

Ledger Sheet of Vulnerable Points

Creation Date: 5/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region Hyderabad	Upper Pinyar Division Hyderabad	Pinyari Circle Hyderabad
Sr. No.	River Name	River System	Bank
S-089	Indus River	Indus River	Left / Right
Bund Name		R.D.	GPS Coordinates
M.S Bund		3/2	24°94'52.17"N, 68°27'64.5"E
Name of Vulnerable Point	M.S Bund 3/2		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of erosive activity in 2022.		
Flow Condition <sup>1</sup>	Distance between main channel and the bund was approximately 4 Kilometers. Water touches the bund at around 500,000 cusecs.		
Site Condition in the Country Side <sup>2</sup>	Cultivation and Population on both land side and riverside of the bund. With settlers on riverside evacuating during high flood level.		
Layout Plan (Source of Satellite Image: Google Earth)			
Evaluation <sup>3</sup>			
Category	Quality Score		
<b>Proactive Type C</b>	<b>1/9</b>		

<sup>1</sup> Water Flow Direction (Rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase






Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	57.28 feet.	No Plan
	H.F. L	51.30 feet.	No Plan
	Free Board Height	5.98 feet.	No Plan
	Top Width	20.00 feet	No Plan
	River Side Slope	2:1	No Plan
	Country Side Slope	2:1	No Plan
	Longitudinal Length	3/2 Mile	No Plan
	Slope Protection Material	Sweet Earth / Stone Pitching	No Plan
	Covering Material/ Pavement on the Top	Sweet Earth	No Plan
	Embankment Material	Sweet Earth	No Plan
Ancillary Structure (Drainage Ditch, and Spurs)	Bund Sluices	No Plan	
Typical Cross Section			
History of Damages			
<b>MM/YYYY</b>	<b>Type of Damage</b>	<b>Description</b>	
08/2022	Eroded	Bund was eroded due to parallel flow of water during high flood level along the bund.	
Record of Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
10/2022	Temporarily / emergency rehabilitation maintenance & repair work as per site requirement, including temporary earthwork, raising and strengthening + improvement of pitching	N.A	Maintenance & Repair (Provincial Government)
Plan for Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
02/2024	Rehabilitation of M.S Bund	2681 (M)	SFERP Through World Bank

N.A = Data is not provided by Irrigation Department

S.F.E.R.P = Sindh Flood Emergency Rehabilitation Project

Sweet Earth = Silty clay without debris

Site Photo					
Vulnerable Section	General View of River Side				
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side		
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	General View of Top				
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	General View of Land side				
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	Facing Downstream Side	Facing Upstream Side			
					
Close View of Deformation					
No noticeable deformations					
Close View of Damages					
No visible damages					

	<p>Photo with 360° angle</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

General View of Land side

Facing Downstream Side




Facing Upstream Side



Photo with 360° angle



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
05/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>The water channel was located approximately 4 kilometers away from the bund.</li> <li>Stone pitching laid across the riverside slope of bund.</li> <li>No countermeasures in place.</li> <li>Erosive activity was documented in 2022; nevertheless, the site did not exhibit any anomalies as it was remediated through temporary rehabilitation funded by maintenance and repair resources.</li> <li>Site does not seem to be deteriorating and is intact.</li> </ul>  <p>Picture 1: Riverside slope and stone pitching</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund


<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet)
			Flood Plain Length	Pass	Floodplain length is about 10700 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	NO	It hasn't been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type C</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet)
			Flood Plain Length	0	Floodplain length is about 10700 feet.
	<b>Quality Score</b>			<b>1/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 5/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region Hyderabad	Upper Pinyari Division Hyderabad	Pinyari Circle Hyderabad
Sr. No.	River Name	River System	Bank
S-090	Indus River	Indus River	Left / Right
Bund Name		R.D.	GPS Coordinates
M.S Bund		5/7	24°94'09.69"N, 68°23'60.28"E
Name of Vulnerable Point	M.S Bund 5/7		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of erosion and breach in 2010.		
Flow Condition <sup>1</sup>	Distance between Main channel and the bund was approximately 1 Kilometer. Water touches the bund at around 200,000+ cusecs.		
Site Condition in the Country Side <sup>2</sup>	Cultivation and Population on both land side and riverside of the bund, with settlers on riverside evacuating during HFL Banoo city parallel to the bund.		
Layout Plan (Source of Satellite Image: Google Earth)			
			
Evaluation <sup>3</sup>			
Category	Quality Score		
<b>Proactive Type R</b>	<b>2/9</b>		

<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	57.30 feet.	No Plan
	H.F. L	51.30 feet.	No Plan
	Free Board Height	6.00 feet.	No Plan
	Top Width	20.00 feet	No Plan
	River Side Slope	2:1	No Plan
	Country Side Slope	2:1	No Plan
	Longitudinal Length	5/7 Mile	No Plan
	Slope Protection Material	Sweet Earth / Stone Pitching	No Plan
	Covering Material/ Pavement on the Top	Sweet Earth	No Plan
	Embankment Material	Sweet Earth	No Plan
	Ancillary Structure (Drainage Ditch, and Spurs)	Bund Sluices	No Plan
Typical Cross Section			
History of Damages			
<b>MM/YYYY</b>	<b>Type of Damage</b>	<b>Description</b>	
2010	Erosion and breach site	Bund was eroded and also breached due to high flood water flowing parallel to the bund.	
Record of Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
10/2022	Temporarily / emergency rehabilitation maintenance & repair work as per site requirement, including temporary earthwork, raising and strengthening + improvement of pitching	N.A	Maintenance & Repair (Provincial Government)
Plan for Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
02/2024	Rehabilitation of M.S Bund	2681 (M)	SFERP Through World Bank

N.A = Data is not provided by Irrigation Department

Site Photo					
Vulnerable Section	General View of River Side				
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	Close View of Deformation				
	No noticeable deformations				
	Close View of Damages				
	No visible damages				







	<p>Photo with 360° angle</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Land side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
05/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>The water channel was located approximately 4 kilometers away from the bund.</li> <li>Stone pitching laid across the riverside slope of the bund.</li> <li>No current countermeasures in place.</li> <li>Erosive activity was documented in 2022; nevertheless, the site did not exhibit any anomalies as it was remediated through temporary rehabilitation funded by maintenance and repair resources.</li> <li>Site does not seem to be deteriorating and is intact.</li> </ul>  <p>Picture 1: Riverside slope and stone pitching</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet)
			Flood Plain Length	Fail	Floodplain length is about 2800 feet.
		Topographic Feature	Breach Record	YES	It has breached in the past.
			Flow Impact	NO	It hasn't been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type R</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet)
			Flood Plain Length	1	Floodplain length is about 2800 feet.
<b>Quality Score</b>			<b>2/9</b>		

