

Polder 26

Model Study

Inundation due to Rainfall Floods

Impact on Inundation due to Selected Culverts

Methodology

Rainfall station at Khulna is used as representative for polder 26

Frequency analysis is performed to determine 10-year return period rainfall of different duration

Intensity-Duration-Frequency (IDF) curve is generated corresponding to 10-year return period rainfall

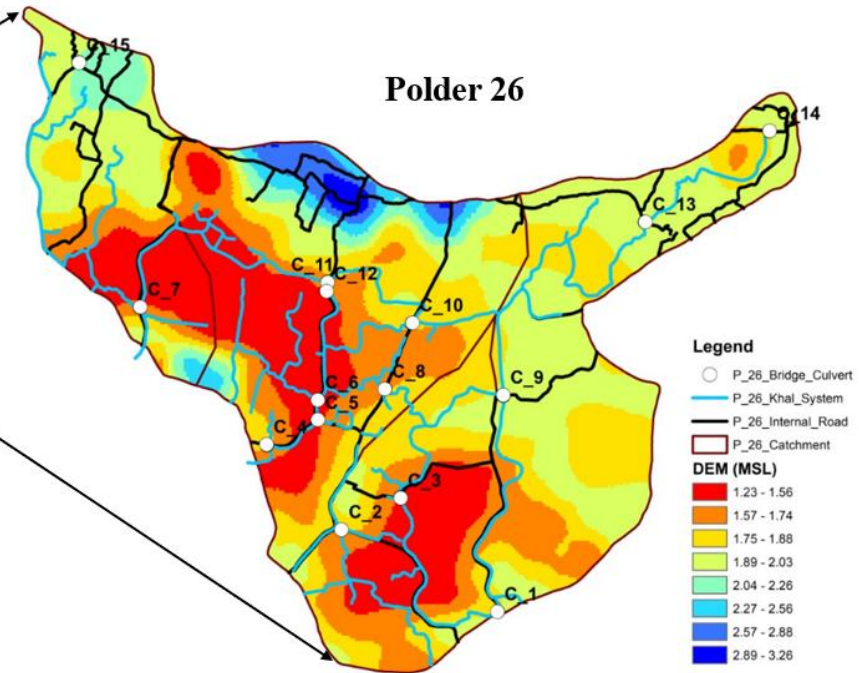
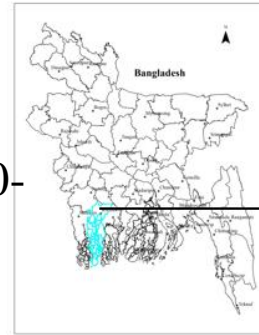
IDF curve is used to select 7 days maximum rainfall intensity for a 10-year return period rainfall

Inundation is computed due to 7-days continuous rainfall represented by the IDF curve

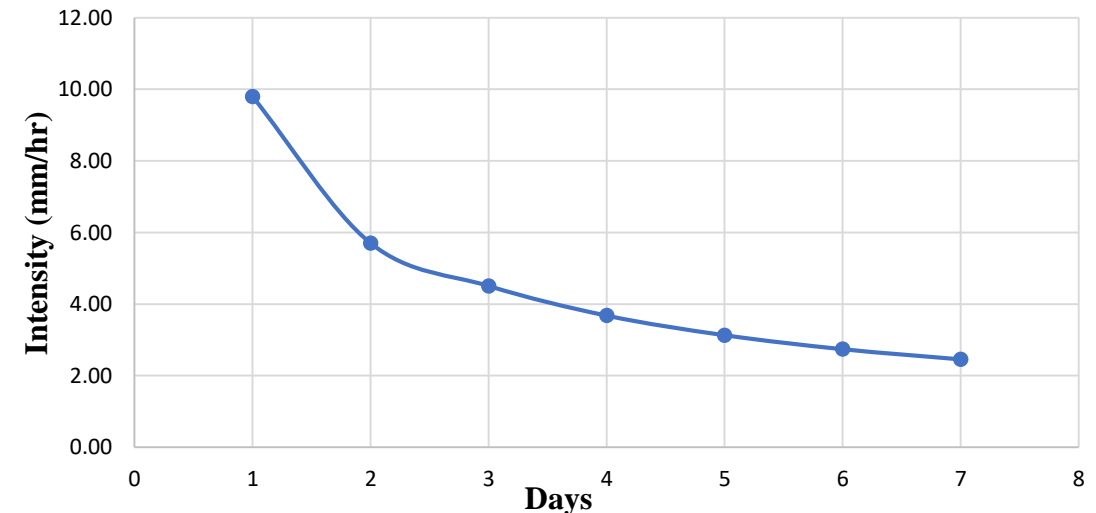
Drainage due to rainfall inundation is calculated by applying the hydrodynamic model (Delft 3D)

LGED design manual (which is similar to FHWA design manual) is used to calculate culvert size

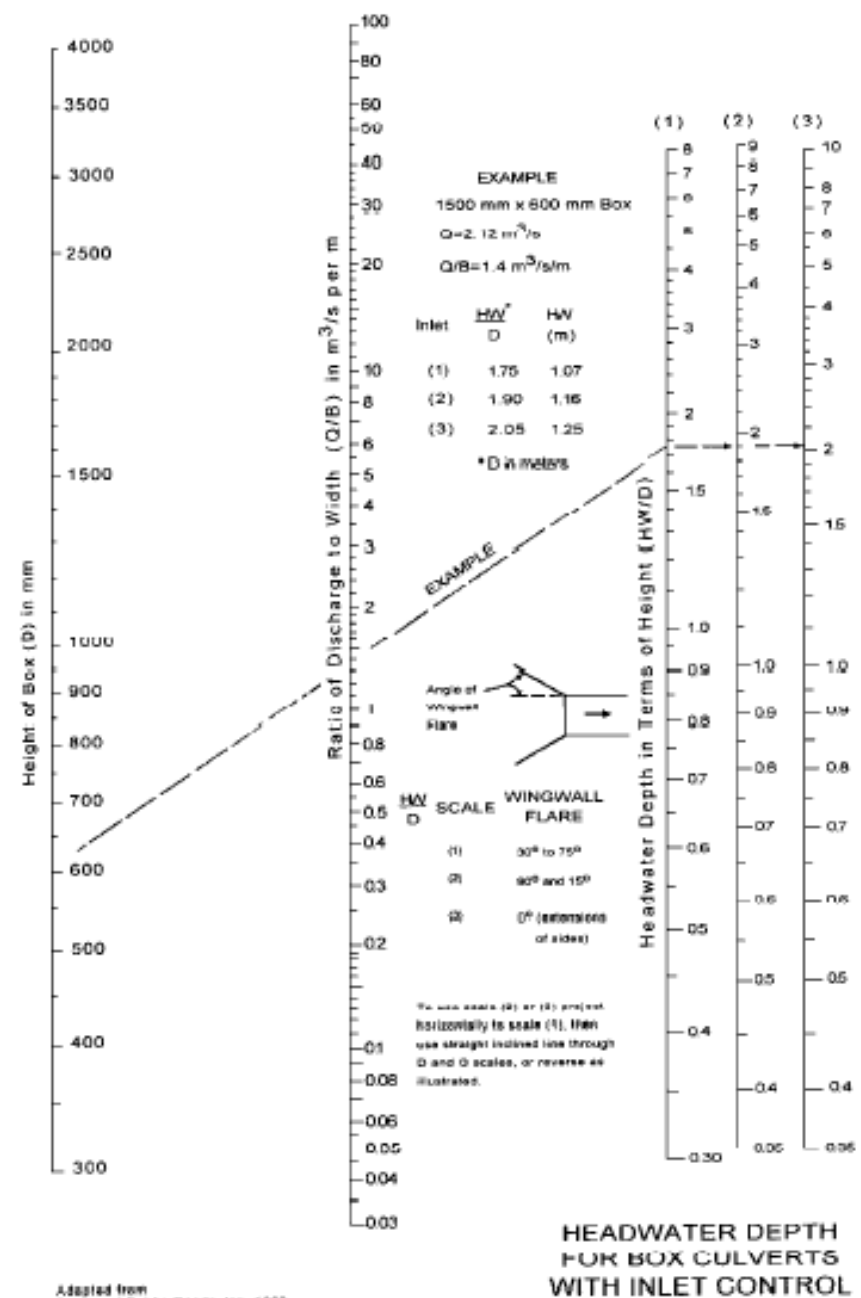
The inundation simulated by the model represents 7 days continuous rainfall with corresponding intensity for a 10-year return period. A smaller duration rainfall that corresponds a higher intensity for the same return period will generate a different inundation.



