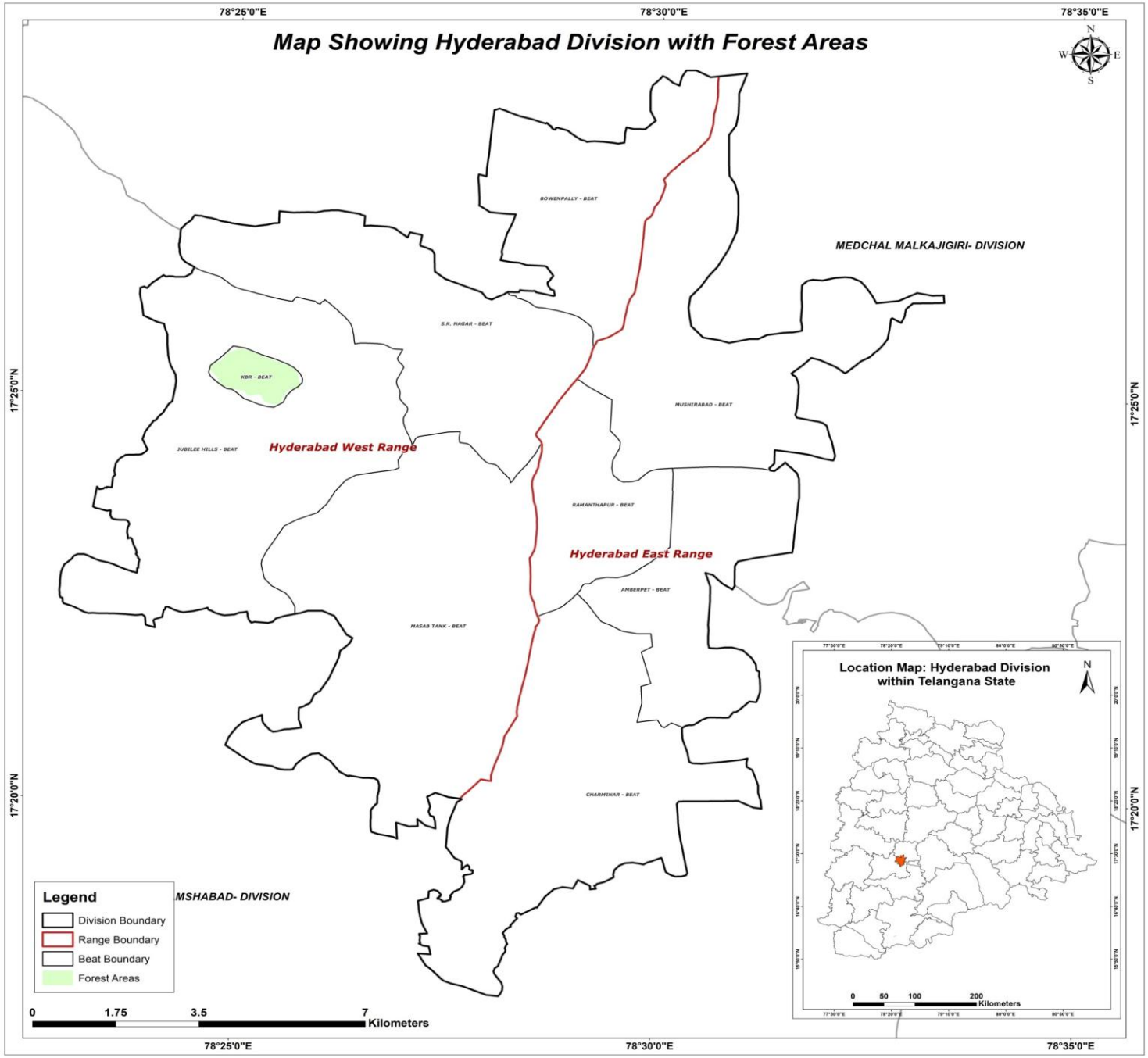
Prepared at Geomatics Centre
Office of Prl. Chief Conservator of Forests
Aranya Bhavan, Hyderabad - 04

SITE SUITABILITY ANALYSIS FOR WATER HARVESTING STRUCTURES USING REMOTE SENSING & GIS



Circle: Charminar
District: Hyderabad
Division: Hyderabad

Prepared at Geomatics Centre
O/o Prl.Chief Conservator of Forests
Aranya Bhavan, Saifabad
Hyderabad - 500004


Map Showing Hyderabad Division with Forest Areas
78°25'0"E
78°30'0"E
78°35'0"E
17°25'0"N
17°20'0"N
N
S
E
W
BOWENPALLY - BEAT
MEDCHAL MALKAJIGIRI- DIVISION
S.R. NAGAR - BEAT
KBR - BEAT
MUSHIRABAD - BEAT
JUBILEE HILLS - BEAT
Hyderabad West Range
RAMANTHAPUR - BEAT
Hyderabad East Range
AMBERPET - BEAT
MASAB TANK - BEAT
CHARMINAR - BEAT
MSHABAD- DIVISION
Legend
Division Boundary
Range Boundary
Beat Boundary
Forest Areas
0 1.75 3.5 7
Kilometers
Location Map: Hyderabad Division within Telangana State
0 50 100 200
Kilometers

METHODOLOGY

Various methods are available to evaluate the suitability of locations for Percolation Tanks and other SMC structures using Arc GIS.

- A common approach is to use Geographic Information System (GIS) tools to decide the suitability by analysing factors like topography, vegetation density, distance to water sources, and terrain slope.

- Data was gathered from various sources, including the Raster Sentinel data obtained from the Copernicus open access hub.

- Elevation values were applied to the raster data using the SNAP software to create a Digital Elevation Model (DEM).

- Using Arc GIS, streams were mapped based on DEM, and potential percolation tank sites were identified based on stream order.

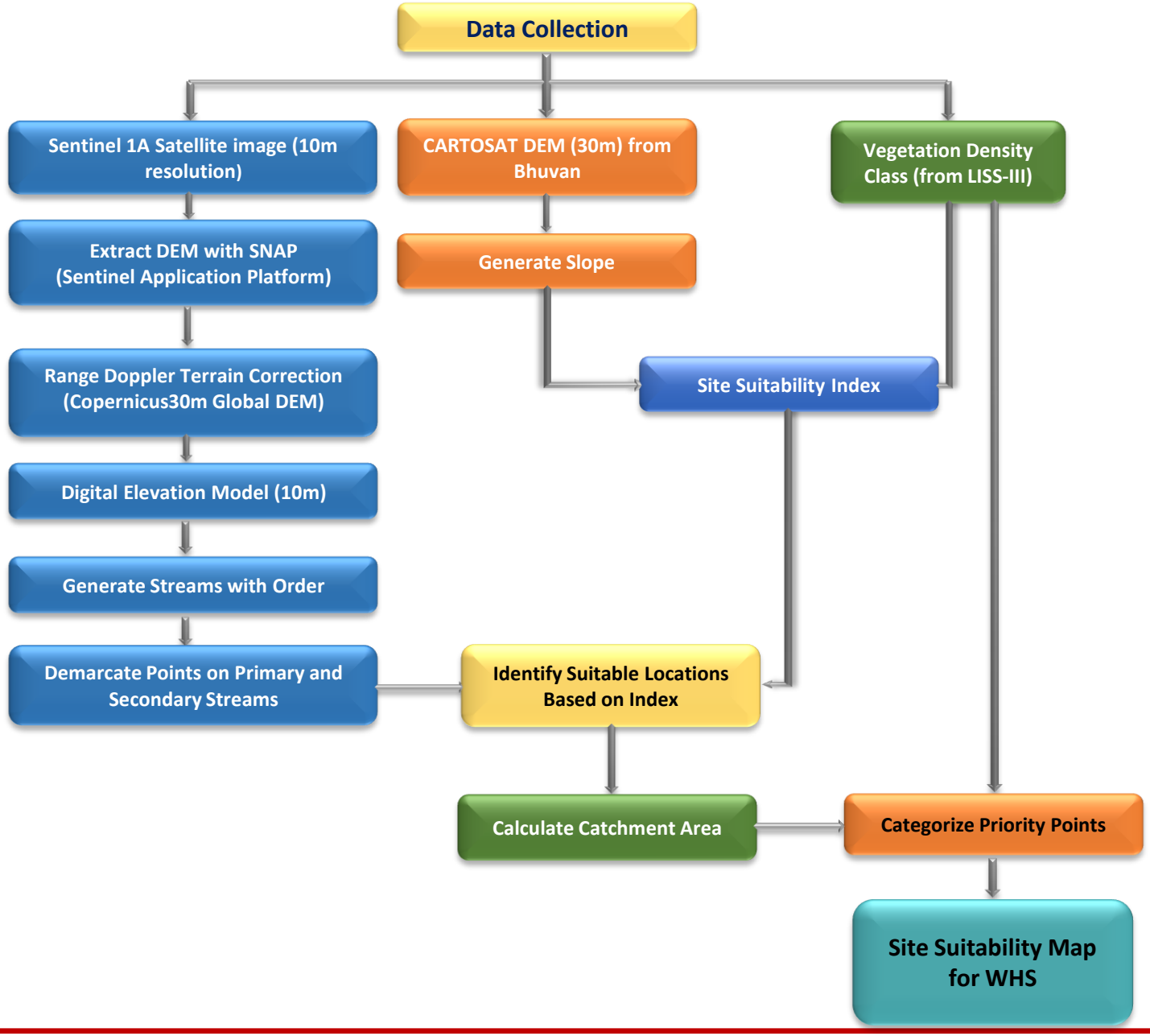
- Slope data generated from the CARTOSAT 30 m DEM (Source: Bhuvan) were also included in the analysis.

- By overlaying these spatial datasets and applying specific criteria, GIS can help identify optimal locations for building percolation tanks.

- Once the best location is identified, the catchment area is determined.

- The location is then ranked on the basis of catchment area and vegetation cover, with rankings ranging from I to V.

FLOW CHART FOR METHODOLOGY



Guidelines for building Percolation Tanks:

- Refer to the Site Suitability Map given by the GIS Cell for suitable locations

- Choose the best location for constructing a percolation tank based on the ranking priority. The priority for treatment of the watershed should be based on stream order, with primary streams taking precedence over secondary streams and secondary streams taking precedence over tertiary streams. This phased approach will ensure effective management of the watershed.

- Field conditions such as local climate, slope, vegetation and soil type must be considered when determining the location. It is important to move either upstream or downstream for a distance of about 50M, depending on the specific conditions of the site.

- It is essential to follow the priority given in the map. If no specific points are indicated, site suitability should be considered a determining factor.

- Encroached areas were not considered when demarcating points for constructing the Percolation tank.

- In the field, where streams are found at the optimal location, a percolation tank can be built if a point is missing on the map.

- The catchment area should also be considered when estimating the construction requirements like length of the bund, height of the bund, wear width etc., after verifying with the actual field conditions.

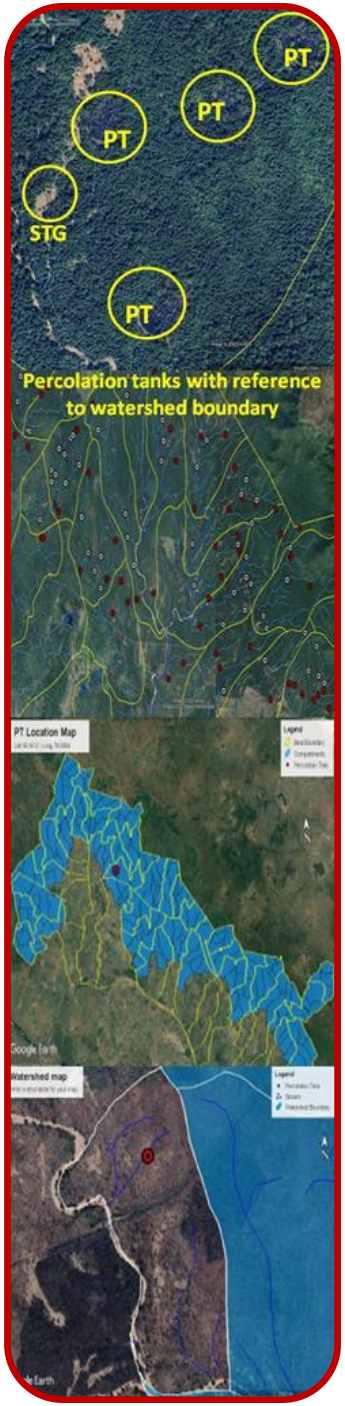
- Planting native vegetation around the tank can stabilize the soil, prevent erosion, and improve water absorption. Use plants that are well suited to the local environment.