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 5/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region Hyderabad	Upper Pinyar Division Hyderabad	Pinyari Circle Hyderabad
Sr. No.	River Name	River System	Bank
S-091	Indus River	Indus River	Left / Right
Bund Name		R.D.	GPS Coordinates
M.S Bund		18/3	24°84'89.11"N, 68°13'82.36"E
Name of Vulnerable Point	M.S Bund (M.V.P)18/3		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of serious Erosion in 2022 flood.		
Flow Condition <sup>1</sup>	Distance between main channel and the bund was approximately 2 Kilometers. However, currently it is less than that. Water touches the bund at around 250,000 cusecs.		
Site Condition in the Country Side <sup>2</sup>	Cultivation and Population on both land side and riverside of the Bund. Kot Alam town nearly one kilometer away from the bund. Settlers on riverside of the bund evacuate during high flood level.		
Layout Plan (Source of Satellite Image: Google Earth)			
Evaluation <sup>3</sup>			
Category	Quality Score		
<b>Emergent Type R</b>	<b>4/9</b>		




















<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points















<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	54.87 feet	No Plan
	H.F. L	49.30 feet.	No Plan
	Free Board Height	5.57 feet.	No Plan
	Top Width	20.00 feet	No Plan
	River Side Slope	1.5:1	No Plan
	Country Side Slope	1:1	No Plan
	Longitudinal Length	18/3 Mile	No Plan
	Slope Protection Material	Sweet Earth / Stone Pitching	No Plan
	Covering Material/ Pavement on the Top	Sweet Earth	No Plan
	Embankment Material	Sweet Earth	No Plan
Ancillary Structure (Drainage Ditch, and Spurs)	Bund Sluices	No Plan	
Typical Cross Section			
History of Damages			
<b>MM/YYYY</b>	<b>Type of Damage</b>	<b>Description</b>	
08/2022	Eroded	Bund was eroded due to high flood water flowing parallel to the bund	
Record of Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
10/2022	Temporarily / emergency rehabilitation maintenance & repair work as per site requirement, including temporary earthwork, raising and strengthening + improvement of pitching	N.A	Maintenance & Repair (Provincial Government)
Plan for Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
02/2024	Rehabilitation of M.S Bund	2681 (M)	SFERP Through World Bank

N.A = Data is not provided by Irrigation Department

Site Photo					
Vulnerable Section	General View of River Side				
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	Close View of Deformation				
					

	<p>Close View of Damages</p> 			
	<p>360 Degrees Photo</p> 			
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p> <table border="1" data-bbox="448 1144 1355 1525"> <tr> <td data-bbox="448 1144 903 1525"> <p>Facing Downstream Side</p>  </td> <td data-bbox="903 1144 1355 1525"> <p>Facing Upstream Side</p>  </td> </tr> </table>		<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
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General View of Land side

Facing Downstream Side





Facing Upstream Side



Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
05/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>The water channel was located approximately 2 Kilometers away from the bund.</li> <li>Stone Pitching laid across the riverside slope.</li> <li>No current countermeasures in place.</li> <li>Erosion was documented in 2022; however, there appears to be no further progression of erosion, largely attributed to the prompt emergency restoration efforts by the Irrigation Department funded through Maintenance &amp; Repair Fund. These efforts included temporary raising, strengthening, and enhancement of Stone Pitching.</li> <li>There seems to be some damages on topside and land side of the bund caused by heavy rainfall.</li> <li>Bund does not seem to be deteriorating and only has minor damages on topside and land side of the bund.</li> </ul>  <p>Pic 1: Damage left by rainfall</p>  <p>Pic 2: Damage left by rainfall</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		YES	The bund body is currently damaged.
		Bund Dimension	Bund Height	Fail	Free board height is 5.6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet)
			Flood Plain Length	Pass	Floodplain length is about 13300 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Emergent Type R</b>	
	For Evaluation Score	Bund Damage		3	The bund body is currently damaged.
		Bund Dimension	Bund Height	1	Free board height is 5.6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet)
			Flood Plain Length	0	Floodplain length is about 13300 feet.
	<b>Quality Score</b>			<b>4/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-092a	Indus River	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
Surjani Bund		0/0 to 1/5	24°76'75.83"N, 68°06'33.28"E
Name of Vulnerable Point	1st Surjani Bund (M.V.P) 0/0 to 1/5_1		
Reason for the Vulnerability	Site considered vulnerable due to the river's direct impact on the embankment which resulted in damage to the pitching in 2022.		
Flow Condition <sup>1</sup>	Distance between main channel and the bund was approximately 10 meters.		
Site Condition in the Country Side <sup>2</sup>	Seasonal Cultivation and Scattered Population across the land side of the bund.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Proactive Type R</b>	<b>4/9</b>

<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

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2022	Stone Pitching Damaged /Launched	Stone Pitching was damaged due to contact and parallel flow of river during High flood level.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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2022	Temporary work (earthwork, raising and strengthening)	N.A	Maintenance & Repair (Provincial Government Government)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
2024	Stone pitching and stone studs and apron rehabilitation and raising of bund	N.A	National Disaster and Risk Management Fund																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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N.A	Widening of bank to reduce seepage		Government Of Sindh																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										


N.A = Data is not provided by Irrigation Department

Site Photo	
Vulnerable Section	General View of River Side
	Facing Downstream Side
	
	Facing Upstream Side
	
	General View of Top
	Facing Downstream Side
	
	Facing Upstream Side
	
	General View of Land side
	Facing Downstream Side
	
Facing Upstream Side	
	
Close View of Deformation	
No noticeable deformations while, the site is under construction	
Close View of Damages	
No visible damages while, the site is under construction	

	<p>Photo with 360° angles</p> 	
<p>Typical Section (adjacent to the vulnerable point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Land side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
03/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>The water channel was located 10 meters away from toe of the bund.</li> <li>Stone Pitching and Stone Apron laid across the riverside slope of the bund.</li> <li>3 Spurs and 2 Studs as countermeasures along the riverside slope of the bund.</li> <li>The degradation of the stone pitching was observed during the flood of 2022. Nevertheless, restoration efforts are currently in progress at this location, rendering additional rehabilitation unnecessary.</li> <li>No anomalies are apparent on the premises. However, the local personnel assert that seepage is a customary event, prompting them to submit a proposal for the widening of the bund.</li> <li>No Deterioration of the bund is imminent.</li> </ul> 	c