Intensity-Duration-Frequency Curve



FHWA (followed by LGED) Design Curve for box culvert



Inundation Scenarios due to Selected Culverts

Selected Culverts

5 BG culverts are marked as “Culvert No (BG)”. When implemented – these are kept in design condition

2 Roads to Rescue culverts are marked as “Culver No (RR)”. When implemented – these are kept in design condition

2 people’s choice culvert locations (determined from Khulna Workshop) are marked as “Culvert No (Local)” – these locations are kept in field condition based on field visit

Rest of the culverts locations are kept in field condition based on field visit

Scenario Generation:

Scenario-1 : Existing condition, no culverts are implemented, rivers (north & east) are not excavated

Scenario-2 : Only BG culverts are implemented, RR culverts are not implemented, rivers are not excavated

Scenario-3 : Only RR culverts are implemented, BG culverts are not implemented, rivers are not excavated

Scenario-4 : Only RR culverts are implemented, BG culverts are not implemented, rivers are excavated

Scenario-5 : Both BG and RR culverts are implemented, rivers are not excavated

Scenario-6 : Only BG culverts are implemented, RR culverts are not implemented, rivers are not excavated

Scenario-7: Both BG culverts and RR culverts are implemented, rivers are also excavated.

BG and RR Culvert Location

**BG Culvert
CN16 (BG)**



**BG Culvert
CN17 (BG)**



**BG Culvert
CN18 (BG)**



**BG Culvert
CN19 (BG)**



**BG Culvert
CN20 (BG)**



**RR Culvert
CN22 (RR)**



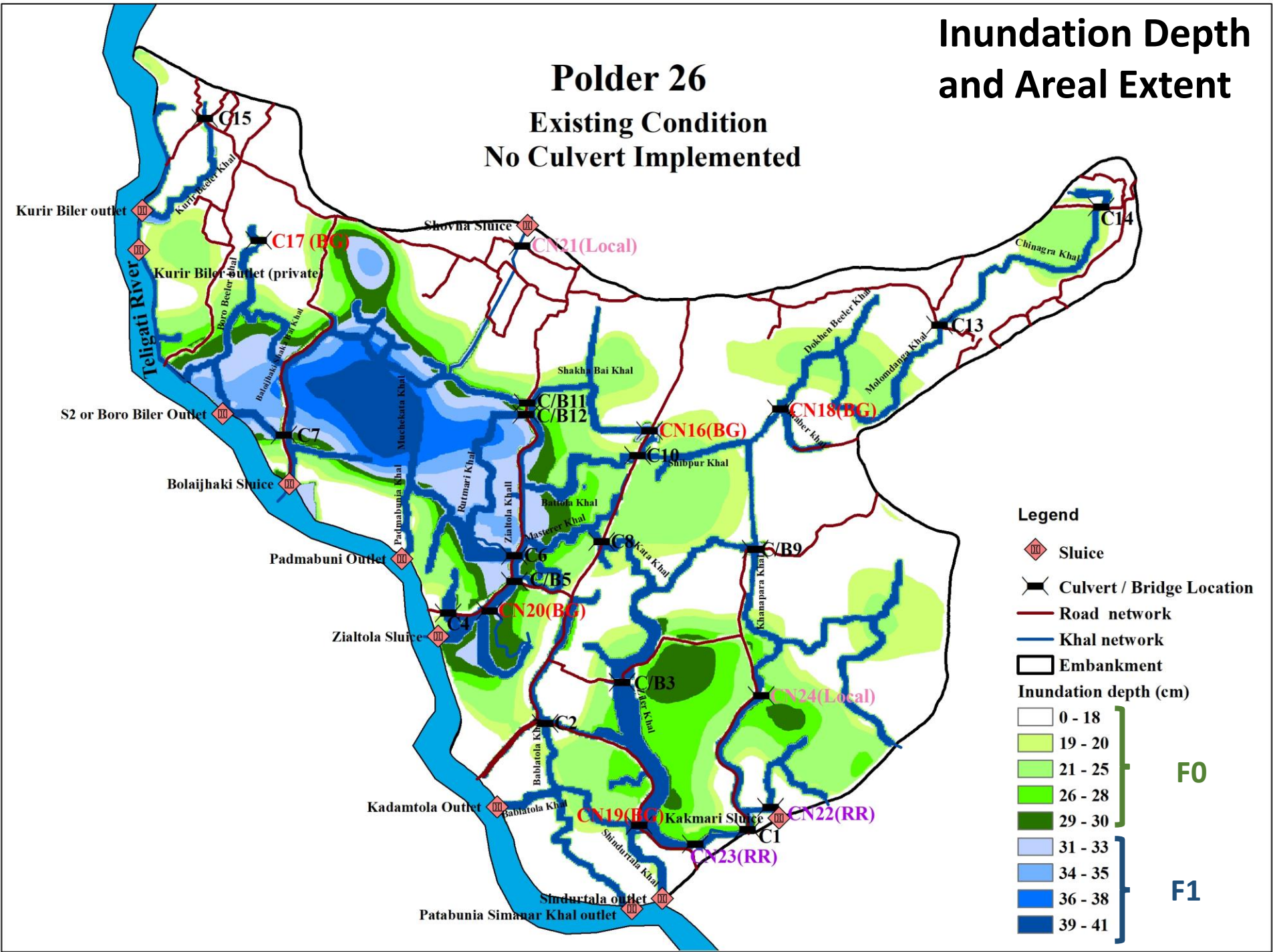
RR Culvert CN23 (RR)