Suitability criteria for Check-Dams and Percolation Tanks (SITE SUITABILITY INDEX)

Index	Slope(Degrees)	Density Class
Highly suitable	0-5	Blank & Scrub
Moderately suitable	0-5	Open Forest
Least suitable	0-5	Dense Forest

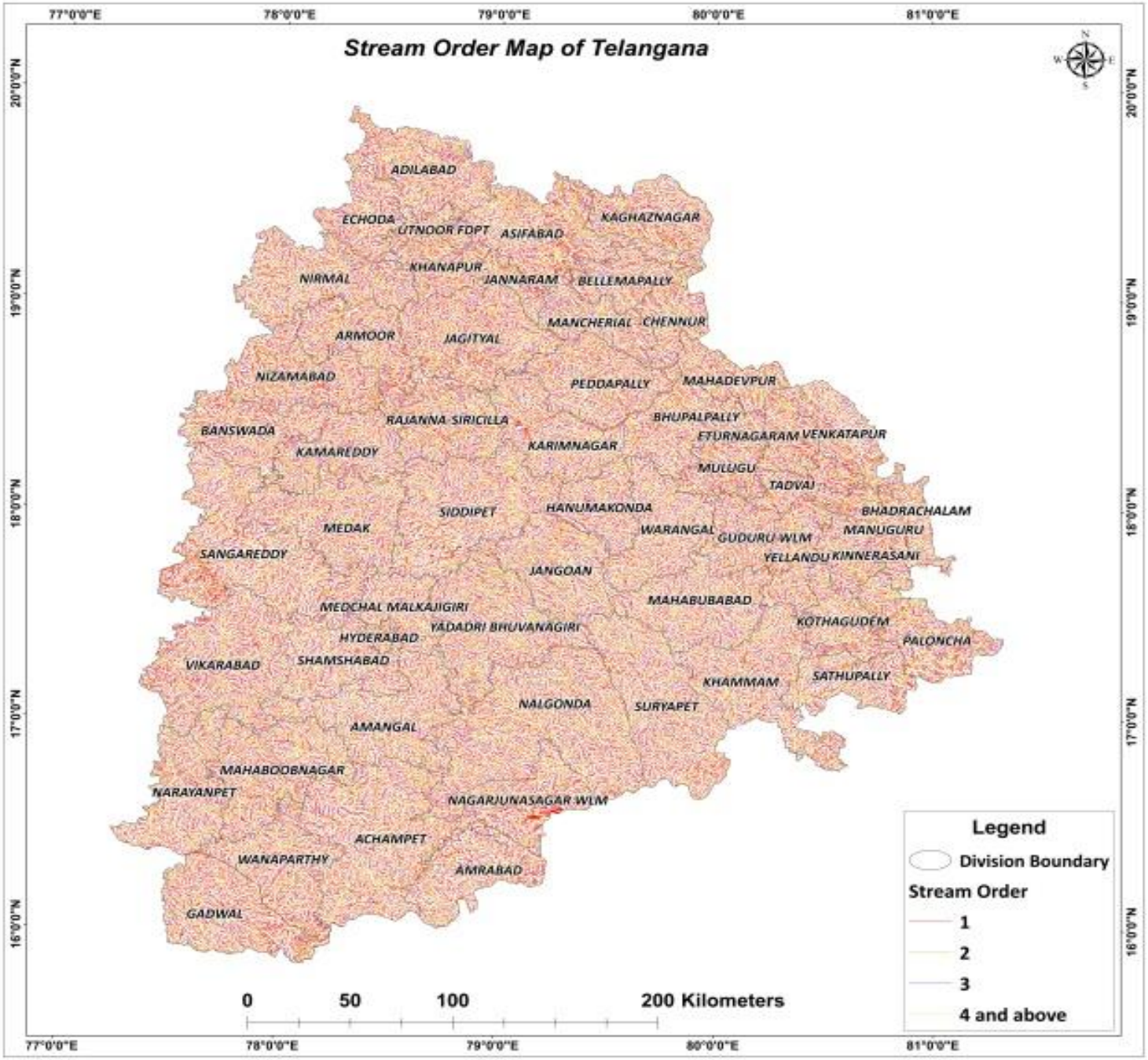
Suitability criteria for Continuous/Staggered contour trenches

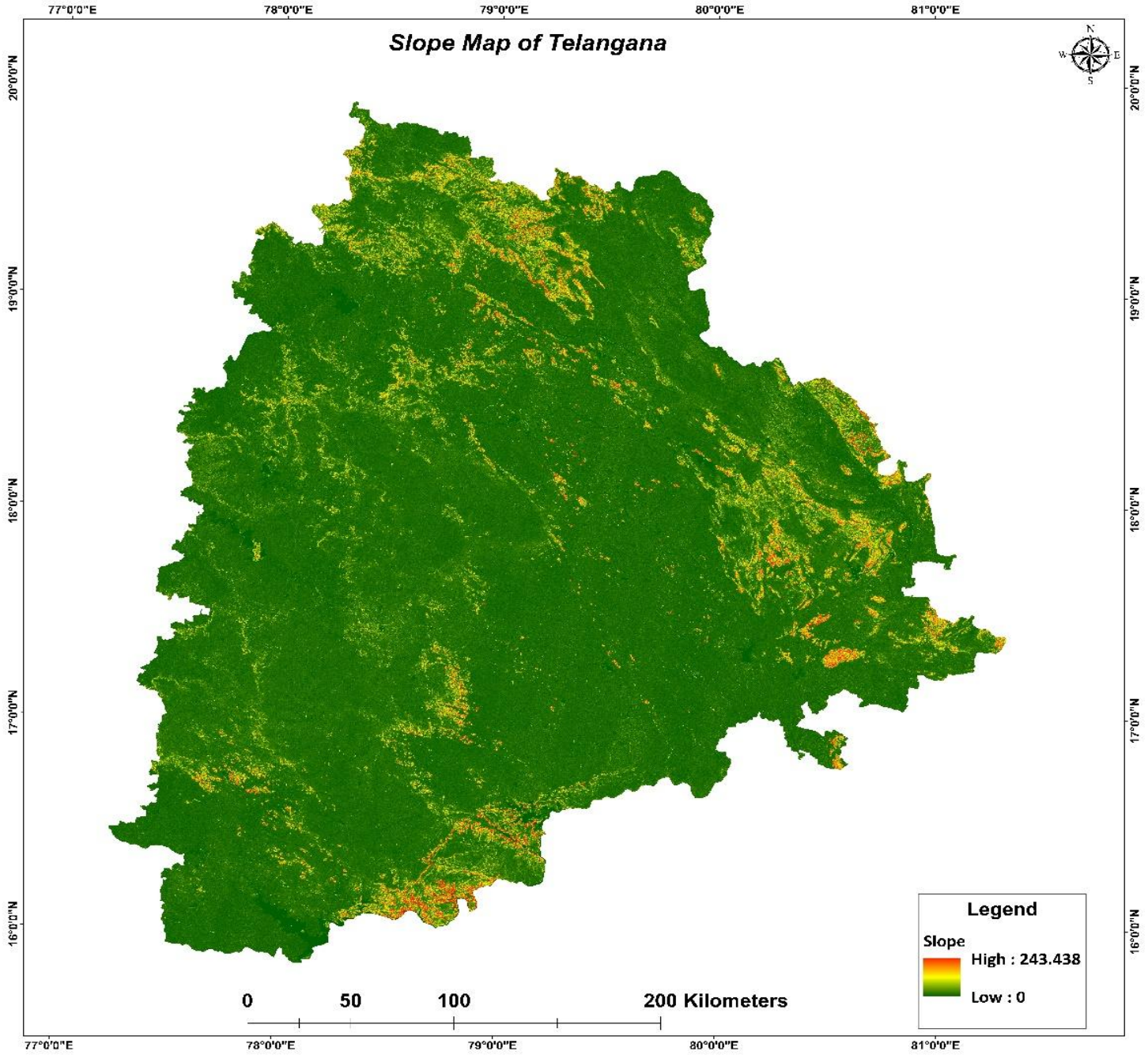
Rank	Slope classes (Degrees)	Density Classes
Highly Suitable	>5 and <= 10	Blanks
Moderately Suitable	>5 and <= 10	Scrub forest
Least suitable	>5 and <= 10	Open forest
	> 10 and < 25	Blanks & scrubs
MPTs and SGPs	>5 and <= 10	Dense Forest
	> 10 and < 25	Open and Dense forest



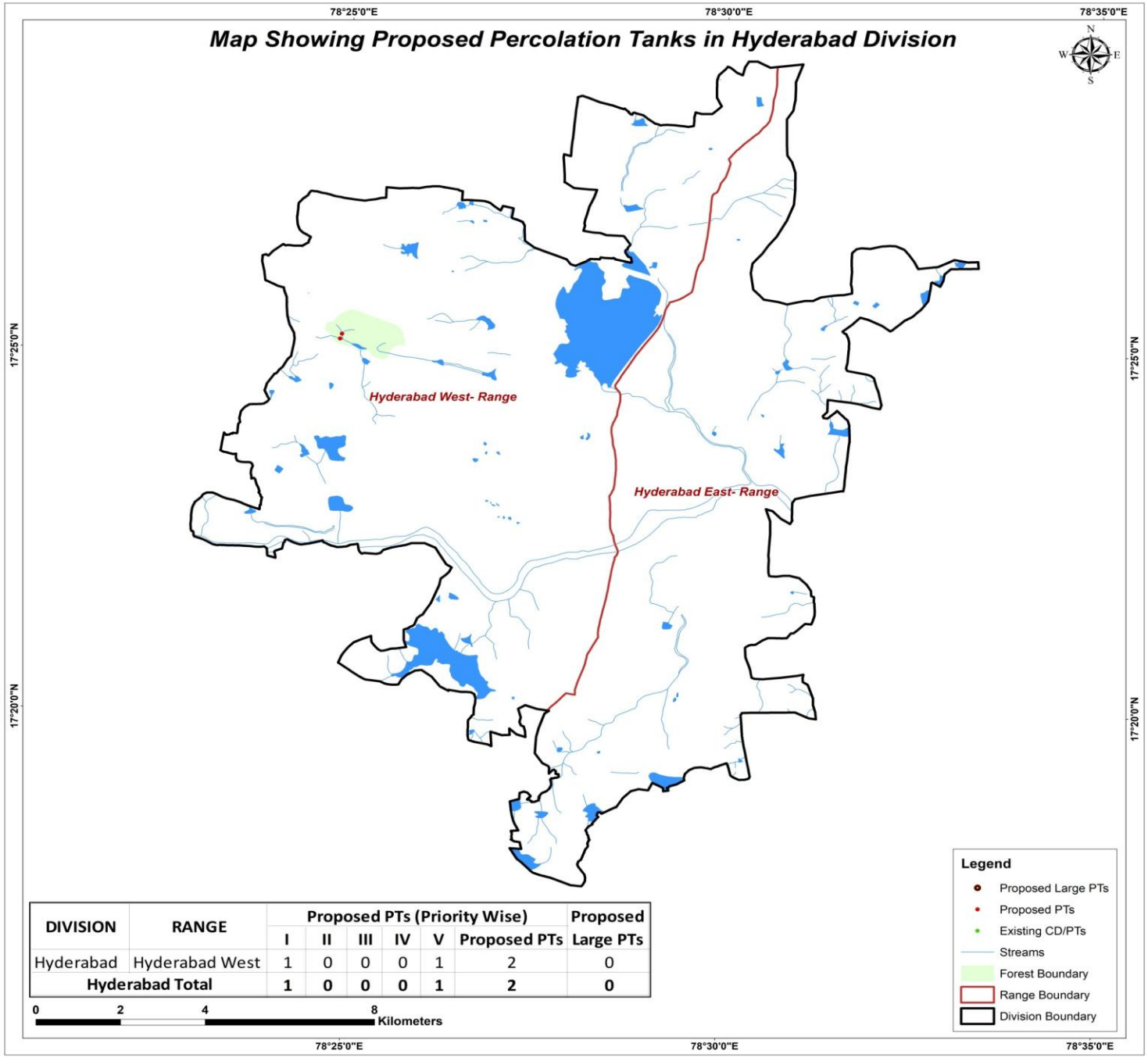
PRIORITY CLASSES FOR PERCOLATION TANK

Priority	Catchment Area(Ha)	Density Class
1	0-25 0-25	Scrub Blank
2	0-25 25-50	Open Forest Blank
3	25-50 >50	Open Forest Scrub & blank
4	0-25 >50	Dense Forest Open Forest
5	25-50 >50	Dense Forest Dense Forest


Stream Order Map of Telangana
77°0'0"E
78°0'0"E
79°0'0"E
80°0'0"E
81°0'0"E
20°0'0"N
19°0'0"N
18°0'0"N
17°0'0"N
16°0'0"N
ADILABAD
ECHODA
UTNOOR FDPT
ASIFABAD
KAGHAZNAGAR
KHANAPUR
NIRMAL
JANNARAM
BELLEMAPALLY
MANCHERIAL
CHENNUR
ARMOOR
JAGITYAL
NIZAMABAD
PEDDAPALLY
MAHADEVPUR
BHUPALPALLY
RAJANNA SIRICILLA
BANSWADA
ETURNAGARAM
VENKATAPUR
KAMAREDDY
KARIMNAGAR
MULUGU
TADVAI
SIDDIPET
HANUMAKONDA
BHADRACHALAM
MEDAK
WARANGAL
MANUGURU
GUDURU WLM
SANGAREDDY
YELLANDU
KINNERASANI
JANGOAN
MAHABUBABAD
MEDCHAL MALKAJIGIRI
KOTHAGUDEM
YADADRI BHUVANAGIRI
HYDERABAD
PALONCHA
VIKARABAD
SHAMSHABAD
KHAMMAM
SATHUPALLY
NALGONDA
SURYAPET
AMANGAL
MAHABOOBNAGAR
NARAYANPET
NAGARJUNASAGAR WLM
ACHAMPET
WANAPARTHY
AMRABAD
GADWAL
0
50
100
200 Kilometers
Legend
Division Boundary
Stream Order
1
2
3
4 and above

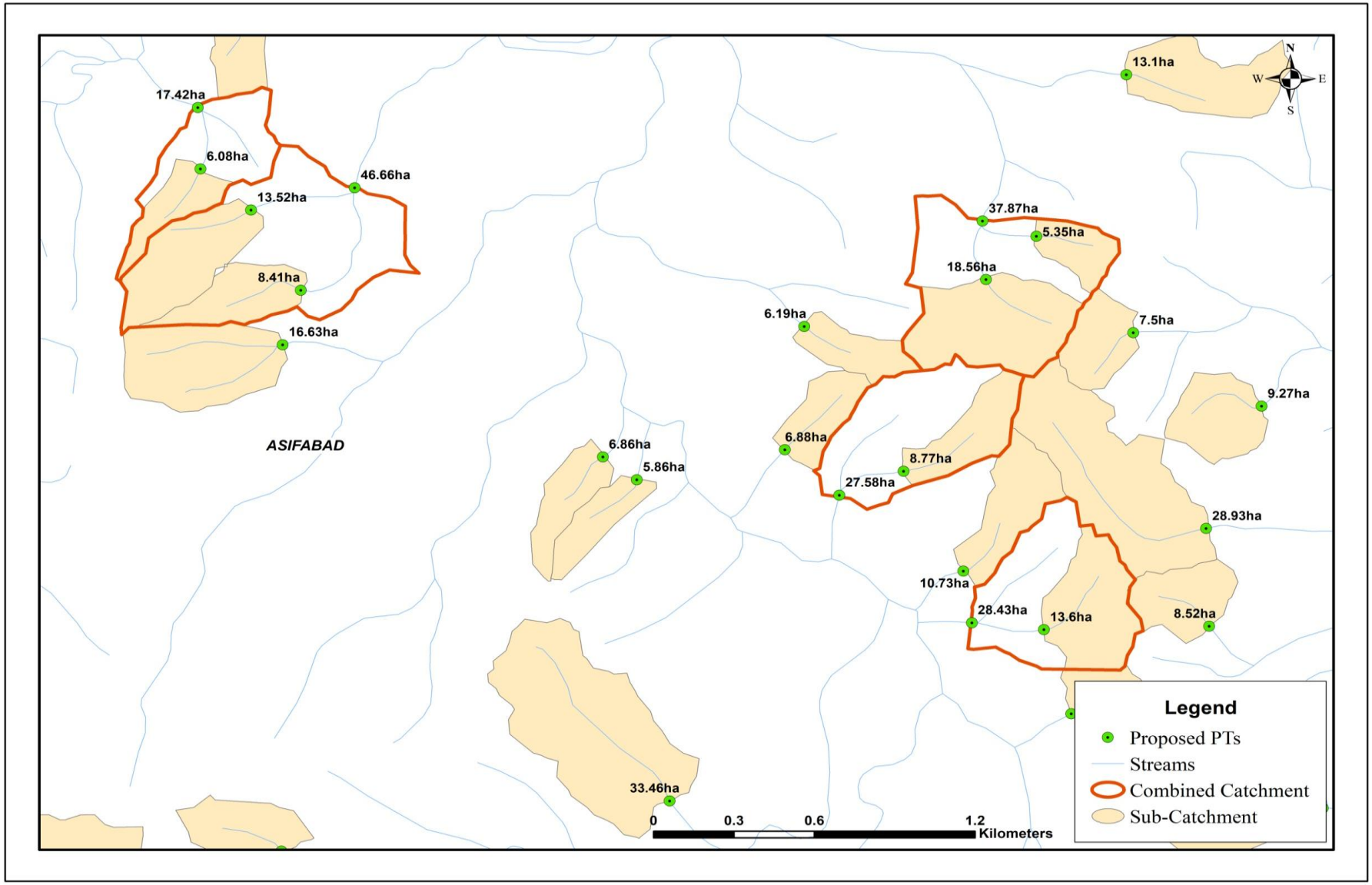

Slope Map of Telangana
77°0'0"E
78°0'0"E
79°0'0"E
80°0'0"E
81°0'0"E
20°0'0"N
19°0'0"N
18°0'0"N
17°0'0"N
16°0'0"N
N
W
E
S
Legend
Slope
High : 243.438
Low : 0
0
50
100
200 Kilometers