Pic 1: Topside of bund and rehabilitative work

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 3.5 feet.
			Bund Width	Fail	The HGL is exposed above the ground.
			Flood Plain Length	Fail	Floodplain length is about 500 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type R</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 6.0 feet.
			Bund Width	2	The HGL is exposed above the ground.
			Flood Plain Length	1	Floodplain length is about 500 feet.
	<b>Quality Score</b>			<b>4/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-092b	Indus River	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
Surjani Bund		0/0 to 1/5	24°77'30.06"N, 68°06'62.61"E
Name of Vulnerable Point	1st Surjani Bund (M.V.P) 0/0 to 1/5_2		
Reason for the Vulnerability	Site considered vulnerable due to the river's direct impact on the embankment which resulted in damage to the pitching in 2022.		
Flow Condition <sup>1</sup>	Distance between main channel and the bund was approximately 1900 feet. However, currently it is less than that. Water touches the bund at around 150,000 cusecs		
Site Condition in the Country Side <sup>2</sup>	Seasonal Cultivation and Scattered Population across the land side of the bund. Ghulam Muhammad Surjo Village adjacent to site.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Proactive Type R</b>	<b>4/9</b>



















<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund																																																																																																																																			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>																																																																																																																																
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	Free Board Height	6.00 .	No Plan																																																																																																																																
	Top Width	30.00 .	No Plan																																																																																																																																
	River Side Slope	2:1	No Plan																																																																																																																																
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	Longitudinal Length	4 Miles 6 Furlongs	No Plan																																																																																																																																
	Slope Protection Material	Stone Pitching and Stone Apron	No Plan																																																																																																																																
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	Ancillary Structure (Drainage Ditch, and Spurs)	3 Spurs 2 studs	No Plan																																																																																																																																
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Vulnerable Section	General View of River Side				
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Close View of Deformation					
No noticeable deformations, while the site is under construction					
Close View of Damages					
No visible damages, while the site is under construction					

	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
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	<p>General View of Land side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
03/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>The water channel was located 10 meters away from toe of the bund.</li> <li>Stone Pitching and Stone Apron laid across the riverside slope of the bund.</li> <li>3 Spurs and 2 Studs as countermeasures along the riverside slope of the bund.</li> <li>Erosion was documented in 2022 on the Stone Pitching and Stone Apron. Nevertheless, the site has been successfully rehabilitated and is currently undergoing additional construction.</li> <li>No anomalies are apparent on the premises. However, the local personnel assert that seepage is a customary event, prompting them to submit a proposal for the widening of the bund.</li> <li>No Deterioration of the bund is imminent.</li> </ul>  <p>Picture 1: Riverside slope pitching and plantation over slope</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 3.5 feet.
			Bund Width	Fail	The HGL is exposed above the ground.
			Flood Plain Length	Fail	Floodplain length is about 2000 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type R</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 3.5 feet.
			Bund Width	2	The HGL is exposed above the ground.
			Flood Plain Length	1	Floodplain length is about 2000 feet.
	<b>Quality Score</b>			<b>4/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-093a	Indus River	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
Surjani Bund		0/0 to 1/5	24°76'54.14"N, 68°06'20.42"E
Name of Vulnerable Point	2 <sup>nd</sup> Surjani Bund 0/0 to 1/5_1		
Reason for the Vulnerability	Site considered vulnerable due to River directly hitting the bund and damaging of Pitching in 2022		
Flow Condition <sup>1</sup>	Distance between Main channel and the bund was approximately 50 meters.		
Site Condition in the Country Side <sup>2</sup>	Seasonal Cultivation and Scattered Population across the land side of the bund.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Proactive Type R</b>	<b>4/9</b>

<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund																														
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>																											
	Top Elevation	52.30 feet.	52.30 feet.																											
	H.F. L	46.30 feet.	No Plan																											
	Free Board Height	6.00 feet.	No Plan																											
	Top Width	30.00 feet.	No Plan																											
	River Side Slope	2:1	No Plan																											
	Country Side Slope	2:1	No Plan																											
	Longitudinal Length	4 Miles 6 Furlongs	No Plan																											
	Slope Protection Material	Stone Pitching and Stone Apron	No Plan																											
	Covering Material/ Pavement on the Top	Earth	No Plan																											
	Embankment Material	Earth	No Plan																											
Ancillary Structure (Drainage Ditch, and Spurs)	3 Spurs 2 studs	No Plan																												
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	<p>Photo with 360° angles</p> 	
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Picture 1: Topside of bund and rehabilitative work

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

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			Bund Width	Fail	The HGL is exposed above the ground.
			Flood Plain Length	Fail	Floodplain length is about 500 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type R</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 6.0 feet.
			Bund Width	2	The HGL is exposed above the ground.
			Flood Plain Length	1	Floodplain length is about 500 feet.
	<b>Quality Score</b>			<b>4/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
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Sr. No.	River Name	River System	Bank
S-093b	Indus River	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
Surjani Bund		0/0 to 1/5	24°74'74.11"N, 68°04'82.11"E
Name of Vulnerable Point	2nd Surjani Bund 0/0 to 1/5_2		
Reason for the Vulnerability	Site considered vulnerable due to River directly hitting the bund and damaging of Pitching in 2022.		
Flow Condition <sup>1</sup>	Distance between main channel and the bund was approximately one kilometer.		
Site Condition in the Country Side <sup>2</sup>	Seasonal Cultivation and Scattered Population across the land side of the bund.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Emergent Type R</b>	<b>7/9</b>

<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

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	River Side Slope	2:1	No Plan																											
	Country Side Slope	2:1	No Plan																											
	Longitudinal Length	4 Miles 6 Furlongs	No Plan																											
	Slope Protection Material	Stone Pitching and Stone Apron	No Plan																											
	Covering Material/ Pavement on the Top	Earth	No Plan																											
	Embankment Material	Earth	No Plan																											
	Ancillary Structure (Drainage Ditch, and Spurs)	3 Spurs 2 studs	No Plan																											
Typical Cross Section																														
	<table border="1"> <thead> <tr> <th>DESIGN</th> <th>REDUCED LEVEL</th> <th>31.06</th> <th>32.30</th> <th>32.30</th> <th>32.30</th> <th>31.06</th> </tr> </thead> <tbody> <tr> <td>DISTANCE</td> <td>35.00</td> <td>11.00</td> <td>11.00</td> <td>11.00</td> <td>11.00</td> <td>35.00</td> </tr> <tr> <th>EXISTING</th> <th>REDUCED LEVEL</th> <td>31.58</td> <td>31.48</td> <td>31.48</td> <td>31.48</td> <td>31.58</td> </tr> <tr> <td>DISTANCE</td> <td>29.00</td> <td>29.00</td> <td>29.00</td> <td>29.00</td> <td>29.00</td> <td>31.77</td> </tr> </tbody> </table>			DESIGN	REDUCED LEVEL	31.06	32.30	32.30	32.30	31.06	DISTANCE	35.00	11.00	11.00	11.00	11.00	35.00	EXISTING	REDUCED LEVEL	31.58	31.48	31.48	31.48	31.58	DISTANCE	29.00	29.00	29.00	29.00	29.00
DESIGN	REDUCED LEVEL	31.06	32.30	32.30	32.30	31.06																								
DISTANCE	35.00	11.00	11.00	11.00	11.00	35.00																								
EXISTING	REDUCED LEVEL	31.58	31.48	31.48	31.48	31.58																								
DISTANCE	29.00	29.00	29.00	29.00	29.00	31.77																								
History of Damages																														
MM/YYYY	Type of Damage	Description																												
2022	Stone Pitching Damaged /Launched	Stone Pitching was damaged due to contact and parallel flow of river during High flood level.																												
Record of Rehabilitation/ Improvement																														
MM/YYYY	Description/Project Name	Cost	Fund Source																											
2022	Temporary work including earthwork, raising, and strengthening	N.A	Maintenance & Repair (Provincial Government Government)																											
2024	Stone pitching and stone studs and apron rehabilitation and raising of bund	N.A	National Disaster and Risk Management Fund																											
Plan for Rehabilitation/ Improvement																														
MM/YYYY	Description/Project Name	Cost	Fund Source																											
N.A	Widening of bank to reduce seepage		Government of Sindh																											