Inundation Depth and Areal Extent

Inundation Depth and Areal Extent

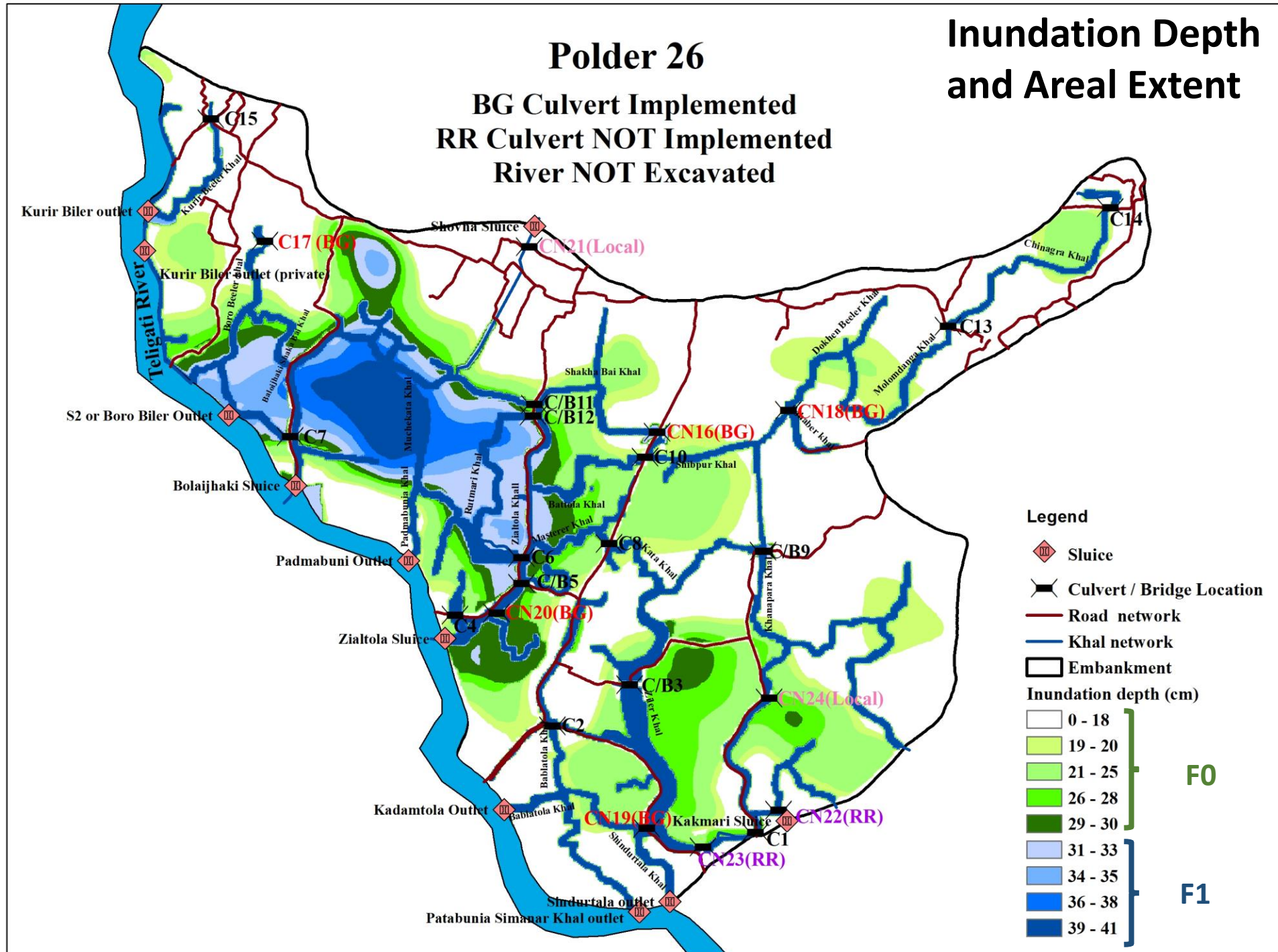
Polder 26 Existing Condition No Culvert Implemented



Polder 26

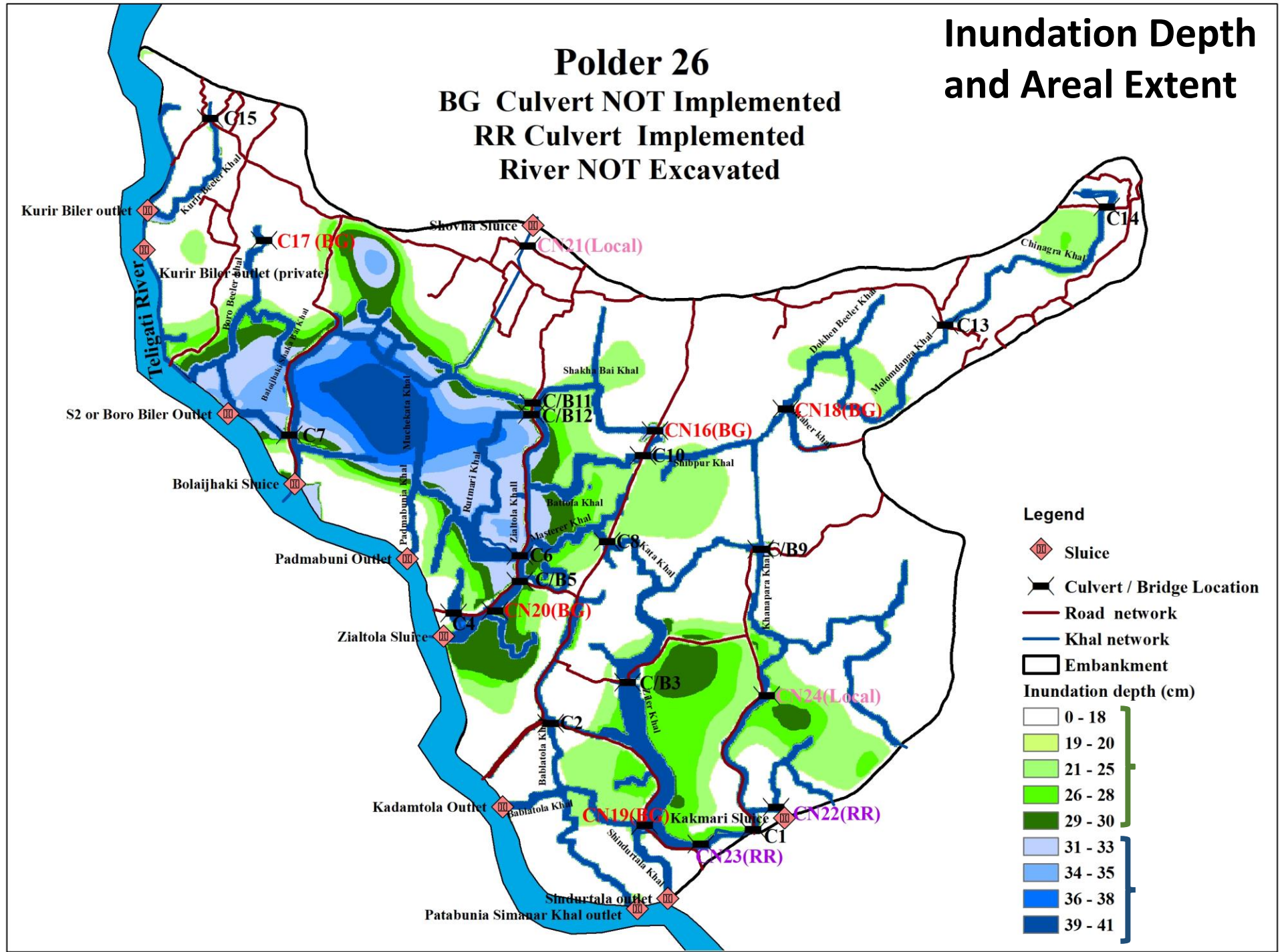
BG Culvert Implemented
RR Culvert NOT Implemented
River NOT Excavated