Map Showing Proposed Percolation Tanks in Hyderabad Division

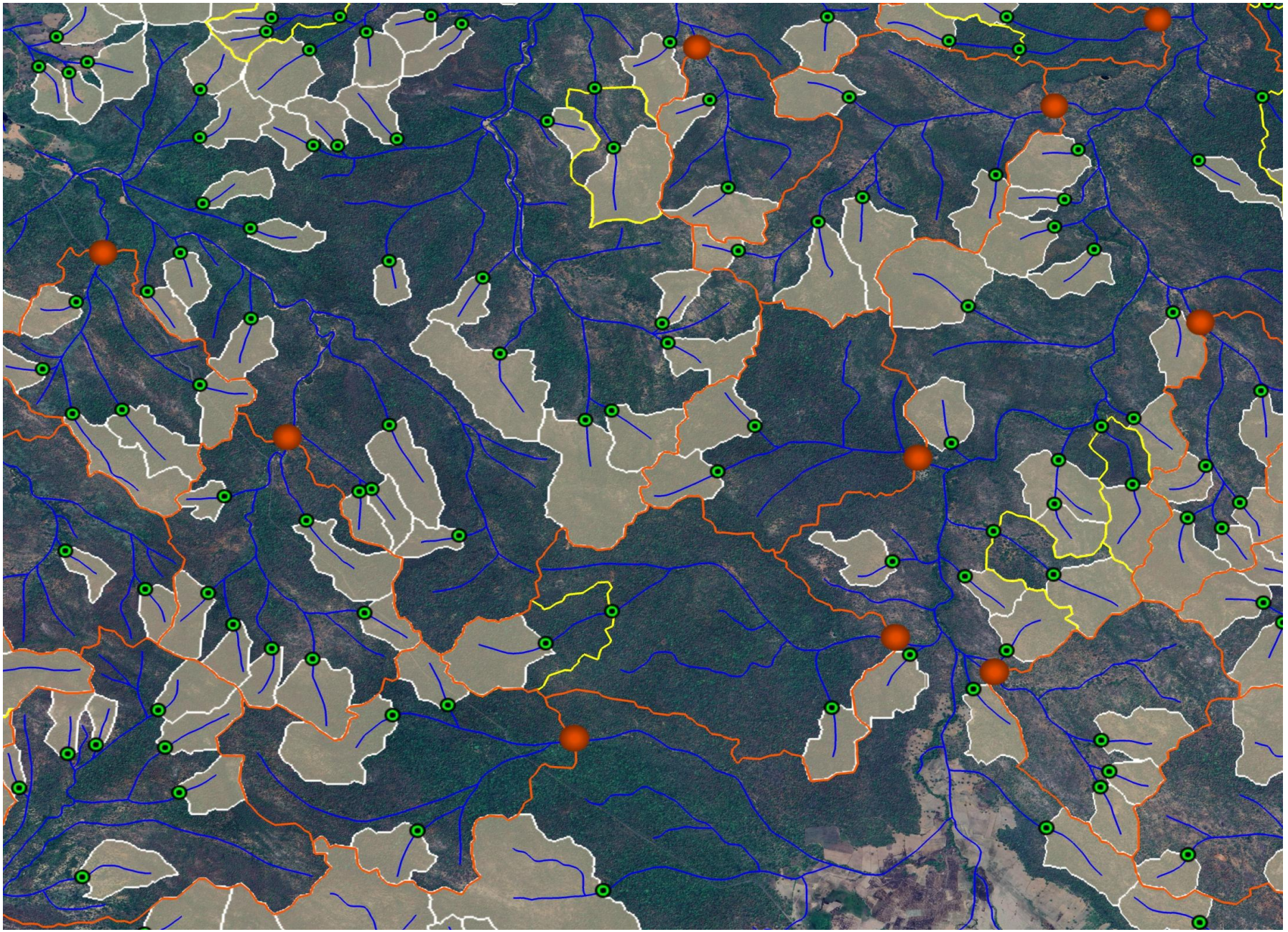


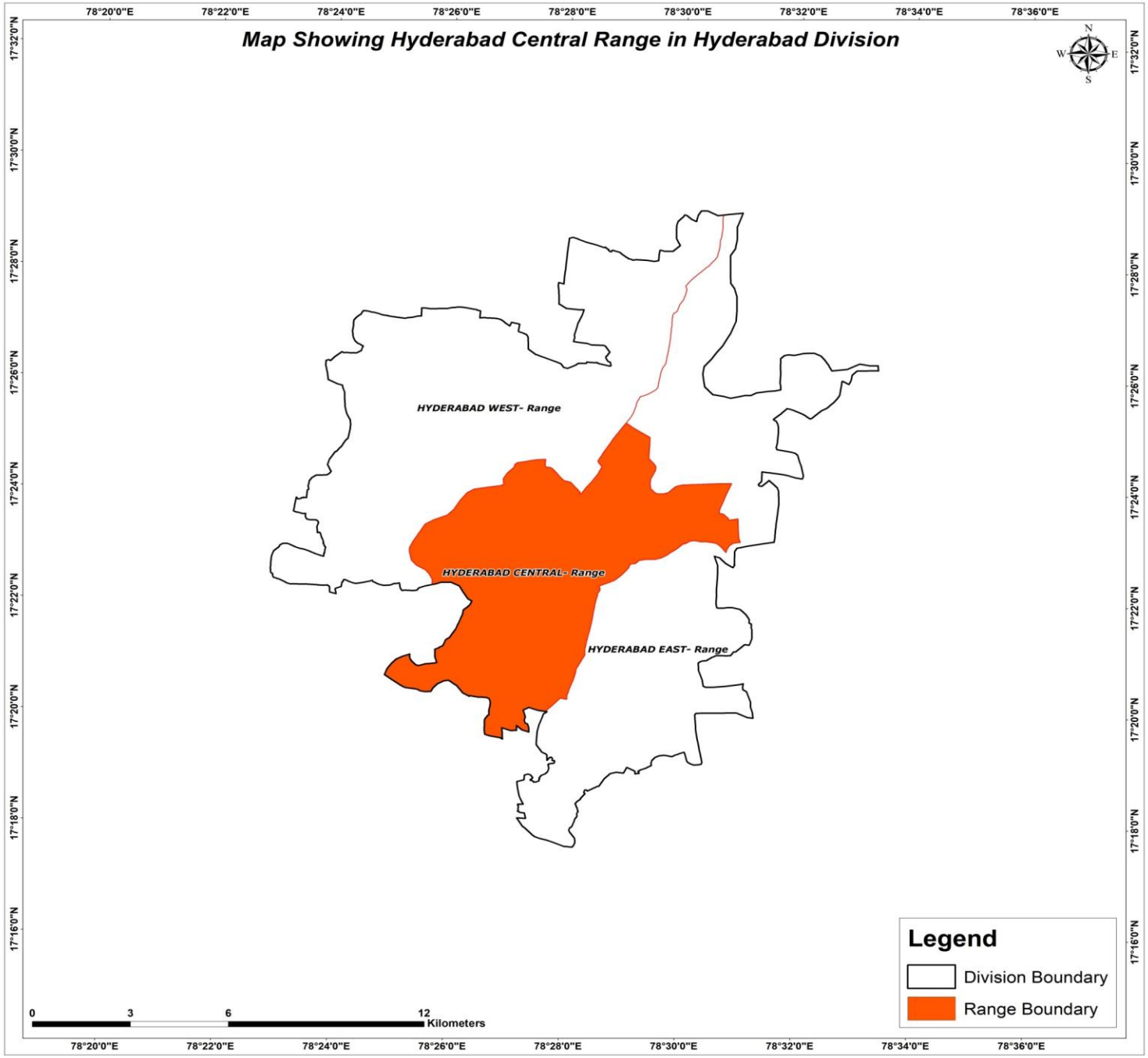
DIVISION	RANGE	Proposed PTs (Priority Wise)						Proposed
		I	II	III	IV	V	Proposed PTs	Large PTs
Hyderabad	Hyderabad West	1	0	0	0	1	2	0
Hyderabad Total		**1**	**0**	**0**	**0**	**1**	**2**	**0**