N.A = Data is not provided by Irrigation Department

Site Photo				
Vulnerable Section	General View of River Side			
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side	
Facing Downstream Side	Facing Upstream Side			
				
	General View of Top			
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side	
Facing Downstream Side	Facing Upstream Side			
				
	General View of Land side			
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side	
Facing Downstream Side	Facing Upstream Side			
				
	Close View of Deformation			
				

	<p>Close View of Damages</p> 	
	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

General View of Land side

Facing Downstream Side





Facing Upstream Side



Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
03/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>The water channel was located approximately one kilometer away from the bund.</li> <li>Stone Pitching and Stone Apron laid across the riverside slope of bund.</li> <li>The site lacks a recorded history of erosive activity. Nevertheless, the local staff reported instances of seepage damage, with signs of deformation on the land side bund attributable to the impact of rainfall and seepage. Additionally, there are noticeable gaps in the Stone Pitching along the riverside slope of the bund.</li> <li>Site does not seem to be deteriorating, however, negligence may lead to it being deteriorated.</li> </ul>  <p>Picture 1: Landward side of bund and damages left by rainfall and seepage</p>  <p>Picture 2: Missing patch of stone pitching across the riverside slope of bund</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		YES	Seepage was observed.
		Bund Dimension	Bund Height	Fail	Free board height is 3.5 feet.
			Bund Width	Fail	The HGL is exposed above the ground.
			Flood Plain Length	Fail	Floodplain length is about 2900 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Emergent Type R</b>	
	For Evaluation Score	Bund Damage		3	Seepage was observed.
		Bund Dimension	Bund Height	1	Free board height is 6.0 feet.
			Bund Width	2	The HGL is exposed above the ground.
			Flood Plain Length	1	Floodplain length is about 2900 feet.
	<b>Quality Score</b>			<b>7/9</b>	

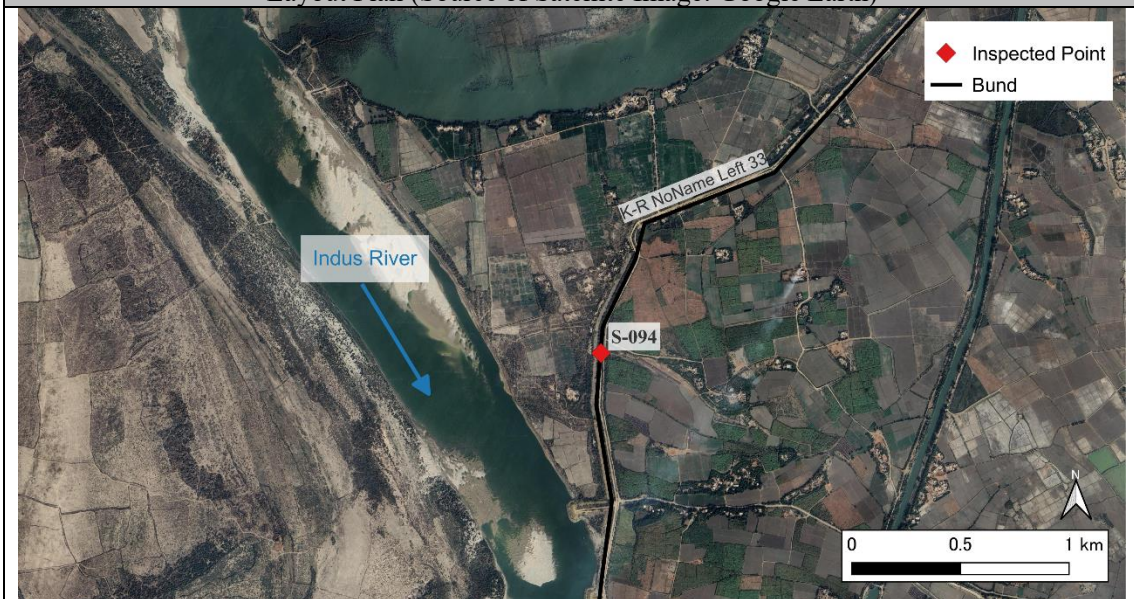
Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-094	Indus River	Indus River	Left / Right
Bund Name		R.D.	GPS Coordinates
M.S Bund		42/5	24°57'77.81"N, 68°02'94.67"E
Name of Vulnerable Point	M.S Bund 42/5		
Reason for the Vulnerability	The site is considered vulnerable due to erosion as a result of the direct impact of river flow.		
Flow Condition <sup>1</sup>	Distance between main channel and the bund was approximately 500 meters.		
Site Condition in the Country Side <sup>2</sup>	Cultivation and Population on land side of bund. Plantation on riverside of the bund.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Emergent Type R</b>	<b>5/9</b>


<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	41.40 feet.	No Plan
	H.F. L	35.40 feet	No Plan
	Free Board Height	6.00 feet	No Plan
	Top Width	20.00 feet.	No Plan
	River Side Slope	2:1	No Plan
	Country Side Slope	1:1.5	No Plan
	Longitudinal Length	29.25 Miles	No Plan
	Slope Protection Material	Stone Pitching and Stone Apron	No Plan
	Covering Material/ Pavement on the Top	Earth	No Plan
	Embankment Material	Earth	No Plan
Ancillary Structure (Drainage Ditch, and Spurs)	4 Spurs	No Plan	
Typical Cross Section			
History of Damages			
<b>MM/YYYY</b>	<b>Type of Damage</b>	<b>Description</b>	
2015	Wave Washing and Seepage	Stone pitching of the riverside slope was damaged due to occurrence of wave washing in 2015 and site was also subjected to seepage	
Record of Rehabilitation / Improvement			
<b>MM/YYYY</b>	<b>Description / Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A
Plan for Rehabilitation / Improvement			
<b>MM/YYYY</b>	<b>Description / Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A

N.A = Data is not provided by Irrigation Department

Site Photo	
Vulnerable Section	General View of River Side
	Facing Downstream Side
	