Inundation Depth and Areal Extent



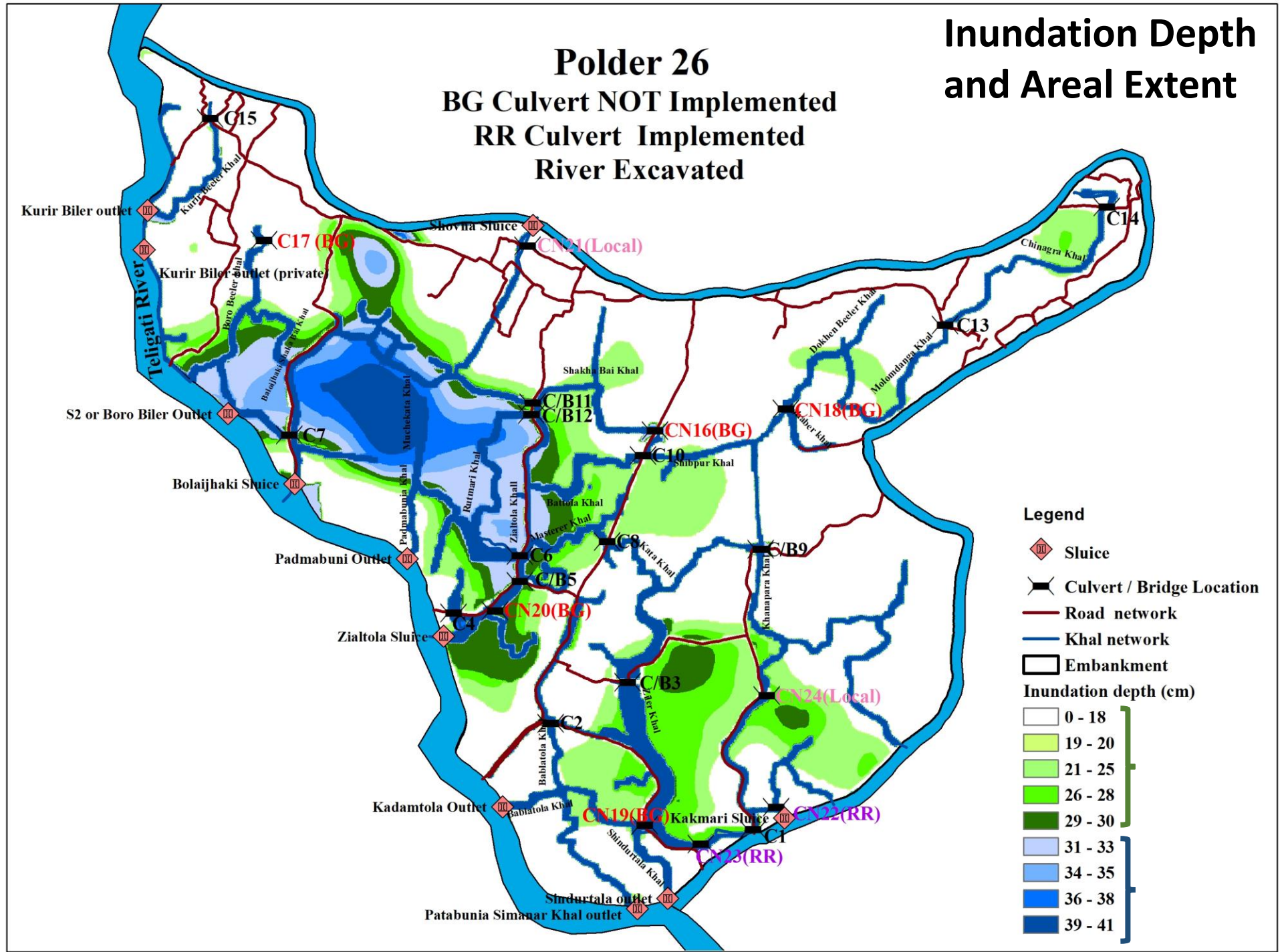
Inundation Depth and Areal Extent

Polder 26
BG Culvert NOT Implemented
RR Culvert Implemented
River NOT Excavated



Inundation Depth and Areal Extent

Polder 26
BG Culvert NOT Implemented
RR Culvert Implemented
River Excavated



Inundation Depth and Areal Extent

Polder 26

BG Culvert Implemented
RR Culvert Implemented
River NOT Excavated

Inundation Depth and Areal Extent

Legend

- Sluice
- Culvert / Bridge Location
- Road network
- Khal network
- Embankment

Inundation depth (cm)

0 - 18	F0
19 - 20	
21 - 25	
26 - 28	
29 - 30	
31 - 33	F1
34 - 35	
36 - 38	
39 - 41	

Legend:

- Sluice**
- Culvert / Bridge Location**
- Road network**
- Khal network**
- Embankment**
- Inundation depth (cm)**
 - 0 - 18
 - 19 - 20
 - 21 - 25
 - 26 - 28
 - 29 - 30
 - 31 - 33
 - 34 - 35
 - 36 - 38
 - 39 - 41

F0 (Green label for depths 19-30 cm)

F1 (Blue label for depths 31-41 cm)

Inundation Depth and Areal Extent

Polder 26

**BG Culvert Implemented
RR Culvert NOT Implemented
River Excavated**

Inundation Depth and Areal Extent

Legend

- Sluice
- Culvert / Bridge Location
- Road network
- Khal network
- Embankment
- Inundation depth (cm)
 - 0 - 18
 - 19 - 20
 - 21 - 25
 - 26 - 28
 - 29 - 30
 - 31 - 33
 - 34 - 35
 - 36 - 38
 - 39 - 41

F0

F1

F1

BG Culvert Implemented
RR Culvert Implemented
River Excavated

Legend:

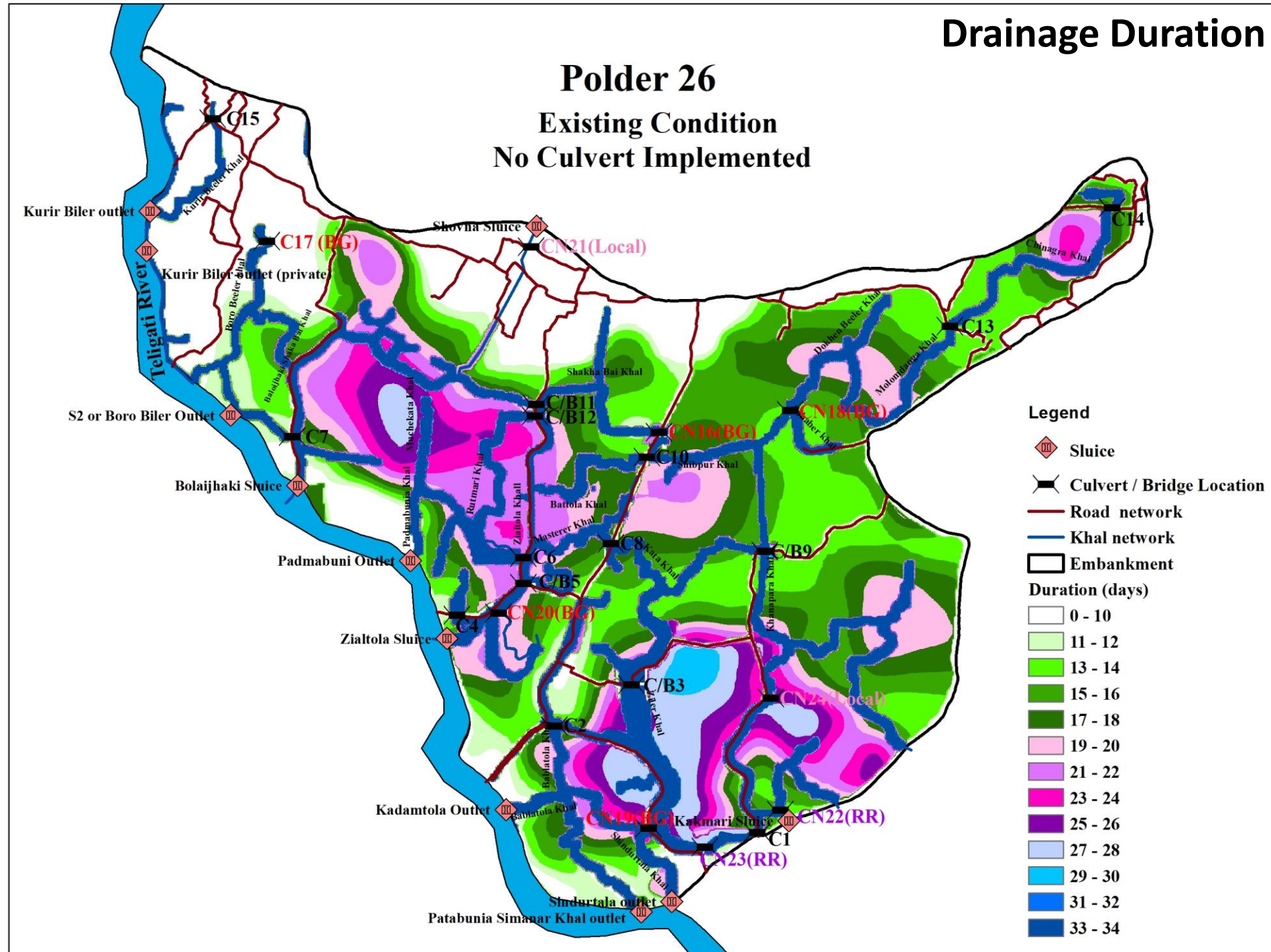
- Sluice
- Culvert / Bridge Location
- Road network
- Khal network
- Embankment
- Inundation depth (cm)**
 - 0 - 18
 - 19 - 20
 - 21 - 25
 - 26 - 28
 - 29 - 30
 - 31 - 33
 - 34 - 35
 - 36 - 38
 - 39 - 41

F0 (Green)

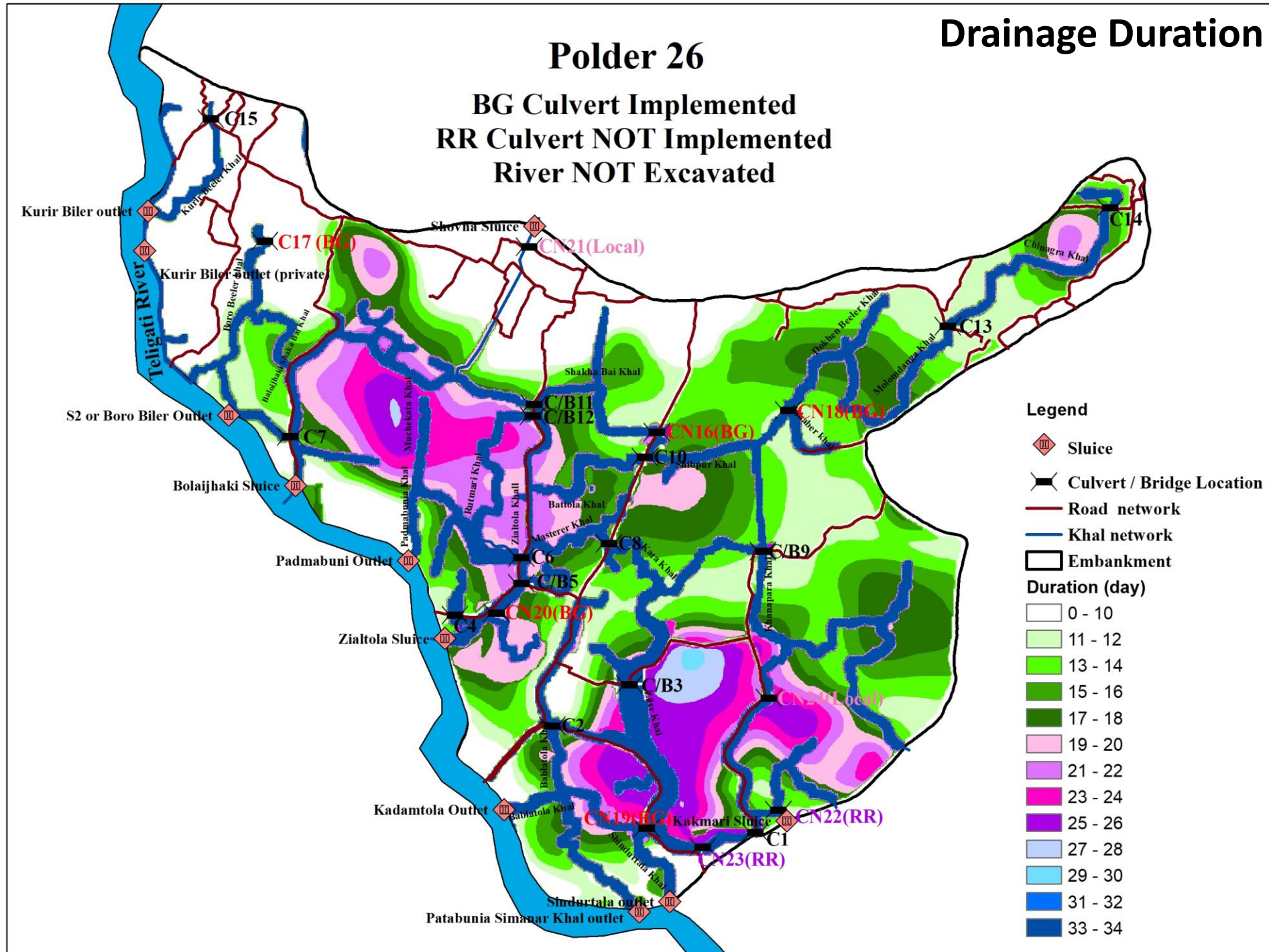
F1 (Blue)