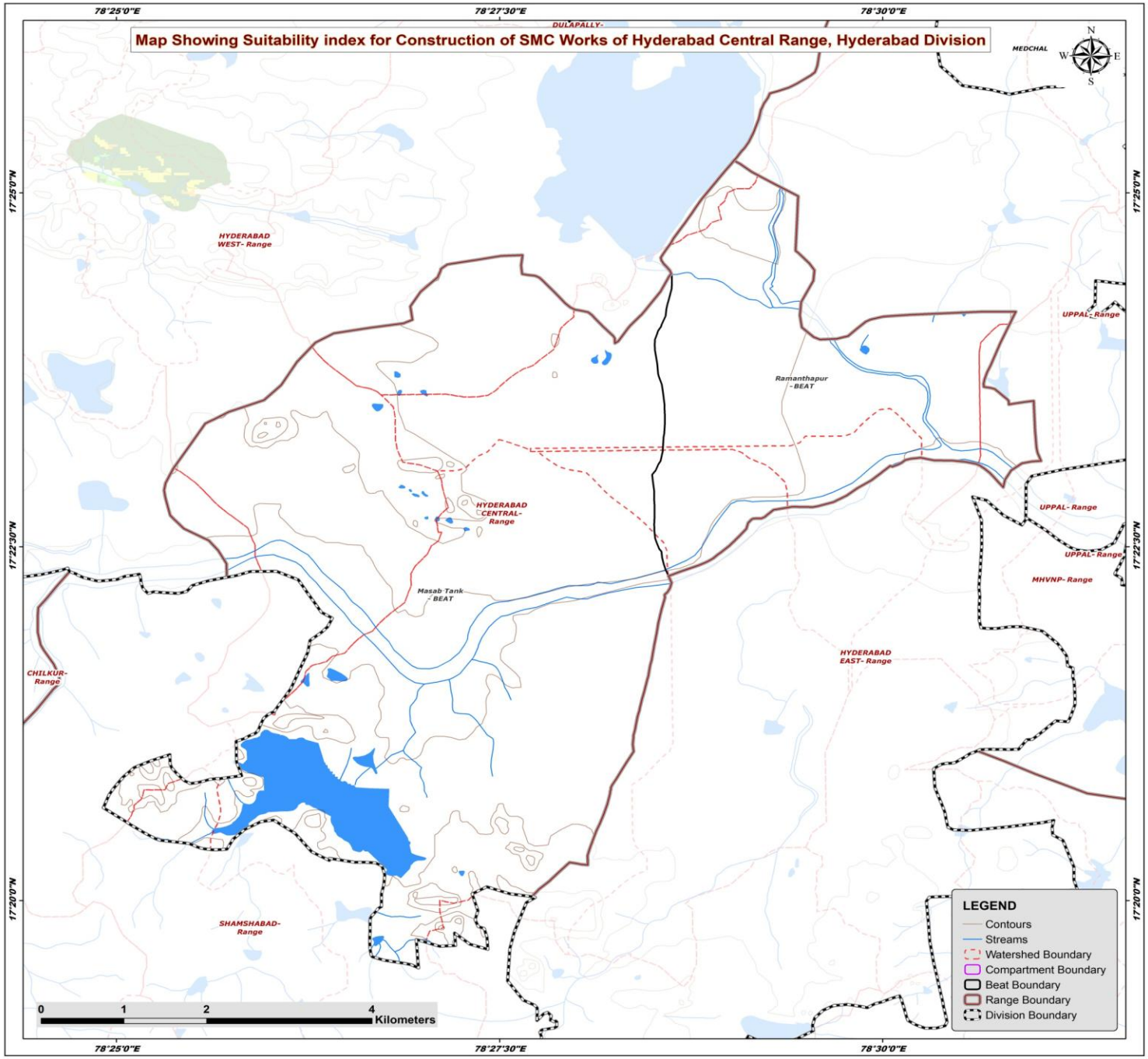
CATCHMENT AREA

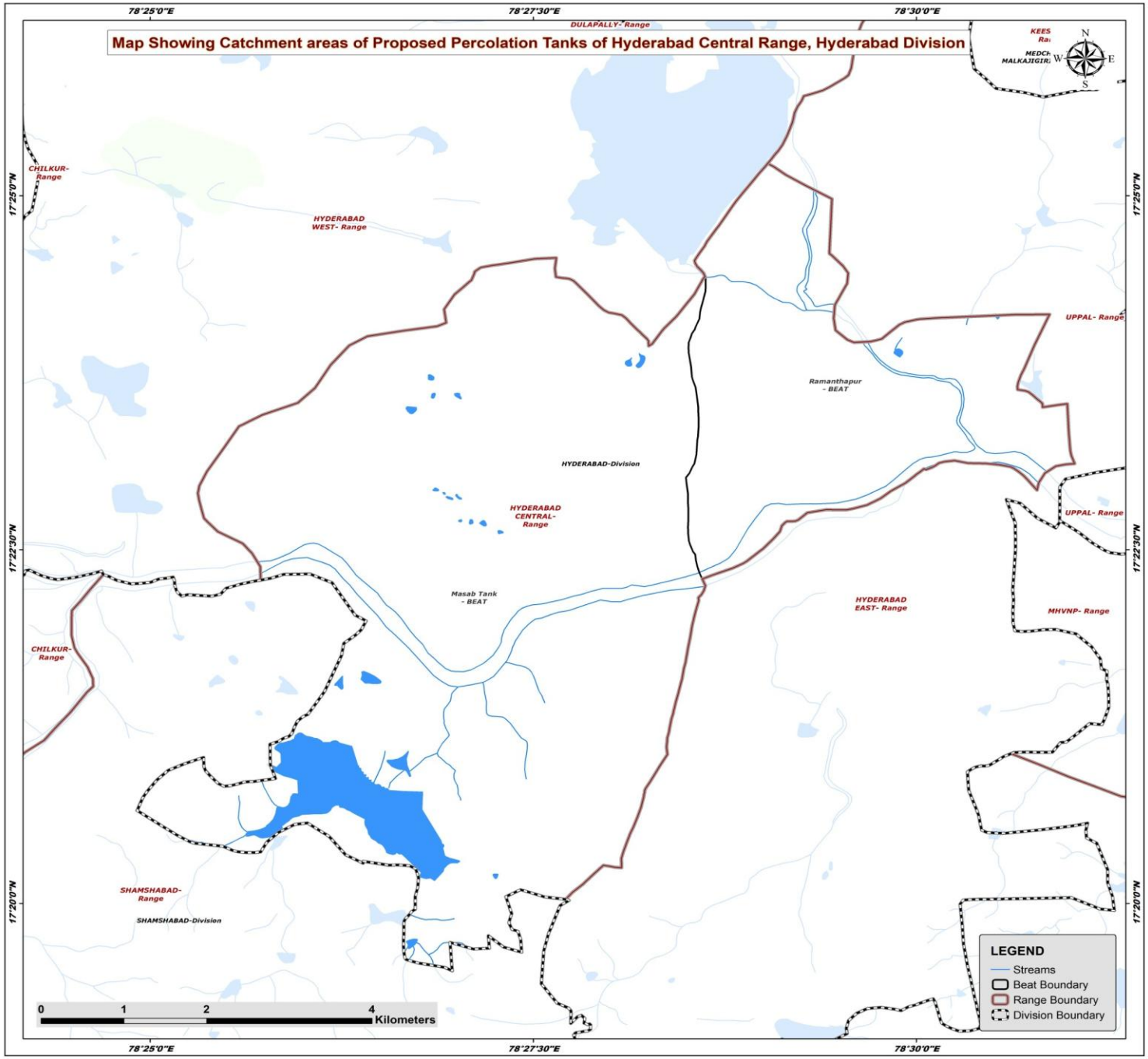


Sample Catchment Map

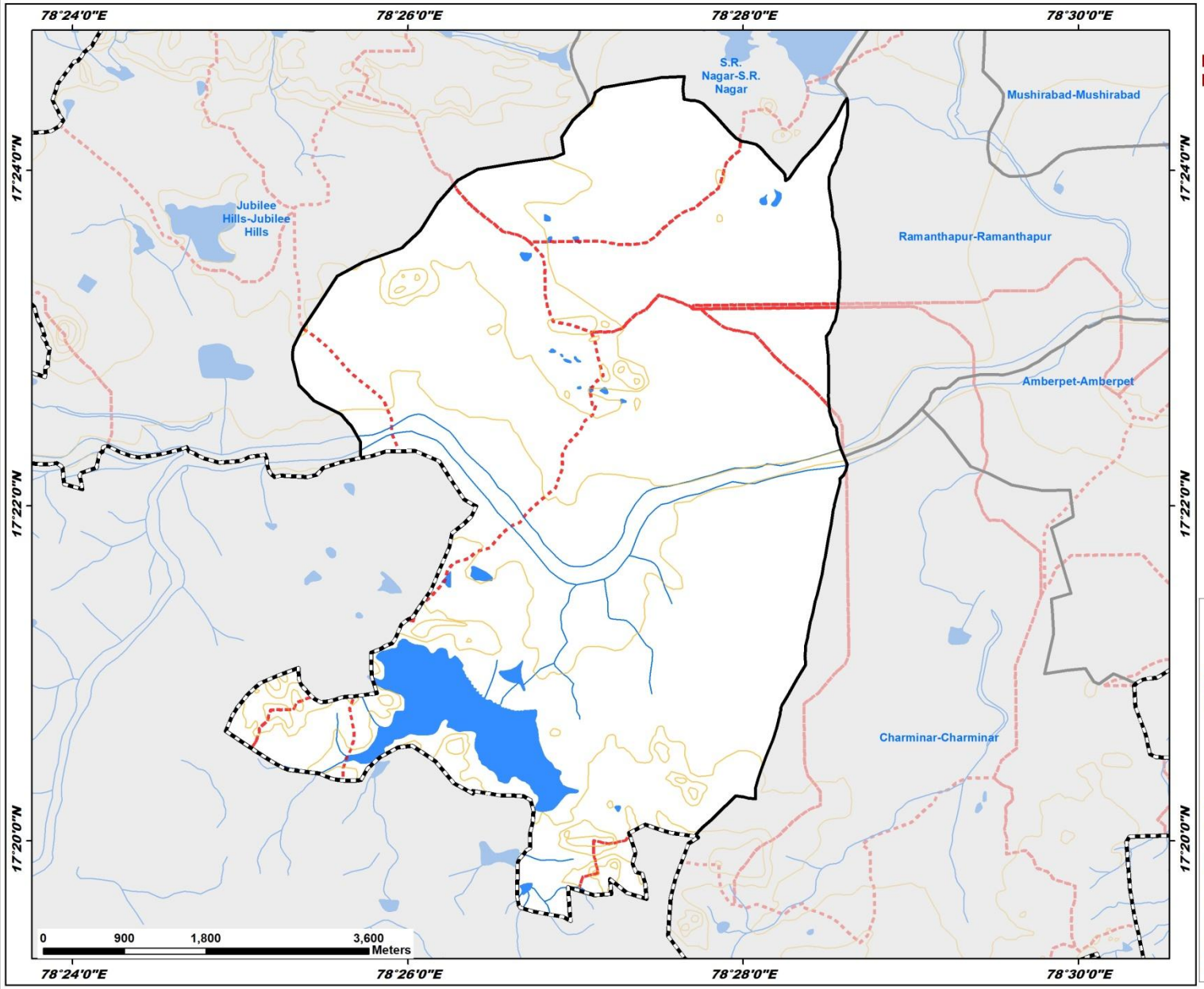



Map Showing Hyderabad Central Range in Hyderabad Division
78°20'0"E
78°22'0"E
78°24'0"E
78°26'0"E
78°28'0"E
78°30'0"E
78°32'0"E
78°34'0"E
78°36'0"E
17°32'0"N
17°30'0"N
17°28'0"N
17°26'0"N
17°24'0"N
17°22'0"N
17°20'0"N
17°18'0"N
17°16'0"N
N
W
E
S
HYDERABAD WEST- Range
HYDERABAD CENTRAL- Range
HYDERABAD EAST- Range
0
3
6
12
Kilometers
Legend
Division Boundary
Range Boundary


Map Showing Suitability index for Construction of SMC Works of Hyderabad Central Range, Hyderabad Division
78°25'0"E
78°27'30"E
78°30'0"E
17°25'0"N
17°22'30"N
17°20'0"N
DULAPALLY-
MEDCHAL
N
S
E
W
HYDERABAD WEST- Range
UPPAL- Range
Ramanthapur - BEAT
HYDERABAD CENTRAL- Range
UPPAL- Range
UPPAL- Range
MHVNP- Range
Masab Tank - BEAT
HYDERABAD EAST- Range
CHILKUR- Range
SHAMSHABAD- Range
LEGEND
Contours
Streams
Watershed Boundary
Compartment Boundary
Beat Boundary
Range Boundary
Division Boundary
0
1
2
4
Kilometers


Map Showing Catchment areas of Proposed Percolation Tanks of Hyderabad Central Range, Hyderabad Division
78°25'0"E
78°27'30"E
78°30'0"E
17°25'0"N
17°22'30"N
17°20'0"N
DULAPALLY- Range
CHILKUR- Range
HYDERABAD WEST- Range
UPPAL- Range
Ramanthapur - BEAT
HYDERABAD-Division
HYDERABAD CENTRAL- Range
Masab Tank - BEAT
HYDERABAD EAST- Range
MHVNP- Range
SHAMSHABAD- Range
SHAMSHABAD-Division
N
S
E
W
0 1 2 4 Kilometers
LEGEND
Streams
Beat Boundary
Range Boundary
Division Boundary

Map Showing Suitability Index for Construction of SMC Works of Masab Tank Beat



N
W E
S

Division : Hyderabad
Range : Hyderabad Central

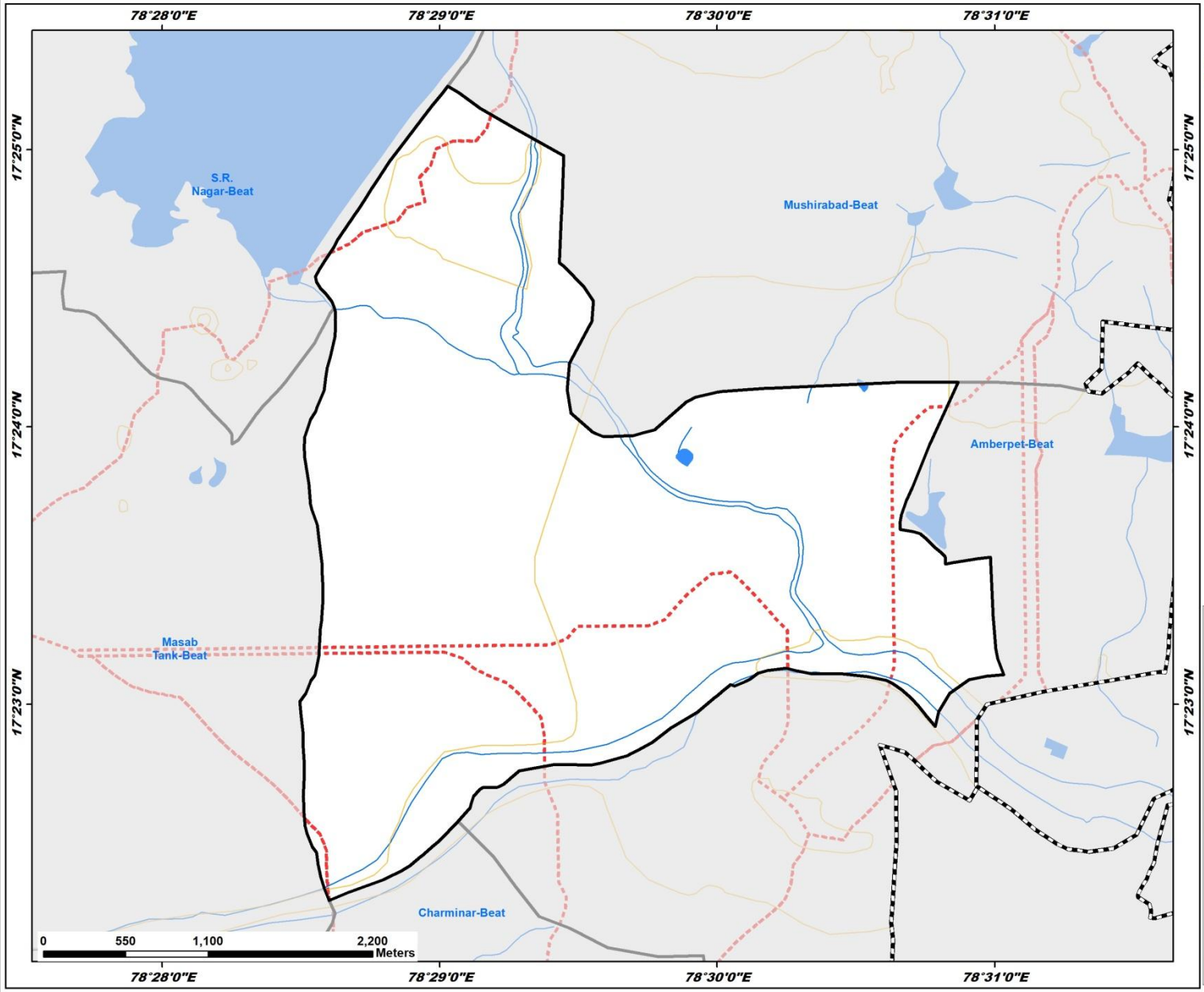
Legend

- Contours
- Streams
- Watershed Boundary
- Compartment Boundary
- Beat Boundary
- Division Boundary

Suitability Index

- CCTs/SCTs - Highly Suitable
- CCTs/SCTs - Moderately Suitable
- CCTs/SCTs - Least Suitable
- PTs - Highly Suitable
- PTs - Moderately Suitable
- PTs - Least Suitable
- MPTs and SGPs - Suitable
- Not Suitable
- Water Body