	Facing Upstream Side
	
	General View of Top
	Facing Downstream Side
	
	Facing Upstream Side
	
	General View of Land side
	Facing Downstream Side
	
Facing Upstream Side	
	
Close View of Deformation	
No noticeable deformations	
Close View of Damages	
No visible damages	









	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Land side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
03/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>• The water channel was located approximately 500 meters from the bund.</li> <li>• Stone Pitching and Stone Apron laid across the riverside slope of the bund.</li> <li>• Spurs as countermeasures.</li> <li>• Plantation over the riverside slope has affected the visibility of stone pitching.</li> <li>• No development of erosion on site. However, seepage was reported by local staff. And shortening of height of the bund which has left free board around 3 feet.</li> <li>• No deterioration of bund.</li> </ul>  <p>Picture 1: General view of bund</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		YES	The bund body is currently damaged.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	Fail	Floodplain length is about 1700 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Emergent Type R</b>	
	For Evaluation Score	Bund Damage		3	The bund body is currently damaged.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	1	Floodplain length is about 1700 feet.
	<b>Quality Score</b>			<b>5/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-095	Indus River	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
M.S Bund		43/5	24°56'50.11"N, 68°02'89.61"E
Name of Vulnerable Point	M.S Bund (M.V.P) 43/5		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of wave washing and minor seepage damages in 2015.		
Flow Condition <sup>1</sup>	Main water channel was located at toe of the bund. Water stays at toe of the bund throughout the year.		
Site Condition in the Country Side <sup>2</sup>	Cultivation and Population on land side of the bund. Laghari Village adjacent to site.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Emergent Type R</b>	<b>5/9</b>

<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	41.40 feet.	No Plan
	H.F. L	35.40 feet	No Plan
	Free Board Height	6.00 feet	No Plan
	Top Width	20.00 feet.	No Plan
	River Side Slope	2:1	No Plan
	Country Side Slope	1:1.5	No Plan
	Longitudinal Length	29.25 Miles	No Plan
	Slope Protection Material	Stone Pitching and Stone Apron	No Plan
	Covering Material/ Pavement on the Top	Earth	No Plan
	Embankment Material	Earth	No Plan
Ancillary Structure (Drainage Ditch, and Spurs)	4 Spurs	No Plan	
Typical Cross Section			
History of Damages			
<b>MM/YYYY</b>	<b>Type of Damage</b>	<b>Description</b>	
2015	Wave Washing and Seepage damages	Site was subjected to wave washing which led to damaging of the riverside slope and seepage damages.	
Record of Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A
Plan for Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A

N.A = Data is not provided by Irrigation Department

Site Photo					
Vulnerable Section	General View of River Side				
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side		
Facing Downstream Side	Facing Upstream Side				
					
	General View of Top				
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side		
Facing Downstream Side	Facing Upstream Side				
					
	General View of Land side				
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side		
Facing Downstream Side	Facing Upstream Side				
					
	Close View of Deformation				
	No noticeable deformations				
	Close View of Damages				
	No visible damages				









	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Land side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
03/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>The water channel was located at toe of the bund.</li> <li>Stone Pitching and Stone Apron laid across the riverside slope of the bund.</li> <li>Stone stud constructed as countermeasure.</li> <li>There is no evidence of erosion at the site.</li> <li>According to the Irrigation department's assertions, the free board during the high flood level (HFL) currently stands below 6 feet. This is due to the damages incurred and the common incidence of seepage. As a result, there is a need for the widening and elevation of the embankment.</li> <li>Site is not deteriorating and seems to have been recently rehabilitated.</li> </ul>  <p>Picture 1: Riverside slope and pitching + apron</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		YES	The bund body is currently damaged.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	Fail	Floodplain length is about 200 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Emergent Type R</b>	
	For Evaluation Score	Bund Damage		3	The bund body is currently damaged.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	1	Floodplain length is about 200 feet.
	<b>Quality Score</b>			<b>5/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-096	Indus River	Indus River	Left / Right
Bund Name		R.D.	GPS Coordinates
M.S Bund		44/3	24°55'36.53"N, 68°02'31.69"E
Name of Vulnerable Point	M.S Bund 44/3		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of erosion caused by direct hit of river flow.		
Flow Condition <sup>1</sup>	Main channel was located at toe of the bund, and stays there throughout the year.		
Site Condition in the Country Side <sup>2</sup>	Cultivation and Population on land side of the bund. Plantation over the riverside slope.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Emergent Type R</b>	<b>5/9</b>

<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	41.40 feet.	No Plan
	H.F. L	35.40 feet	No Plan
	Free Board Height	6.00 feet	No Plan
	Top Width	20.00 feet	No Plan
	River Side Slope	2:1	No Plan
	Country Side Slope	1:1.5	No Plan
	Longitudinal Length	29.25 Miles	No Plan
	Slope Protection Material	Stone Pitching and Stone Apron	No Plan
	Covering Material/ Pavement on the Top	Earth	No Plan
	Embankment Material	Earth	No Plan
Ancillary Structure (Drainage Ditch, and Spurs)	4 Spurs	No Plan	
Typical Cross Section			
History of Damages			
<b>MM/YYYY</b>	<b>Type of Damage</b>	<b>Description</b>	
2015	Wave Washing and Seepage	Stone pitching of the riverside slope was damaged due to occurrence of wave washing in 2015 and site was also subjected to seepage	
Record of Rehabilitation / Improvement			
<b>MM/YYYY</b>	<b>Description / Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A
Plan for Rehabilitation / Improvement			
<b>MM/YYYY</b>	<b>Description / Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A

N.A = Data is not provided by Irrigation Department







Site Photo	
Vulnerable Section	General View of River Side
	Facing Downstream Side
	
	Facing Upstream Side
	
	General View of Top
	Facing Downstream Side
	
	Facing Upstream Side
	
	General View of Land side
	Facing Downstream Side
	
Facing Upstream Side	
	
Close View of Deformation	
No noticeable deformations	
Close View of Damages	



Photo with 360° angles



Typical Section  
(Adjacent to the Vulnerable Point)

General View of River Side

Facing Downstream Side



Facing Upstream Side



General View of Top

Facing Downstream Side



Facing Upstream Side



General View of Landside

Facing Downstream Side




Facing Upstream Side



Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
03/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>• The water channel was located at toe of the bund.</li> <li>• Stone Pitching and Stone Apron laid across the riverside slope of the bund.</li> <li>• No current countermeasures near this site.</li> <li>• Erosion was first documented in 2010 and its progression has been linked to Stone pitching and Apron. However, poor visibility is attributed to the accumulation of silt in the area.</li> <li>• Site has greatly reduced in height.</li> <li>• If Site is not rehabilitated it may lead to over topping in a future flood.</li> </ul>  <p>Picture 1: Pitching damage and silt accumulation</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund


<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		YES	The bund body is currently damaged.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	Fail	Floodplain length is about 400 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Emergent Type R</b>	
	For Evaluation Score	Bund Damage		3	The bund body is currently damaged.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	1	Floodplain length is about 400 feet.
	<b>Quality Score</b>			<b>5/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-097	Indus River	Indus River	Left / Right
Bund Name		R.D.	GPS Coordinates
M.S Bund		44/0	24°55'83.33"N, 68°02'74.36"E
Name of Vulnerable Point	M.S Bund (M.V.P) 44/0+200		
Reason for the Vulnerability	Site is considered vulnerable due to occurrence of over topping in 2015 and wave washing against the riverside slope.		
Flow Condition <sup>1</sup>	Main Water Channel was located at toe of the bund. Water stays at toe of the bund throughout the year.		
Site Condition in the Country Side <sup>2</sup>	Cultivation and Population on land side of the bund. Munarki Bungalow at land side of the bund.		
Layout Plan (Source of Satellite Image: Google Earth)			
			
Evaluation <sup>3</sup>			
Category	Quality Score		
<b>Emergent Type R</b>	<b>5/9</b>		

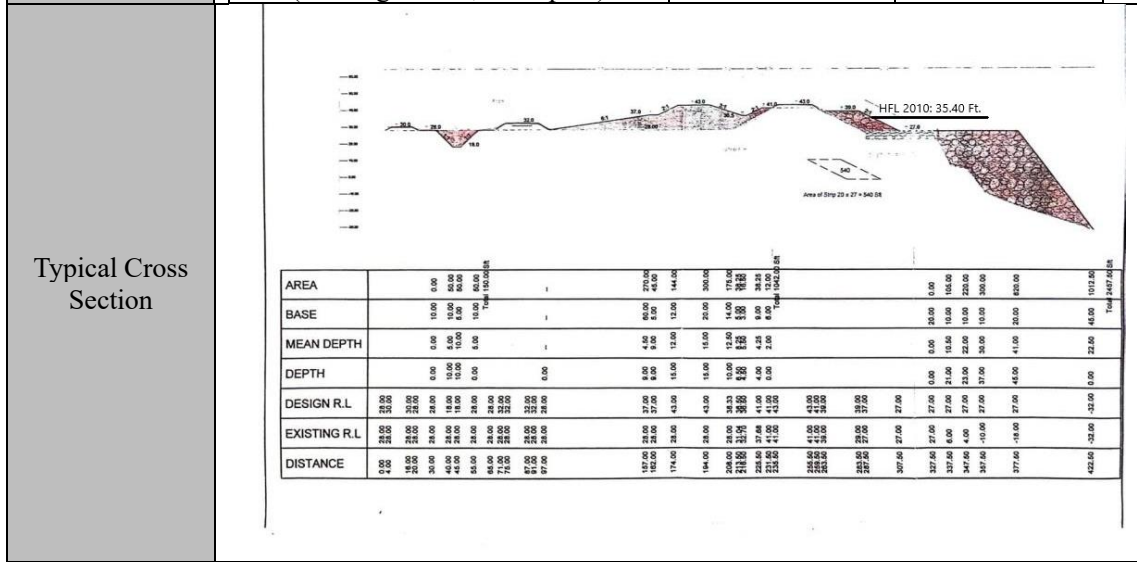
<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

















<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

**Basic Information of the Bund**

Basic Dimensions and Materials	Item	Existing	Proposed
	Top Elevation	41.40 feet	No Plan
	H.F. L	35.40 feet	No Plan
	Free Board Height	6.00 feet	No Plan
	Top Width	20.00 feet	No Plan
	River Side Slope	2:1	No Plan
	Country Side Slope	1:1.5	No Plan
	Longitudinal Length	29 Miles 2 Furlongs	No Plan
	Slope Protection Material	Stone Pitching and Stone Apron	No Plan
	Covering Material/ Pavement on the Top	Earth	No Plan
	Embankment Material	Earth	No Plan
	Ancillary Structure (Drainage Ditch, and Spurs)	4 Spurs	No Plan



Site Photo				
Vulnerable Section	General View of River Side			
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side	
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	General View of Top			
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Facing Downstream Side	Facing Upstream Side			
				
	<p>Close View of Deformation</p> <p>No noticeable deformations</p>			
	<p>Close View of Damages</p> 			









	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Land side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
03/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>The water channel was located at toe of bund but not observable due to silt accumulation and plantation.</li> <li>Stone Pitching and Stone apron laid across the riverside slope of the bund.</li> <li>The elevation of the site has diminished primarily as a result of frequent passage by both local individuals and wildlife, leading to a free board of under 6 feet, as documented by the Irrigation Department.</li> <li>The accumulation of silt and vegetation along the riverside slope of the embankment has led to decreased visibility of the Stone Apron.</li> <li>No degradation of the embankment has been observed. Nevertheless, it may be necessary to implement proactive measures such as enhancing the pitching, raising the elevation, and reinforcing the structure to mitigate any potential risks of harm.</li> </ul>  <p>Picture 1: Riverside slope and slight damage of pitching and silt accumulation</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		YES	The bund body is currently damaged.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	Fail	Floodplain length is about 200 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Emergent Type R</b>	
	For Evaluation Score	Bund Damage		3	The bund body is currently damaged.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	1	Floodplain length is about 200 feet.
	<b>Quality Score</b>			<b>5/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 5/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-098a	Indus River	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
Gungri chord Bund		0/0 to 0/7	24°41'67.58"N, 67°93'69.47"E
Name of Vulnerable Point	Gungri chord Bund 0/0 to 0/7_1		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of wave washing and over topping in 2010 super flood.		
Flow Condition <sup>1</sup>	Distance between Main channel and bund was approximately 2 kilometers. Water touches bund at around 375,000+ Cusecs.		
Site Condition in the Country Side <sup>2</sup>	Cultivation and Population on both land side and riverside of bund. Cultivable lands and Population being submerged during High Flood Level.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Proactive Type C</b>	<b>3/9</b>

