Drainage Duration

Polder 26
Existing Condition
No Culvert Implemented



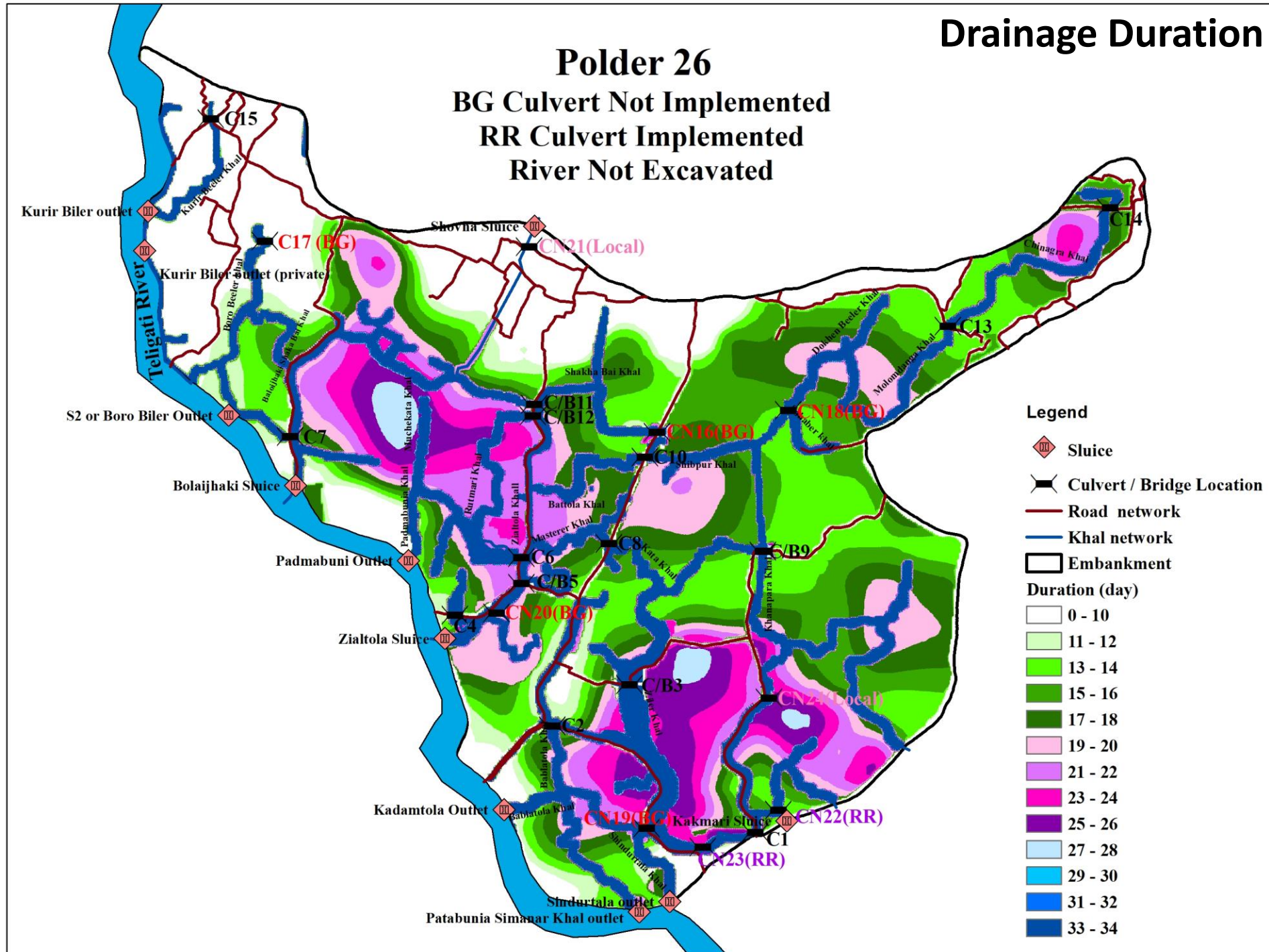
**BG Culvert Implemented
RR Culvert NOT Implemented
River NOT Excavated**



Drainage Duration

Polder 26

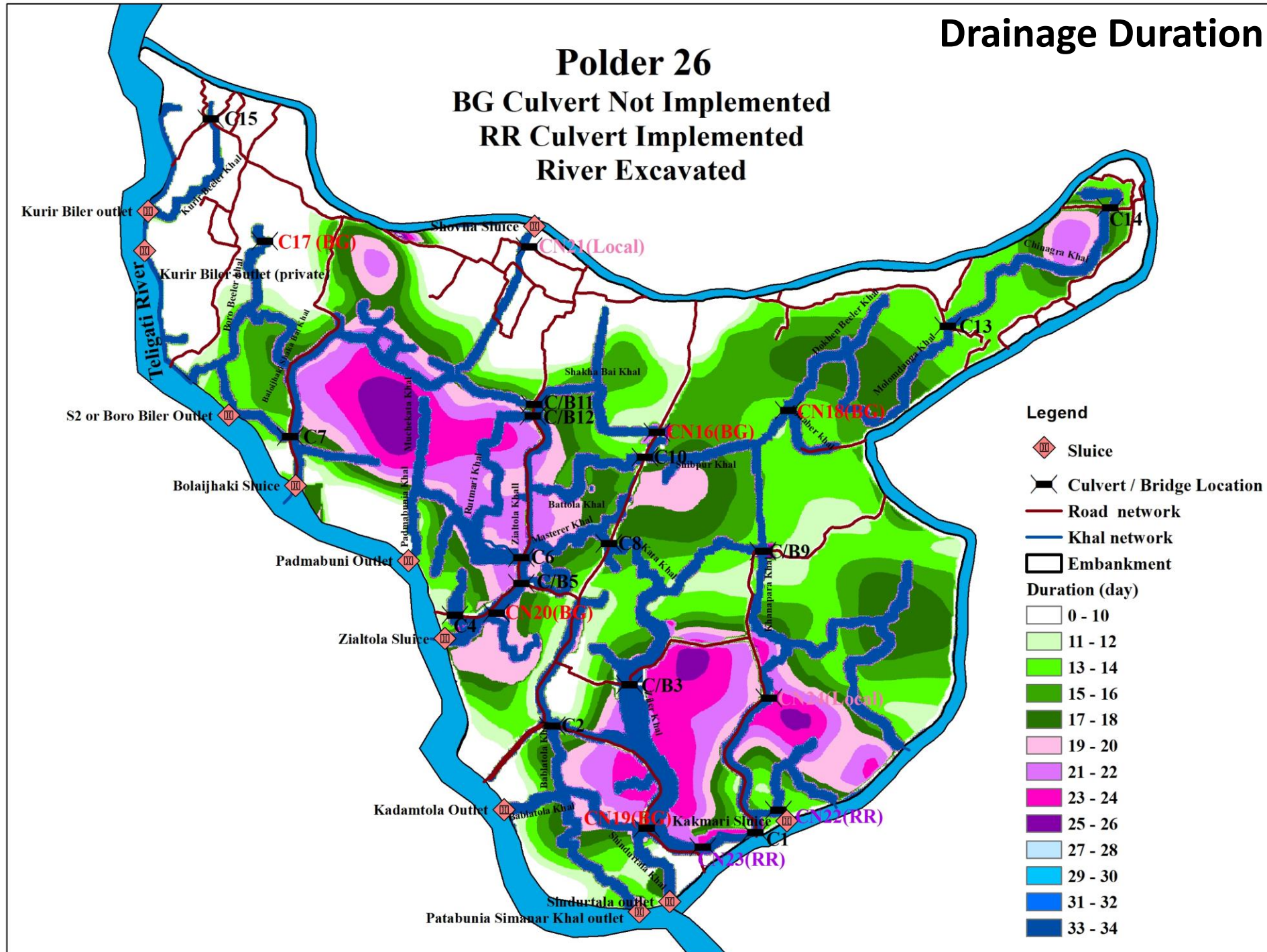
BG Culvert Not Implemented
RR Culvert Implemented
River Not Excavated