Map Showing Suitability index for Construction of SMC Works of Ramanthapur Beat



N
W
E
S

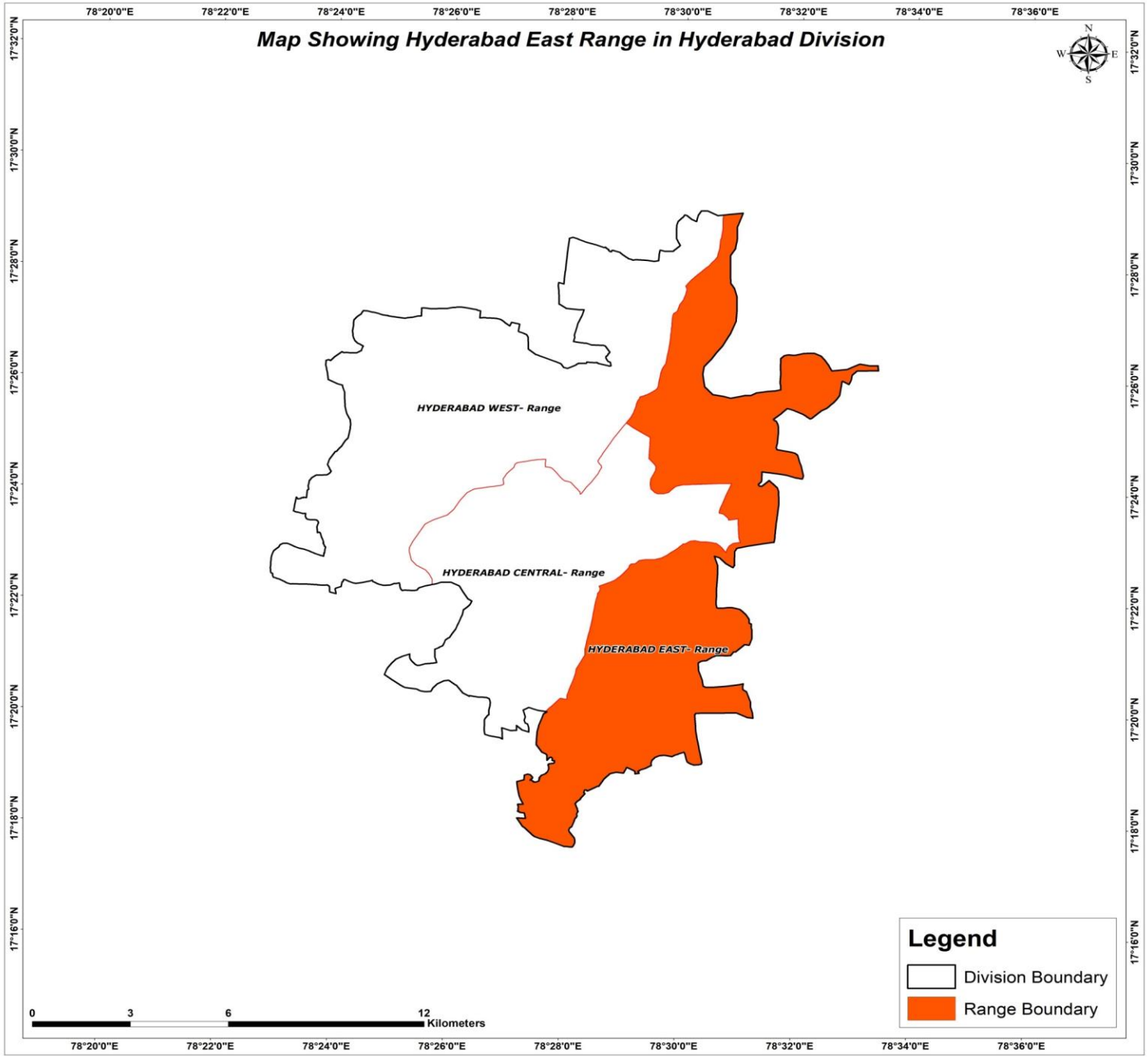
Division : Hyderabad
Range : Hyderabad Central

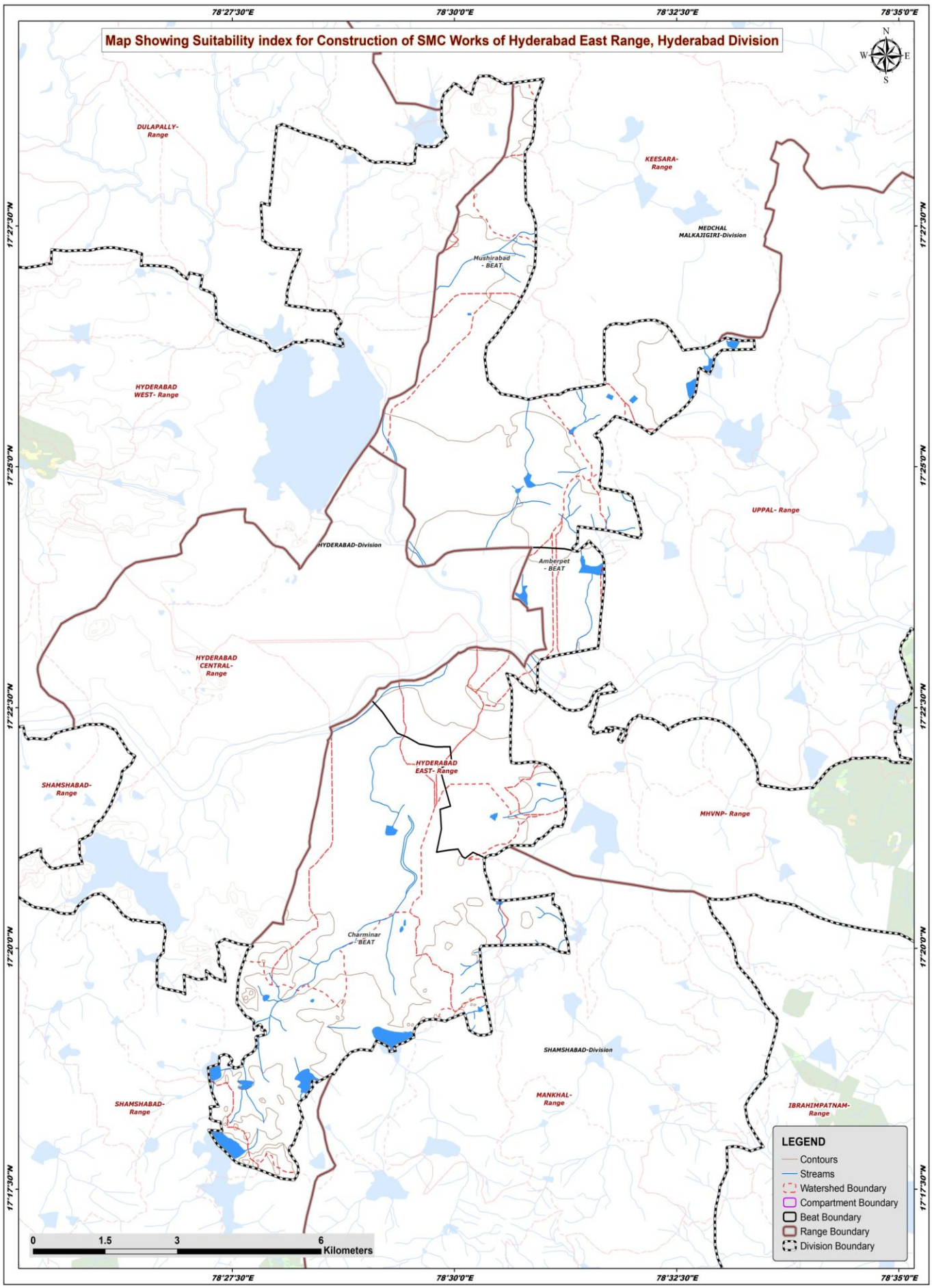
Legend

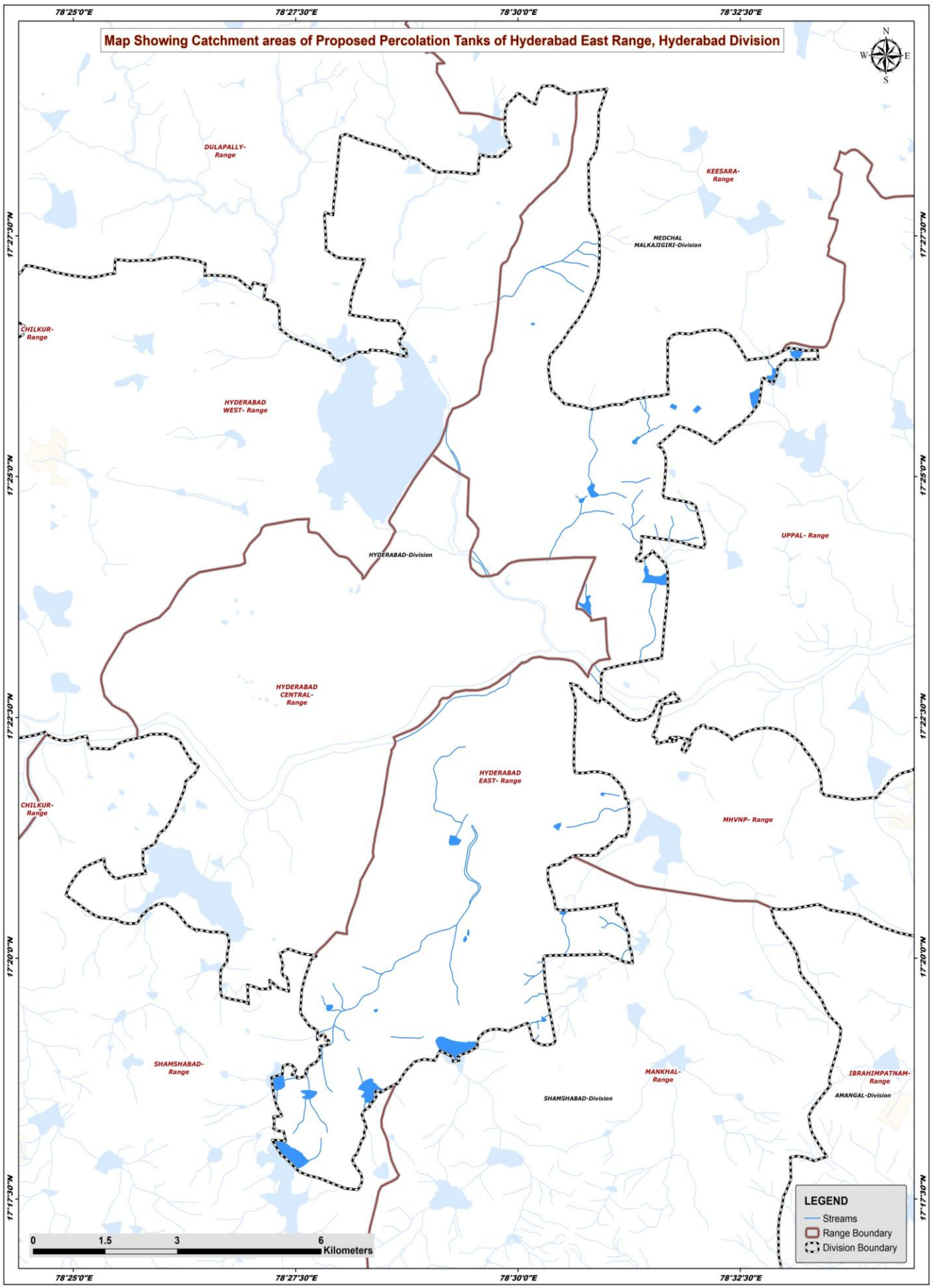
- Contours
- Streams
- Watershed Boundary
- Compartment Boundary
- Beat Boundary
- Division Boundary

Suitability Index

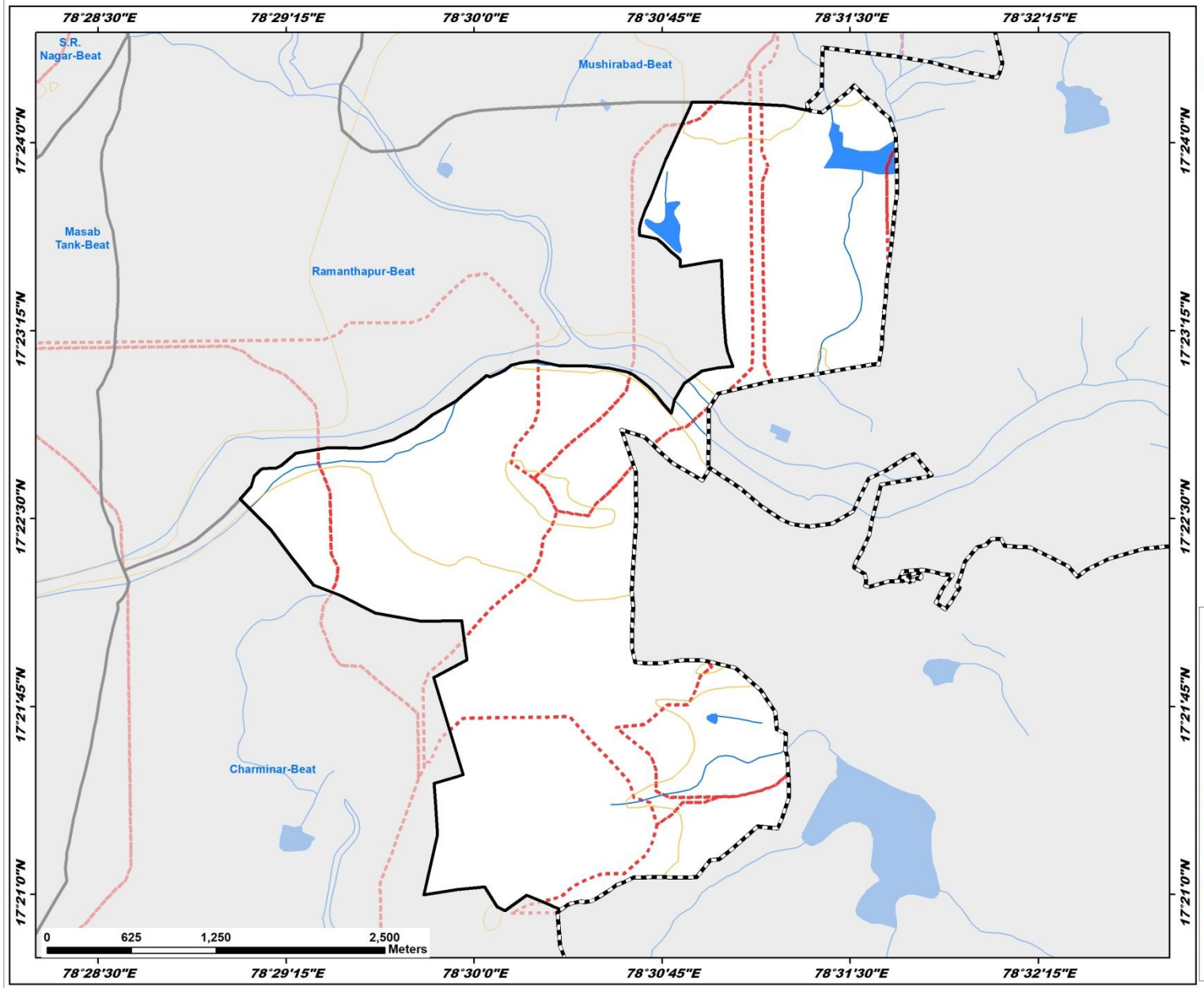
- CCTs/SCTs - Highly Suitable
- CCTs/SCTs - Moderately Suitable
- CCTs/SCTs - Least Suitable
- PTs - Highly Suitable
- PTs - Moderately Suitable
- PTs - Least Suitable
- MPTs and SGPs - Suitable
- Not Suitable
- Water Body