Drainage Duration

Polder 26

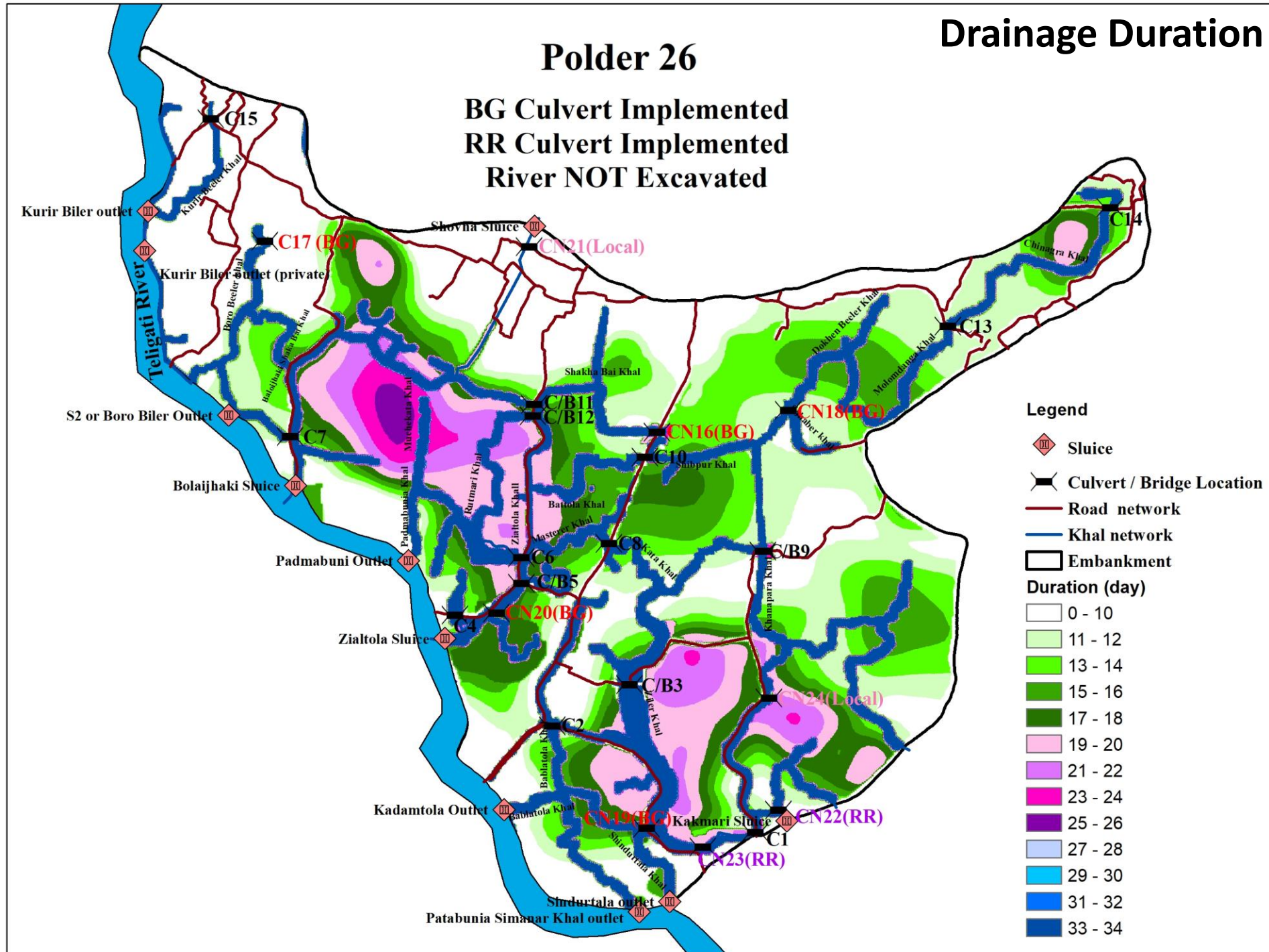
BG Culvert Not Implemented
RR Culvert Implemented
River Excavated



Drainage Duration

Polder 26

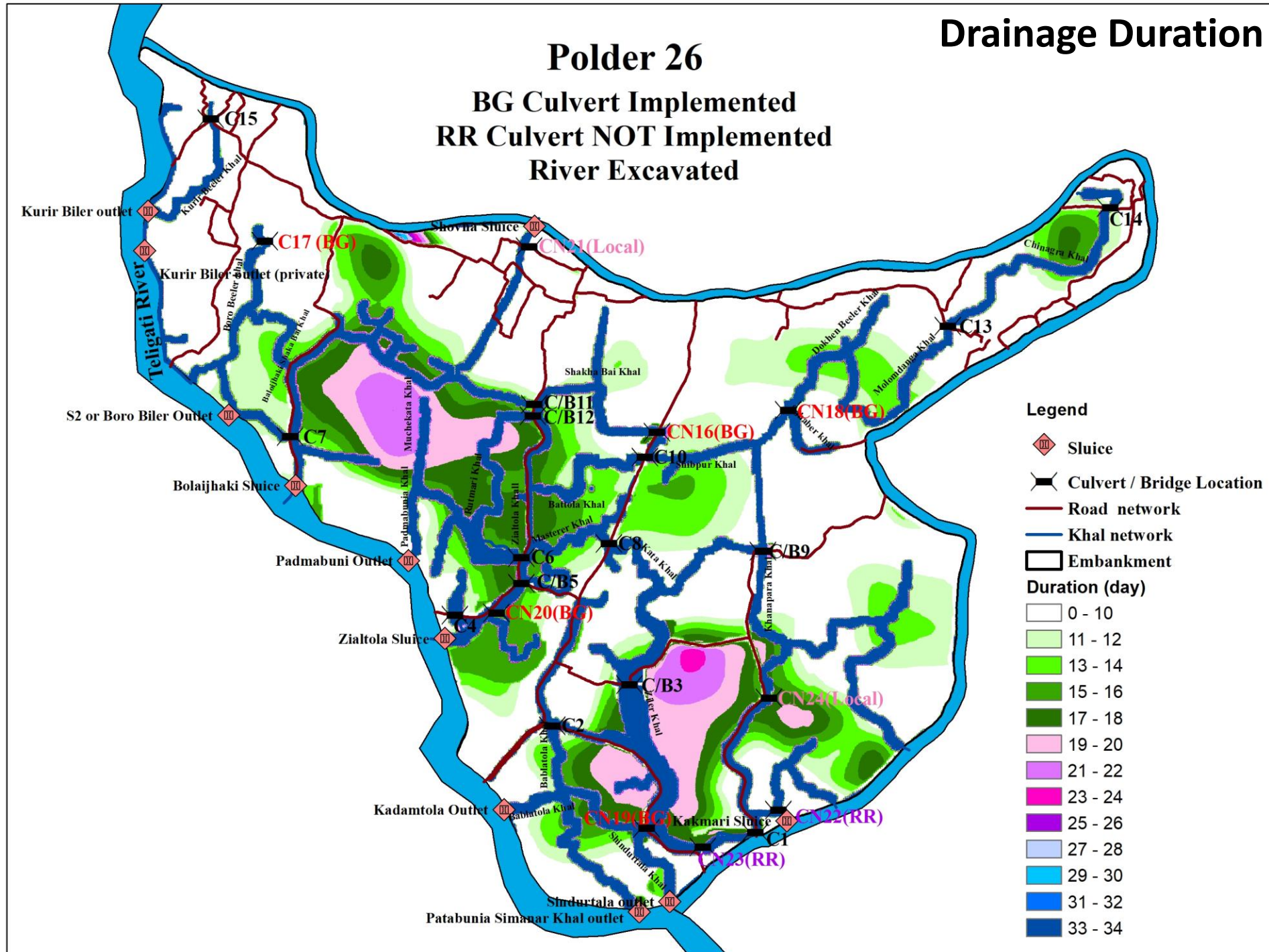
BG Culvert Implemented
RR Culvert Implemented
River NOT Excavated



Drainage Duration

Polder 26

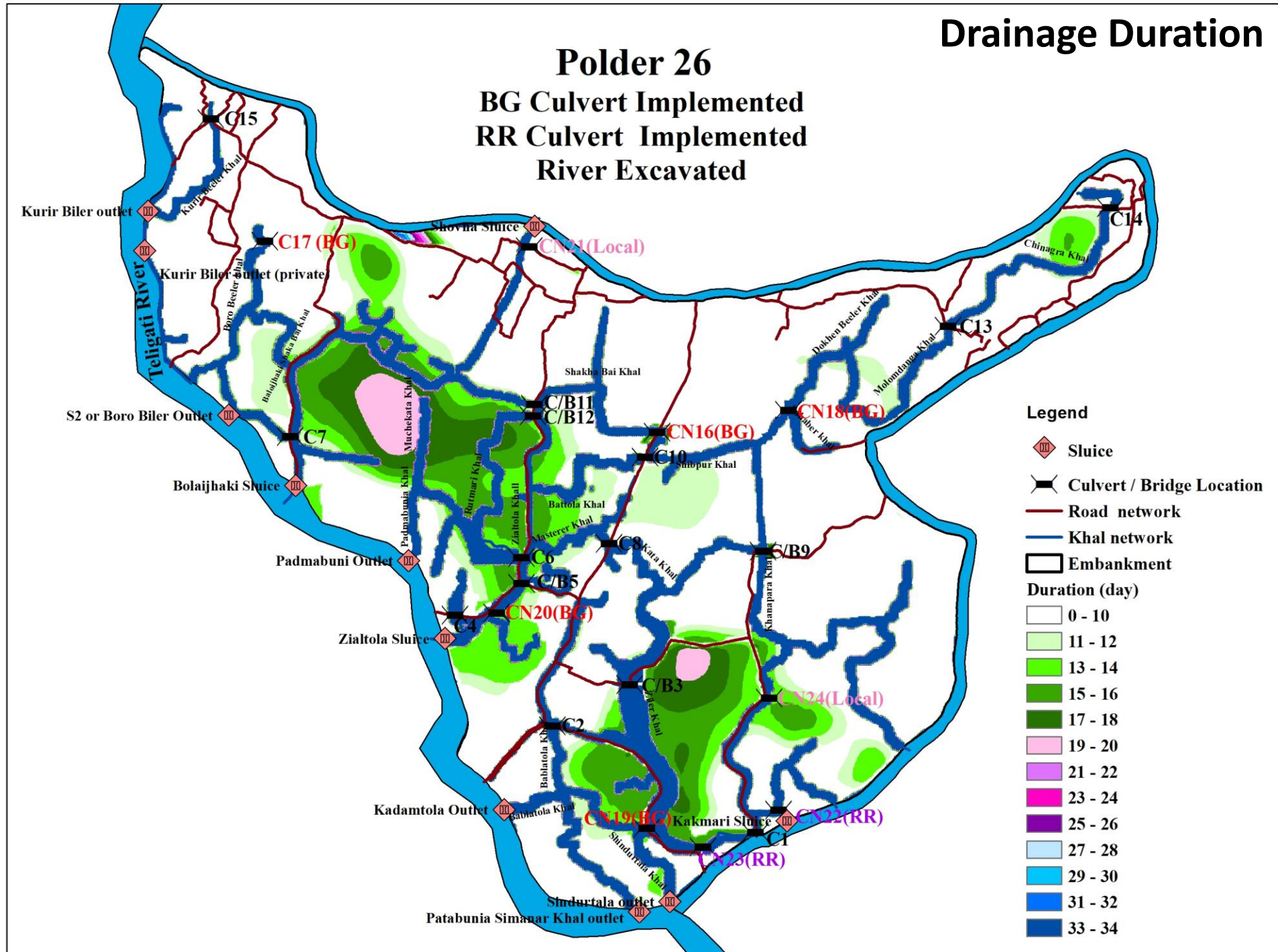
BG Culvert Implemented
RR Culvert NOT Implemented
River Excavated



Drainage Duration

Polder 26

BG Culvert Implemented
RR Culvert Implemented
River Excavated



	Inundated Area (acre)						
	Existing Condition	BG Implemented RR NOT Implemented River NOT excavated	BG NOT Implemented RR Implemented River NOT excavated	BG NOT Implemented RR Implemented River excavated	BG Implemented RR Implemented River NOT excavated	BG Implemented RR NOT Implemented River excavated	BG Implemented RR Implemented River excavated
F0 (0-30cm)	5087	5122	5140	5154	5212	5285	5365
F1 (31-90cm)	1528	1492	1474	1461	1402	1329	1250

Design Dimension of Culverts

Culvert No.	Recommended Design from Model result (Height x Width)	Design by BWDB (Height x Width)	Comment
C16 (BG)	2.5m x 6m		BG Culvert. BWDB design Not Available
C17(BG)	2.5m x 2.5m	2.5m x 3.5m	BG Culvert
C18(BG)	2.5m x 3m	2.5m x 3.5m	BG Culvert
C19(BG)	2.5m x 11m		BWDB design Not Available. 2 culverts with size 2.5m x 5.5m are recommended based on model result
C20(BG)	2.5m x 3.5m	2.5m x 3.5m	BG Culvert
C22(RR)	2.5m x 4.5m		RR Culvert
C23(RR)	2.5m x 3m		RR Culvert