Map Showing Hyderabad East Range in Hyderabad Division
78°20'0"E
78°22'0"E
78°24'0"E
78°26'0"E
78°28'0"E
78°30'0"E
78°32'0"E
78°34'0"E
78°36'0"E
17°32'0"N
17°30'0"N
17°28'0"N
17°26'0"N
17°24'0"N
17°22'0"N
17°20'0"N
17°18'0"N
17°16'0"N
N
W
E
S
HYDERABAD WEST- Range
HYDERABAD CENTRAL- Range
HYDERABAD EAST- Range
0
3
6
12
Kilometers
Legend
Division Boundary
Range Boundary


Map Showing Suitability index for Construction of SMC Works of Hyderabad East Range, Hyderabad Division
78°27'30"E
78°30'0"E
78°32'30"E
78°35'0"E
17°27'30"N
17°25'0"N
17°22'30"N
17°20'0"N
17°17'30"N
N
S
E
W
DULAPALLY- Range
KEESARA- Range
MEDCHAL MALKAJIGIRI-Division
Mushirabad - BEAT
HYDERABAD WEST- Range
UPPAL- Range
HYDERABAD-Division
Amberpet - BEAT
HYDERABAD CENTRAL- Range
HYDERABAD EAST- Range
SHAMSHABAD- Range
MHVNP- Range
Charminar - BEAT
SHAMSHABAD-Division
SHAMSHABAD- Range
MANKHAL- Range
IBRAHIMPATNAM- Range
LEGEND
Contours
Streams
Watershed Boundary
Compartment Boundary
Beat Boundary
Range Boundary
Division Boundary
0
1.5
3
6
Kilometers


Map Showing Catchment areas of Proposed Percolation Tanks of Hyderabad East Range, Hyderabad Division
78°25'0"E
78°27'30"E
78°30'0"E
78°32'30"E
17°27'30"N
17°25'0"N
17°22'30"N
17°20'0"N
17°17'30"N
N
S
E
W
DULAPALLY- Range
KEESARA- Range
MEDCHAL MALKAJIGIRI-Division
CHILKUR- Range
HYDERABAD WEST- Range
HYDERABAD-Division
UPPAL- Range
HYDERABAD CENTRAL- Range
HYDERABAD EAST- Range
CHILKUR- Range
MHVNP- Range
SHAMSHABAD- Range
MANKHAL- Range
IBRAHIMPATNAM- Range
SHAMSHABAD-Division
AMANGAL-Division
0
1.5
3
6
Kilometers
LEGEND
Streams
Range Boundary
Division Boundary

Map Showing Suitability index for Construction of SMC Works of Amberpet Beat



N
W
E
S

Division : Hyderabad
Range : Hyderabad East

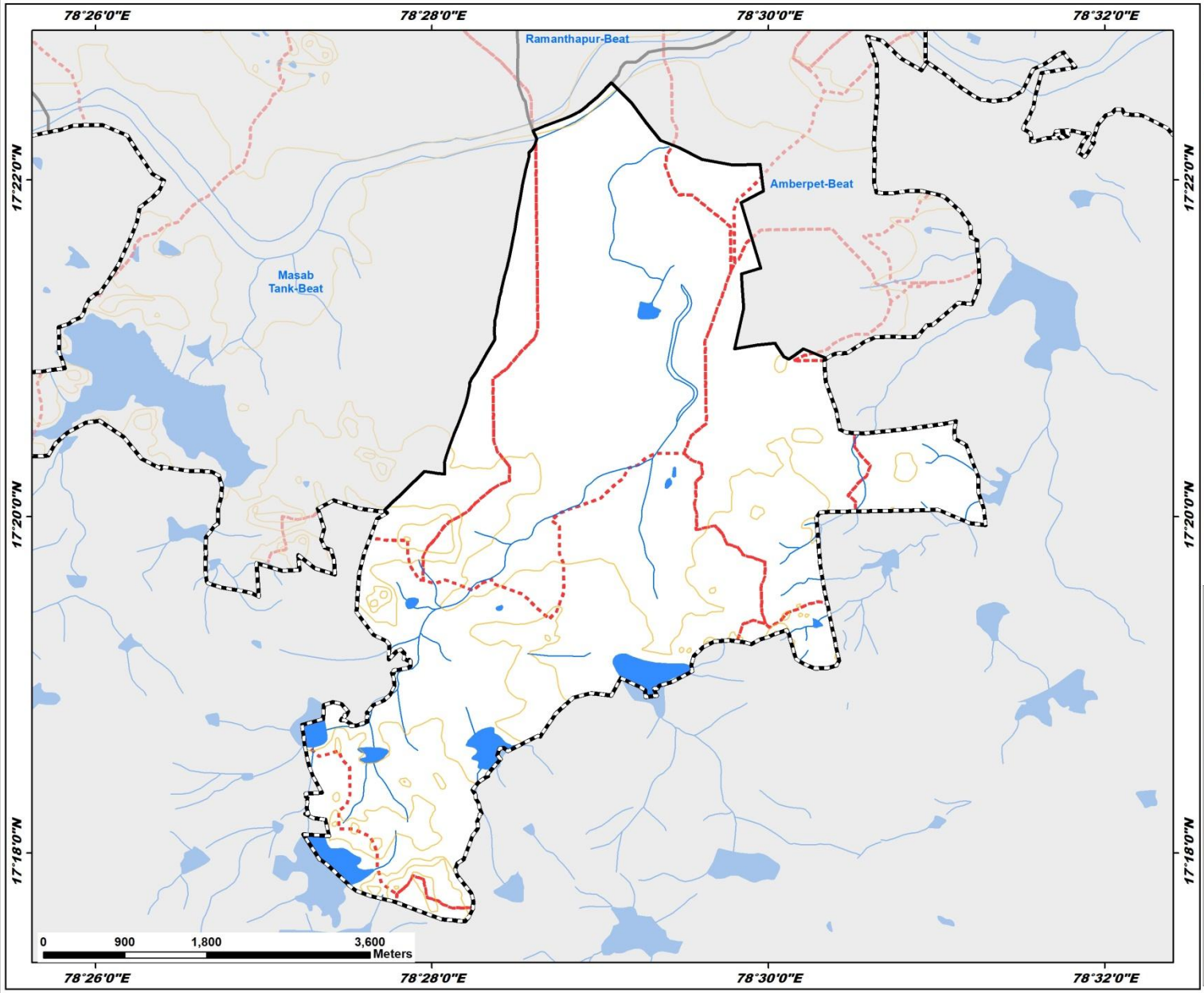
Legend

- Contours
- Streams
- Watershed Boundary
- Compartment Boundary
- Beat Boundary
- Division Boundary

Suitability Index

- CCTs/SCTs - Highly Suitable
- CCTs/SCTs - Moderately Suitable
- CCTs/SCTs - Least Suitable
- PTs - Highly Suitable
- PTs - Moderately Suitable
- PTs - Least Suitable
- MPTs and SGPs - Suitable
- Not Suitable
- Water Body

Map Showing Suitability index for Construction of SMC Works of Charminar Beat



N
W
E
S

Division : Hyderabad
Range : Hyderabad East

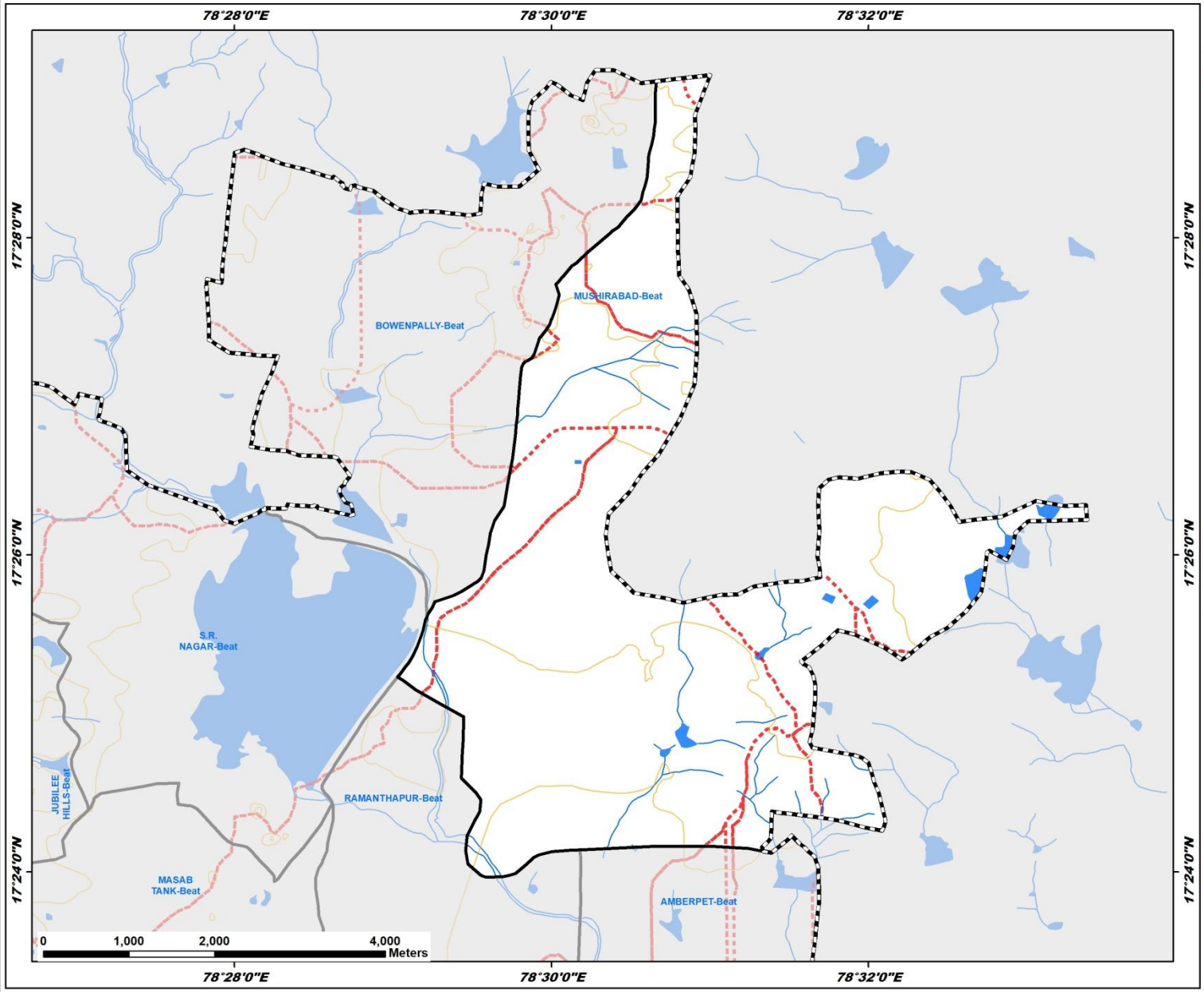
Legend

- Division Boundary
- Beat Boundary
- 1_ABL
- Contours
- Streams
- Compartment Boundary
- Watershed Boundary

Suitability Index

- CCTs/SCTs - Highly Suitable
- CCTs/SCTs - Moderately Suitable
- CCTs/SCTs - Least Suitable
- PTs - Highly Suitable
- PTs - Moderately Suitable
- PTs - Least Suitable
- MPTs and SGPs - Suitable
- Not Suitable
- Water Body

Map Showing Suitability Index for Construction of SMC Works of Mushirabad Beat



N
W
E
S

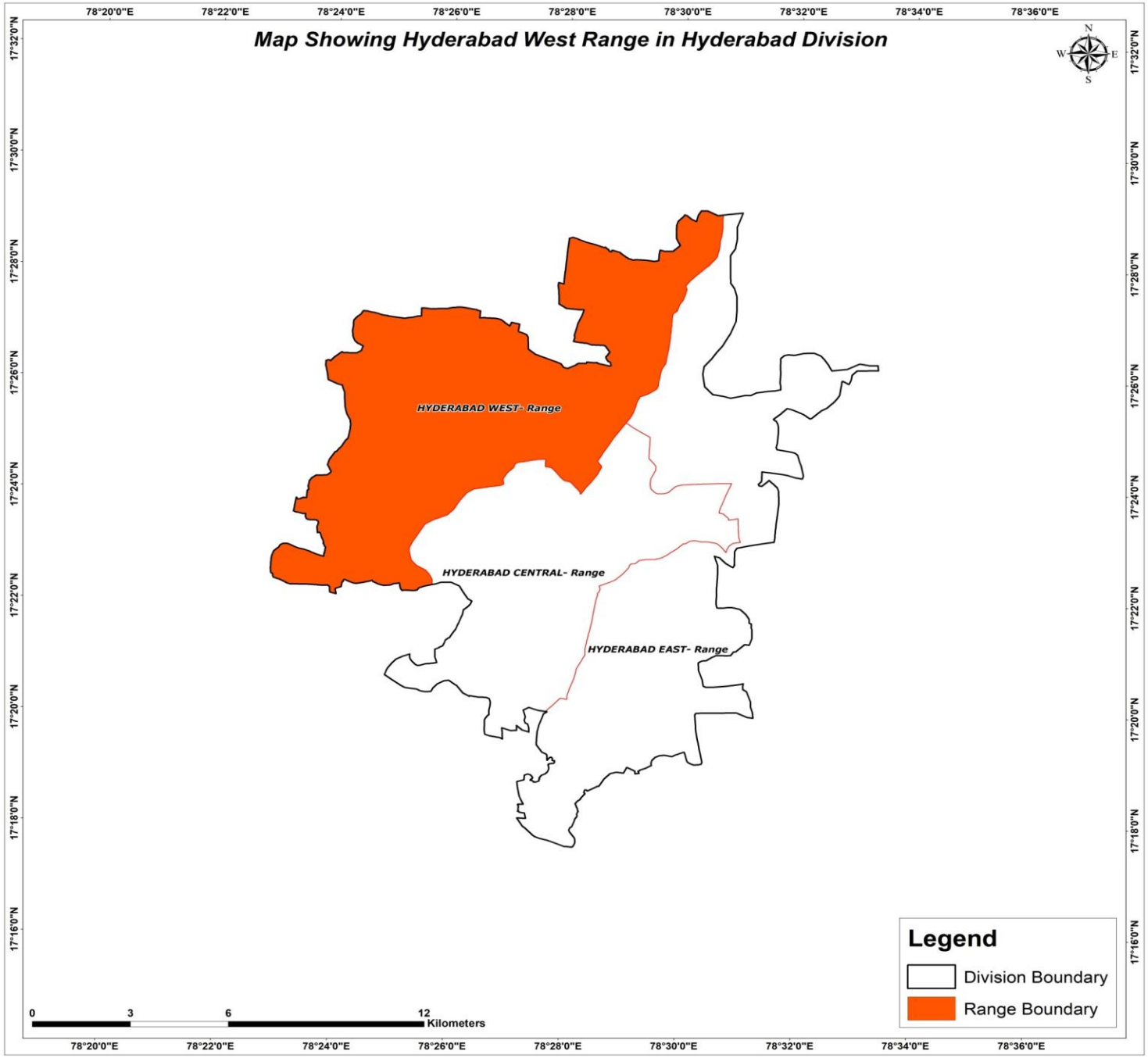
Division : Hyderabad
Range : Hyderabad East

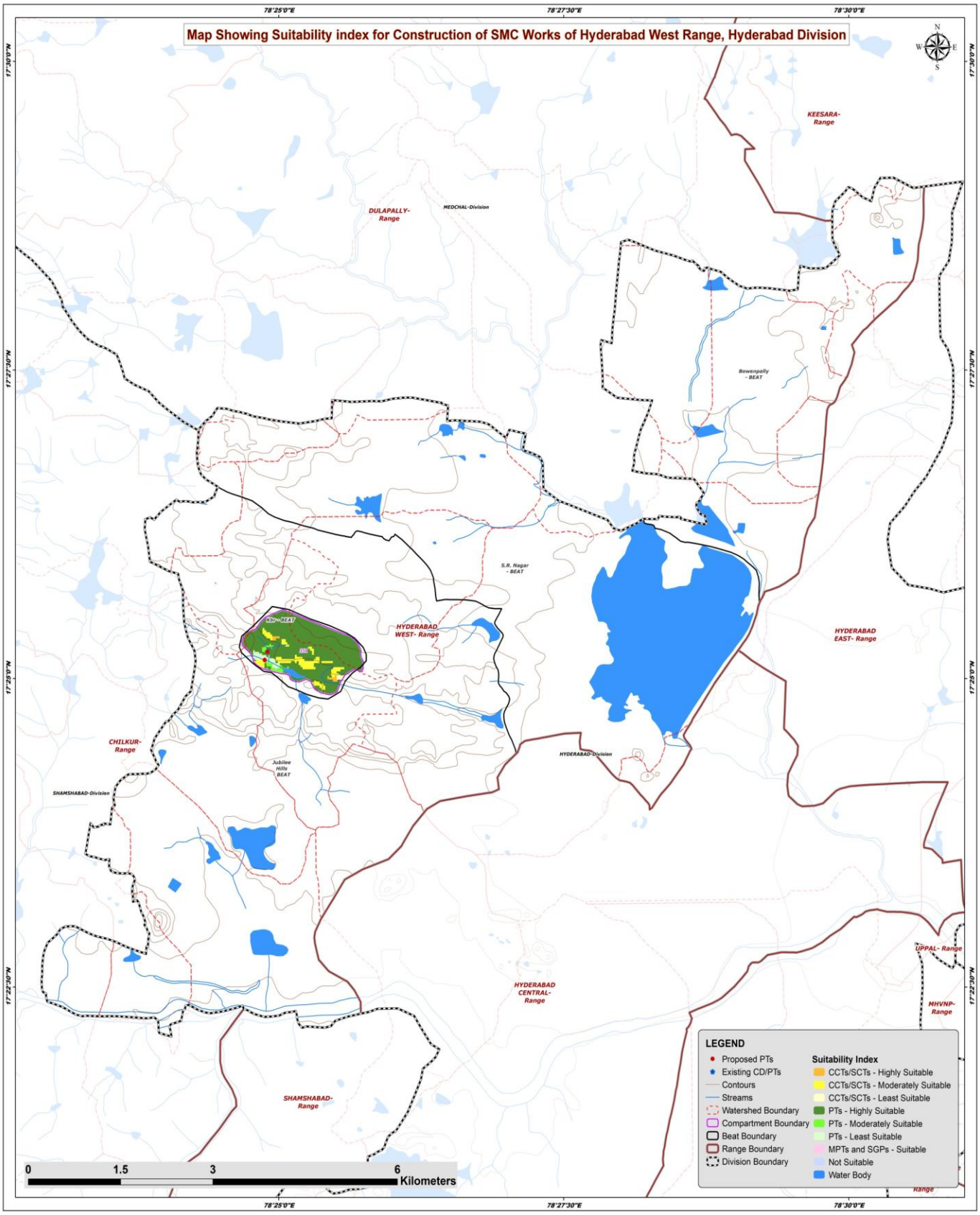
Legend

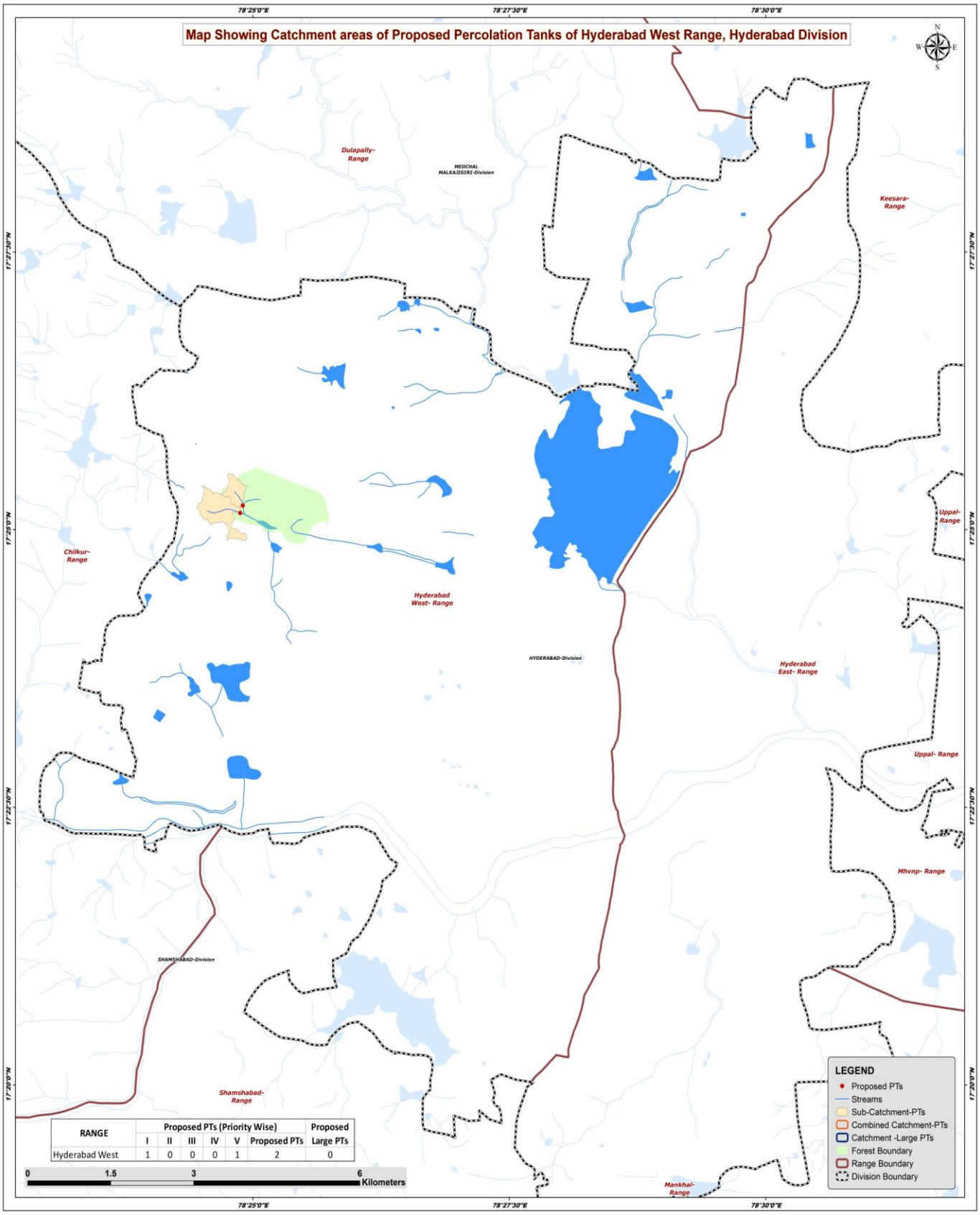
- Contours
- Streams
- Watershed Boundary
- Compartment Boundary
- Beat Boundary
- Division Boundary

Suitability Index

- CCTs/SCTs - Highly Suitable
- CCTs/SCTs - Moderately Suitable
- CCTs/SCTs - Least Suitable
- PTs - Highly Suitable
- PTs - Moderately Suitable
- PTs - Least Suitable
- MPTs and SGPs - Suitable
- Not Suitable
- Water Body


Map Showing Hyderabad West Range in Hyderabad Division
78°20'0"E
78°22'0"E
78°24'0"E
78°26'0"E
78°28'0"E
78°30'0"E
78°32'0"E
78°34'0"E
78°36'0"E
17°32'0"N
17°30'0"N
17°28'0"N
17°26'0"N
17°24'0"N
17°22'0"N
17°20'0"N
17°18'0"N
17°16'0"N
N
W
E
S
HYDERABAD WEST- Range
HYDERABAD CENTRAL- Range
HYDERABAD EAST- Range
0
3
6
12
Kilometers
Legend
Division Boundary
Range Boundary


Map Showing Suitability index for Construction of SMC Works of Hyderabad West Range, Hyderabad Division
78°25'0"E
78°27'30"E
78°30'0"E
17°30'0"N
17°27'30"N
17°25'0"N
17°22'30"N
N
S
E
W
KEESARA- Range
DULAPALLY- Range
MEDCHAL-Division
Bowenpally - BEAT
S.R. Nagar - BEAT
Kbpr BEAT
HYDERABAD WEST- Range
HYDERABAD EAST- Range
HYDERABAD-Division
CHILKUR- Range
Jubilee Hills BEAT
SHAMSHABAD-Division
HYDERABAD CENTRAL- Range
UPPAL- Range
MHVNP- Range
SHAMSHABAD- Range
LEGEND
Proposed PTs
Existing CD/PTs
Contours
Streams
Watershed Boundary
Compartment Boundary
Beat Boundary
Range Boundary
Division Boundary
Suitability Index
CCTs/SCTs - Highly Suitable
CCTs/SCTs - Moderately Suitable
CCTs/SCTs - Least Suitable
PTs - Highly Suitable
PTs - Moderately Suitable
PTs - Least Suitable
MPTs and SGPs - Suitable
Not Suitable
Water Body
0
1.5
3
6
Kilometers



RANGE	Proposed PTs (Priority Wise)						Proposed
	I	II	III	IV	V	Proposed PTs	Large PTs
Hyderabad West	1	0	0	0	1	2	0

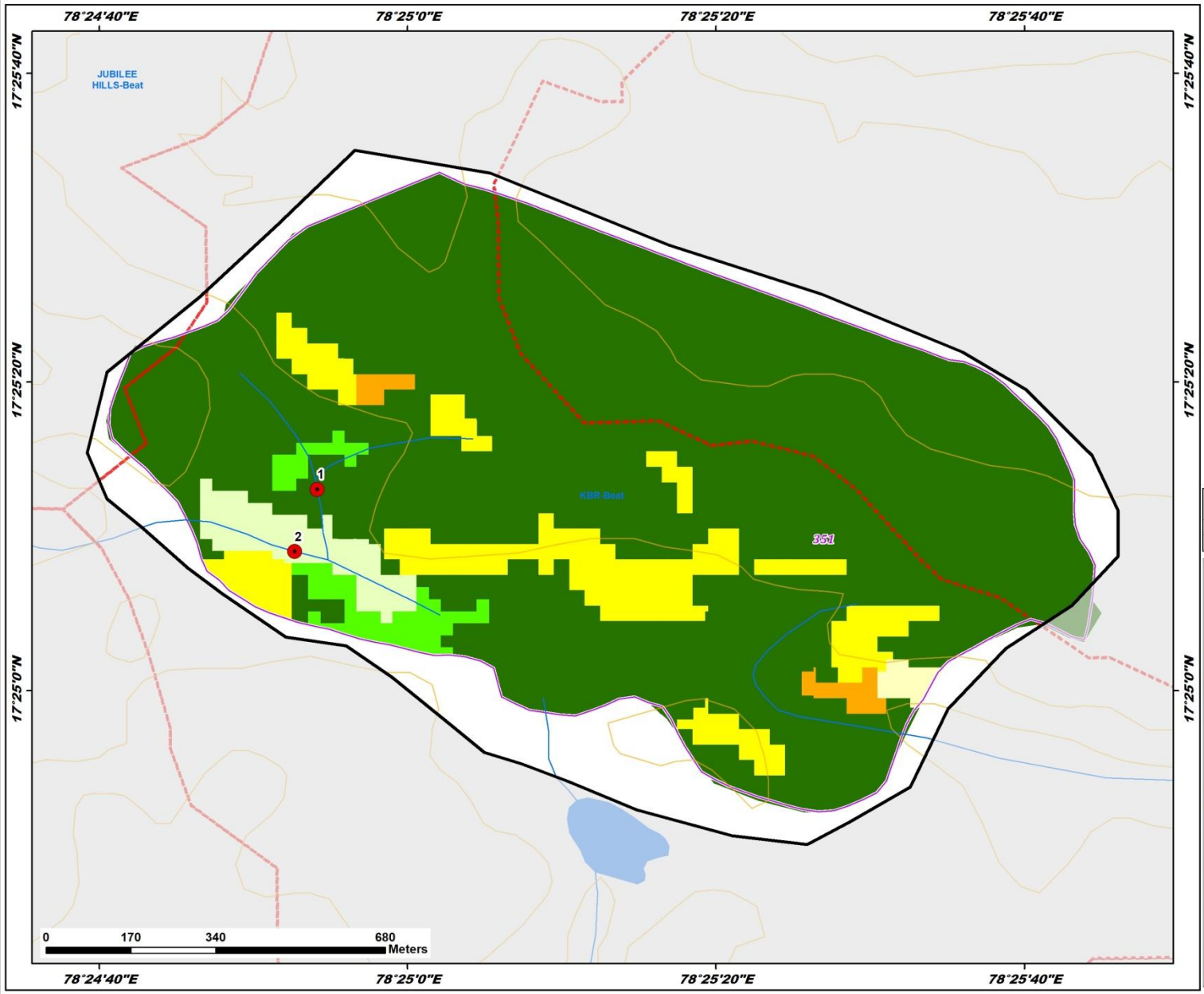
Beat wise Abstract of Proposed PT's – Hyderabad(W) Range

S. No.	Beat	Proposed PT's
1	KBR	2
	Total	**2**

List of Proposed PTs – Hyderabad W Range

ID	Latitude	Longitude	Catchment Area_Ha	Priority	Beat
1	17.420289	78.415043	12.750	I	KBR
2	17.419170	78.414636	32.780	V	KBR

Map Showing Suitability index for Construction of SMC Works of KBR Beat



Division : Hyderabad
Range : Hyderabad West

ID	Latitude	Longitude	Catchment Area_Ha	Priority
1	17.420289	78.415043	12.75	I
2	17.419170	78.414636	32.78	V

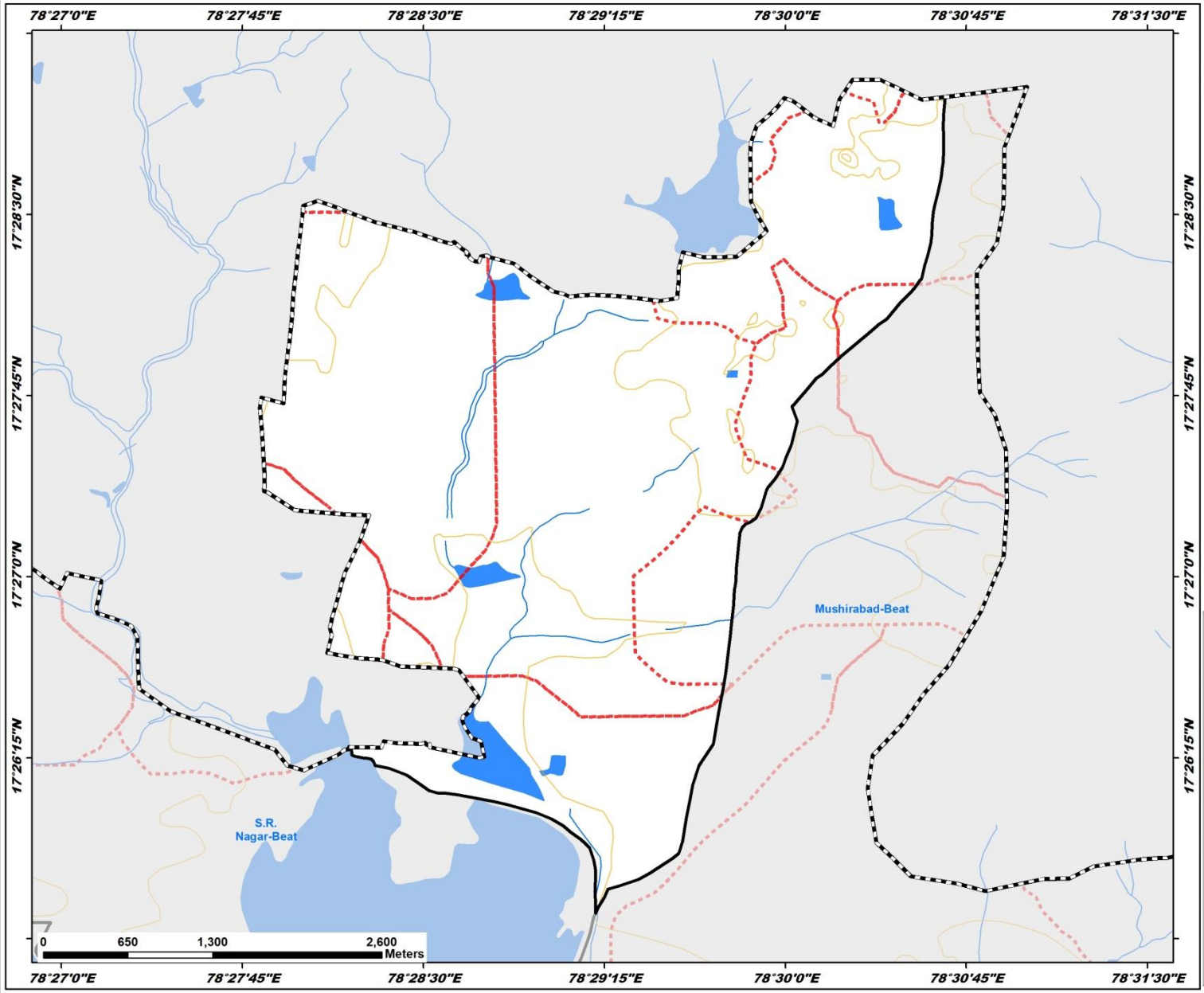
Legend

- Proposed_PTs
- Existing CD/PTs
- Contours
- Streams
- Watershed Boundary
- Compartment Boundary
- Beat Boundary
- Division Boundary

Suitability Index

- CCTs/SCTs - Highly Suitable
- CCTs/SCTs - Moderately Suitable
- CCTs/SCTs - Least Suitable
- PTs - Highly Suitable
- PTs - Moderately Suitable
- PTs - Least Suitable
- MPTs and SGPs - Suitable
- Not Suitable
- Water Body

Map Showing Suitability index for Construction of SMC Works of Bowenpally Beat



N
W
E
S

Division : Hyderabad
Range : Hyderabad West

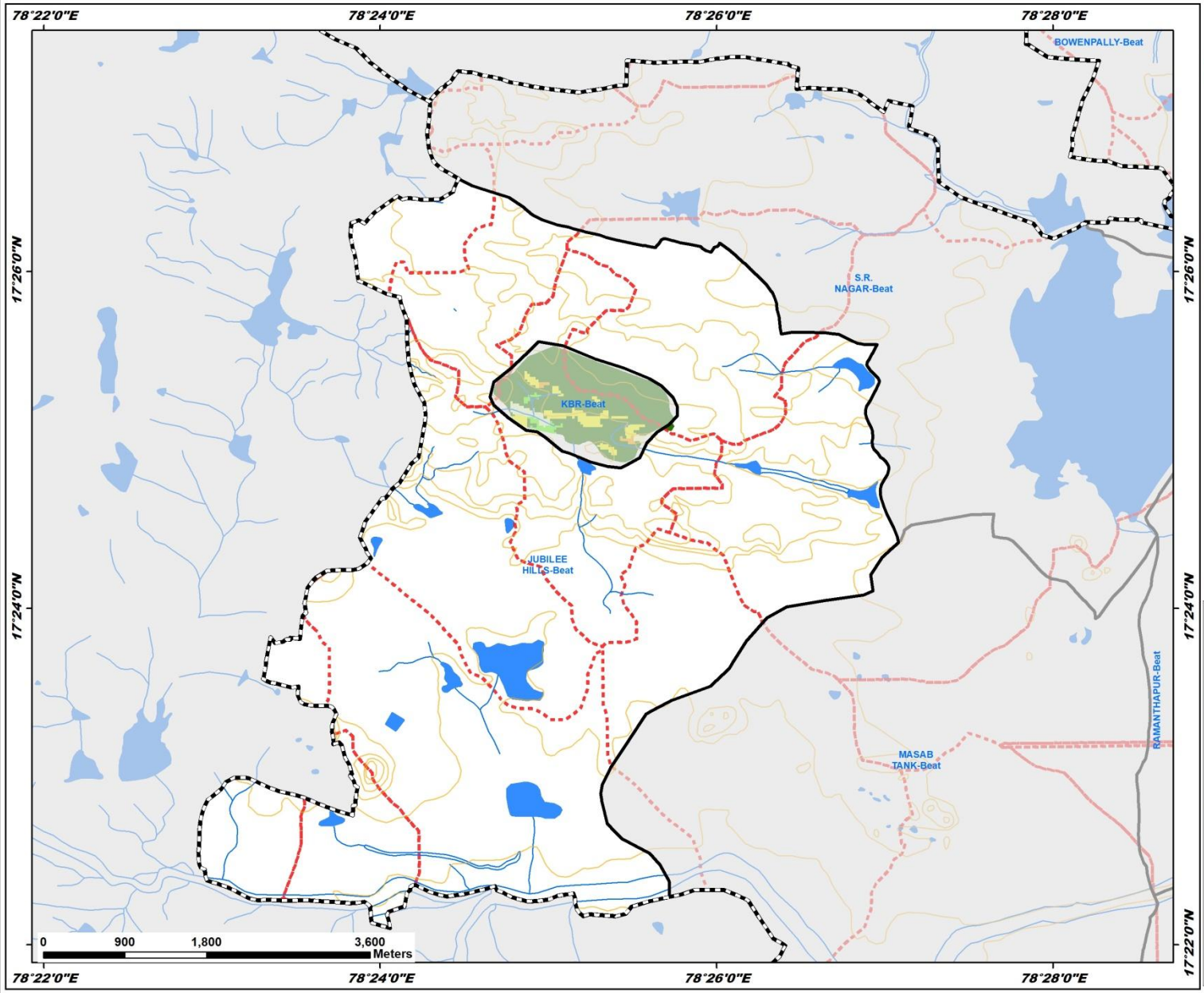
Legend

- Contours
- Streams
- Watershed Boundary
- Compartment Boundary
- Beat Boundary
- Division Boundary

Suitability Index

- CCTs/SCTs - Highly Suitable
- CCTs/SCTs - Moderately Suitable
- CCTs/SCTs - Least Suitable
- PTs - Highly Suitable
- PTs - Moderately Suitable
- PTs - Least Suitable
- MPTs and SGPs - Suitable
- Not Suitable
- Water Body

Map Showing Suitability index for Construction of SMC Works of Jubliee Hills Beat



N
W
E
S

Division : Hyderabad
Range : Hyderabad West

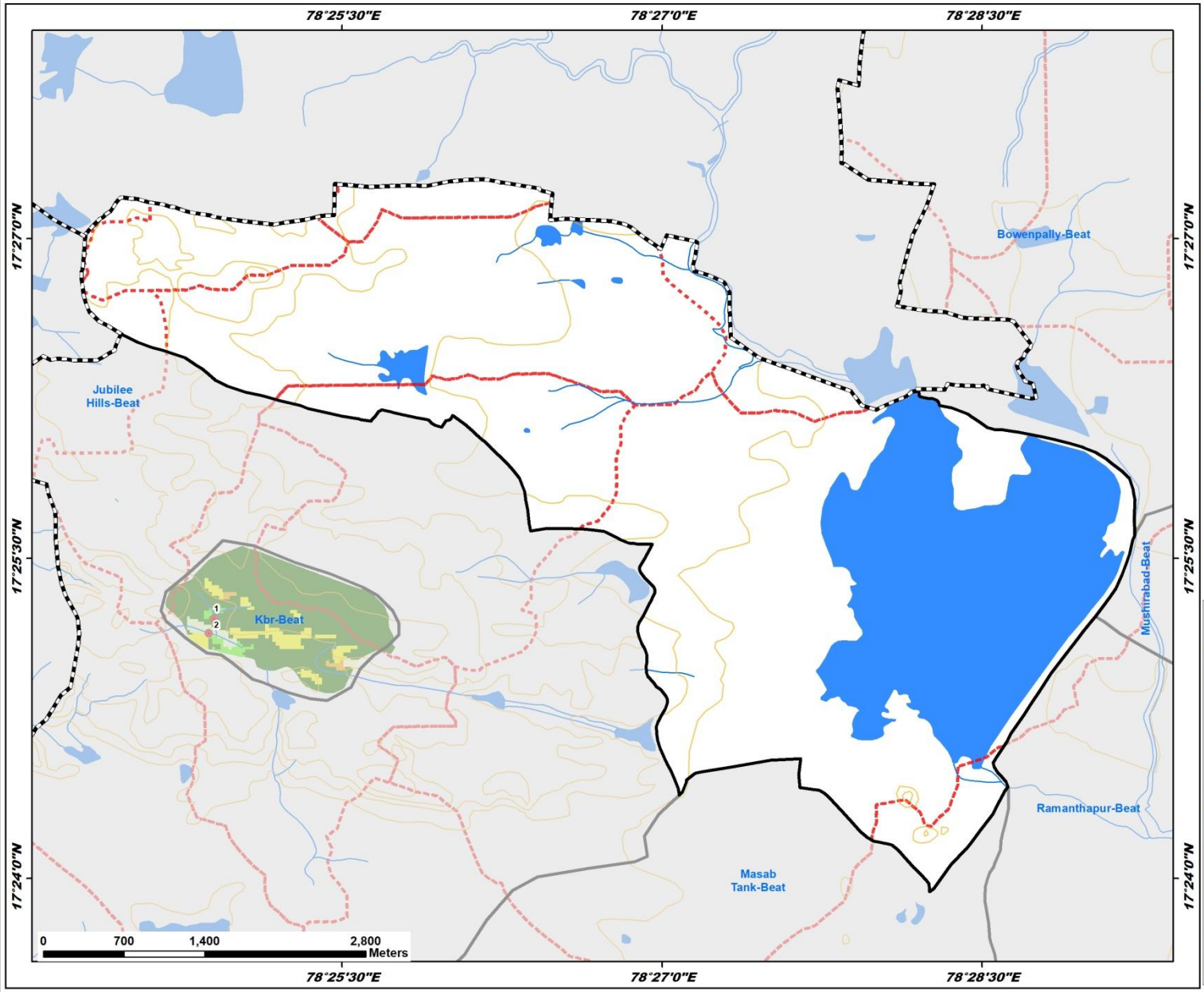
Legend

- Contours
- Streams
- Watershed Boundary
- Compartment Boundary
- Beat Boundary
- Division Boundary

Suitability Index

- CCTs/SCTs - Highly Suitable
- CCTs/SCTs - Moderately Suitable
- CCTs/SCTs - Least Suitable
- PTs - Highly Suitable
- PTs - Moderately Suitable
- PTs - Least Suitable
- MPTs and SGPs - Suitable
- Not Suitable
- Water Body

Map Showing Suitability index for Construction of SMC Works of S R Nagar Beat



N
W E
S

Division : Hyderabad
Range : Hyderabad West

Legend

- Contours
- Streams
- Watershed Boundary
- Compartment Boundary
- Beat Boundary
- Division Boundary

Suitability Index

- CCTs/SCTs - Highly Suitable
- CCTs/SCTs - Moderately Suitable
- CCTs/SCTs - Least Suitable
- PTs - Highly Suitable
- PTs - Moderately Suitable
- PTs - Least Suitable
- MPTs and SGPs - Suitable
- Not Suitable
- Water Body