<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points






<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase


Basic Information of the Bund																								
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>																					
	Top Elevation	25.00 feet	No Plan																					
	H.F. L	19.00 feet	No Plan																					
	Free Board Height	6.00 feet	No Plan																					
	Top Width	30.00 feet	No Plan																					
	River Side Slope	2:1	No Plan																					
	Country Side Slope	2:1	No Plan																					
	Longitudinal Length	0.8 Miles	No Plan																					
	Slope Protection Material	Earth	No Plan																					
	Covering Material/ Pavement on the Top	Earth	No Plan																					
	Embankment Material	Earth	No Plan																					
	Ancillary Structure (Drainage Ditch, and Spurs)	None	No Plan																					
Typical Cross Section	<p style="text-align: center;">X-SECTION OF KUKA WARI RETARDING BUND MILE 3/6 (EXTENSION PORTION)</p>																							
	<p style="text-align: center;">History of Damages</p> <table border="1"> <thead> <tr> <th>MM/YYYY</th> <th>Type of Damage</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>2010</td> <td>Wave washing and Over topping</td> <td>Erosive activity along the riverside slopes and over topping has been recorded in 2010</td> </tr> </tbody> </table> <p style="text-align: center;">Record of Rehabilitation/ Improvement</p> <table border="1"> <thead> <tr> <th>MM/YYYY</th> <th>Description/Project Name</th> <th>Cost</th> <th>Fund Source</th> </tr> </thead> <tbody> <tr> <td>N.A</td> <td>Temporary rehabilitation/emergency work, including raising and strengthening, + earthwork</td> <td>N.A</td> <td>Maintenance and Repair (Provincial Government)</td> </tr> </tbody> </table> <p style="text-align: center;">Plan for Rehabilitation/ Improvement</p> <table border="1"> <thead> <tr> <th>MM/YYYY</th> <th>Description/Project Name</th> <th>Cost</th> <th>Fund Source</th> </tr> </thead> <tbody> <tr> <td>N.A</td> <td>N.A</td> <td>N.A</td> <td>N.A</td> </tr> </tbody> </table>			MM/YYYY	Type of Damage	Description	2010	Wave washing and Over topping	Erosive activity along the riverside slopes and over topping has been recorded in 2010	MM/YYYY	Description/Project Name	Cost	Fund Source	N.A	Temporary rehabilitation/emergency work, including raising and strengthening, + earthwork	N.A	Maintenance and Repair (Provincial Government)	MM/YYYY	Description/Project Name	Cost	Fund Source	N.A	N.A	N.A
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N.A	N.A	N.A	N.A																					

N.A = Data is not provided by Irrigation Department

Site Photo				
Vulnerable Section	General View of River Side			
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side	
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	General View of Top			
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Facing Downstream Side	Facing Upstream Side			
				
Close View of Deformation				
No noticeable deformations				
Close View of Damages				
				

	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Land side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

	<p>Photo with 360° angles</p> 
<p>Upstream End of the Bund</p>	<p>General View (In the case that the VP is located near the end )</p> 
	<p>Photo with 360° angles</p> 

Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
05/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>• The water channel was located approximately 2 Kilometers away from the bund.</li> <li>• No pitching across the riverside slope of the bund.</li> <li>• No current countermeasures at site.</li> <li>• No visible erosion is present on the site; however, damages resulting from wave impact against the bund have been reported and observed. The local staff claims that the soil quality is subpar, which may contribute to the observed issues.</li> <li>• No distortion or decay of the embankment, but such issues may arise if proper maintenance is not carried out.</li> </ul>  <p>Picture 1: Damages on riverside slope of bund</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Fail	The HGL isn't exposed above the ground, but the soil cover thickness over HGL is less than the guideline value ( 2 feet > Soil Depth $\geq$ 4 feet ).
			Flood Plain Length	Fail	Floodplain length is about 4900 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	NO	It hasn't been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type C</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	1	The HGL isn't exposed above the ground, but the soil cover thickness over HGL is less than the guideline value ( 2 feet > Soil Depth $\geq$ 4 feet ).
			Flood Plain Length	1	Floodplain length is about 4900 feet.
	<b>Quality Score</b>			<b>3/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 5/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-098b	Indus River	Indus River	Left / Right
Bund Name		R.D.	GPS Coordinates
Gungri chord Bund		0/0 to 0/7	24°41'22.5"N, 67°92'01.17"E
Name of Vulnerable Point	Gungri chord Bund 0/0 to 0/7_2		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of wave washing and over topping in 2010 super flood.		
Flow Condition <sup>1</sup>	Distance between main channel and bund was approximately 2 Kilometers. Water touches the bund at around 375,000+ Cusecs.		
Site Condition in the Country Side <sup>2</sup>	Agricultural activities and residential areas are present on both the landward and riverside of the bund, with cultivable lands and settlements becoming submerged during high flood levels.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation <sup>3</sup>	
Category	Quality Score
<b>Proactive Type C</b>	<b>2/9</b>

<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points





<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)




<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase


Basic Information of the Bund																								
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>																					
	Top Elevation	25.00 feet	No Plan																					
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	Slope Protection Material	Stone Pitching	No Plan																					
	Covering Material/ Pavement on the Top	Earth	No Plan																					
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	Ancillary Structure (Drainage Ditch, and Spurs)	Bund	No Plan																					
Typical Cross Section	<p style="text-align: center;">X-SECTION OF KUKA WARI RETARDING BUND MILE 3/6 (EXTENSION PORTION)</p>																							
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N.A = Data is not provided by Irrigation Department

Site Photo					
Vulnerable Section	General View of River Side				
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	General View of Top				
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	General View of Land side				
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Facing Downstream Side	Facing Upstream Side				
					
	Close View of Deformation				
	No noticeable deformations				
	Close View of Damages				
	No visible damages				

	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Land side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

	<p>Photo with 360° angles</p> 
<p>Upstream End of the Bund</p>	<p>General View (In the case that the VP is located near the end)</p> 
	<p>Photo with 360° angles</p> 

Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
05/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>• The water channel was located approximately 2 Kilometers away from the bund.</li> <li>• Stone Pitching laid across the riverside slope of the bund.</li> <li>• No current countermeasures at site.</li> <li>• No erosion or other abnormalities reported or observed on site.</li> <li>• No deformation or deterioration of bund observable.</li> <li>• Site does not require rehabilitation.</li> </ul>  <p>Picture 1: Riverside slope and stone pitching</p>	c

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Fail	The HGL isn't exposed above the ground, but the soil cover thickness over HGL is less than the guideline value ( 2 feet > Soil Depth $\geq$ 4 feet ).
			Flood Plain Length	Pass	Floodplain length is about 8300 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	NO	It hasn't been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type C</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	1	The HGL isn't exposed above the ground, but the soil cover thickness over HGL is less than the guideline value ( 2 feet > Soil Depth $\geq$ 4 feet ).
			Flood Plain Length	0	Floodplain length is about 8300 feet.
	<b>Quality Score</b>			<b>2/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 5/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-099a	Indus River	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
Kuka Link Bund		6/0 to 7/0	24°39'71.36"N, 67°89'03.06"E
Name of Vulnerable Point	Kuka Link Bund 6/0 to 7/0_1		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of wave washing during HFL of 2022 and site being close to the sea.		
Flow Condition <sup>1</sup>	Distance between Main channel and the bund was approximately 4 kilometers. Water touches the bund at around 350,000+ cu secs.		
Site Condition in the Country Side <sup>2</sup>	Agricultural activities and residential areas are located on both sides of the bund, with cultivable lands and populated areas becoming submerged during high flood levels.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation <sup>3</sup>	
Category	Quality Score
<b>Emergent Type C</b>	<b>4/9</b>

<sup>1</sup> Water Flow Direction (Rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup>

Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	26.75 feet	No Plan Provided
	H.F. L	20.75 feet	No Plan
	Free Board Height	6.00 feet	No Plan
	Top Width	20.00 feet	No Plan Provided
	River Side Slope	2:1	No Plan Provided
	Country Side Slope	2:1	No Plan Provided
	Longitudinal Length	1 Mile	No Plan Provided
	Slope Protection Material	Earth + Stone Pitching	No Plan Provided
	Covering Material/ Pavement on the Top	Earth	No Plan Provided
	Embankment Material	Earth	No Plan Provided
	Ancillary Structure (Drainage Ditch, and Spurs)	Bund	No Plan Provided
Typical Cross Section			
History of Damages			
MM/YYYY	Type of Damage	Description	
08/2022	Wave washing	Occurrence of wave washing during High Flood Level has led to damages towards the stone pitching.	
Record of Rehabilitation/ Improvement			
MM/YYYY	Description/Project Name	Cost	Fund Source
08/2022	Temporarily / emergency rehabilitation maintenance & repair work carried out as per site requirement, including earthwork, raising and strengthening temporary improvement of stone pitching	N.A	Maintenance and Repair (Provincial Government)
Plan for Rehabilitation/ Improvement			
MM/YYYY	Description/Project Name	Cost	Fund Source
N.A	N.A	N.A	N.A

N.A = Data is not provided by Irrigation Department

Site Photo				
Vulnerable Section	General View of River Side			
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side	
Facing Downstream Side	Facing Upstream Side			
				
	General View of Top			
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Facing Downstream Side	Facing Upstream Side			
				
	General View of Land side			
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side	
Facing Downstream Side	Facing Upstream Side			
				
Close View of Deformation				
No noticeable deformations				
Close View of Damages				
				









	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Landside</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY Y	Inspection Type	Description and Photo	Damage <sup>5</sup>
05/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>• The water channel was located approximately 4 Kilometers away from the bund.</li> <li>• Stone Pitching laid across the riverside slope of the bund.</li> <li>• No current countermeasures at site.</li> <li>• There are no major damages or issues at the site, only minor damages on the land side slope of the embankment that were caused by rainfall and can be easily repaired with minimal earthwork.</li> <li>• No deterioration or deformation of bund was observed at site.</li> </ul>  <p>Picture 1: Damages left by rainfall on landside of bund</p>	c

<sup>4</sup>Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		YES	The bund body is currently damaged.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	Pass	Floodplain length is about 15400 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	NO	It hasn't been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Emergent Type C</b>	
	For Evaluation Score	Bund Damage		3	The bund body is currently damaged.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	0	Floodplain length is about 15400 feet.
	<b>Quality Score</b>			<b>4/9</b>	

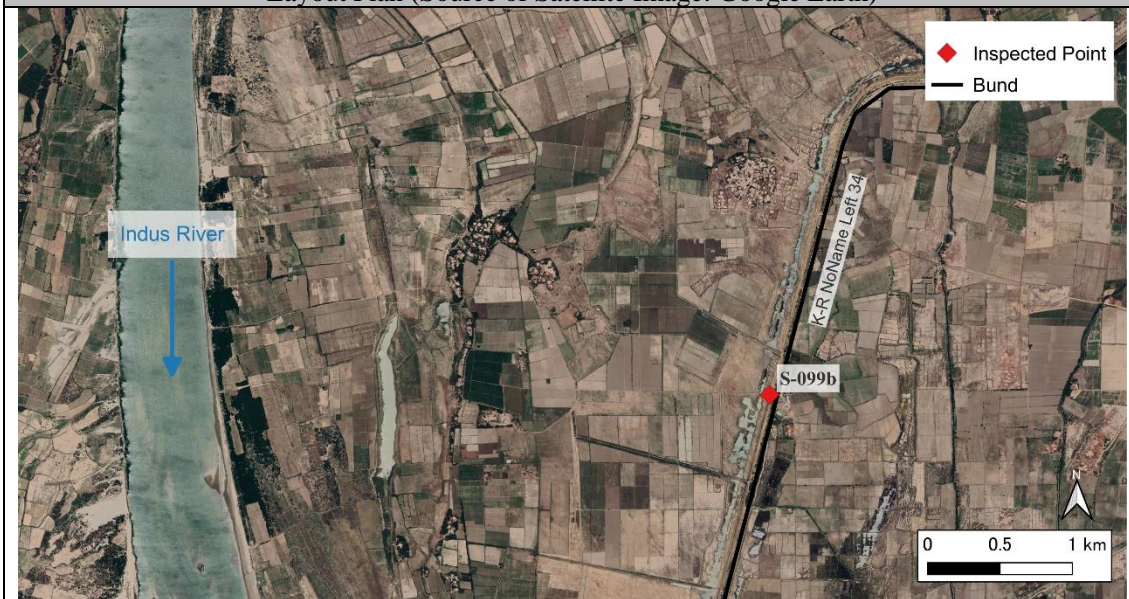
Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 5/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-099b	IndusRiver	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
Kuka Link Bund		6/0 to 7/0	24°38'31.44"N, 67°88'63.53"E
Name of Vulnerable Point	Kuka Link Bund 6/0 to 7/0_2		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of wave washing during HFL of 2022 and site being close to the sea.		
Flow Condition <sup>1</sup>	Distance between main channel and bund was approximately 4 kilometers. Water touches the bund at around 350,000+ cusecs.		
Site Condition in the Country Side <sup>2</sup>	Agricultural activities and residential areas are present on both sides of bund, with cultivable lands and populations have been being submerged during high flood level situations.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation <sup>3</sup>	
Category	Quality Score
<b>Proactive Type C</b>	<b>1/9</b>

<sup>1</sup> Water Flow Direction (Rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	26.75 feet	No Plan
	H.F. L	20.75 feet	No Plan
	Free Board Height	6.00 feet	No Plan
	Top Width	18.50 feet	No Plan
	River Side Slope	2:1	No Plan
	Country Side Slope	2:1	No Plan
	Longitudinal Length	1 Mile	No Plan
	Slope Protection Material	Earth + Stone Pitching	No Plan
	Covering Material/ Pavement on the Top	Earth	No Plan
	Embankment Material	Earth	No Plan
Ancillary Structure (Drainage Ditch, and Spurs)	Bund	No Plan	
Typical Cross Section			
History of Damages			
<b>MM/YYYY</b>	<b>Type of Damage</b>	<b>Description</b>	
08/2022	Wave washing	Occurrence of wave washing during High Flood Level has led to damages towards the stone pitching.	
Record of Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
08/2022	Temporarily / emergency rehabilitation maintenance & repair work carried out as per site requirement that include earthwork, raising and strengthening stone pitching	N.A	Maintenance and Repair (Provincial Government)
Plan for Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A

N.A = Data not provided by Irrigation Department

Site Photo					
Vulnerable Section	General View of River Side				
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side		
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	General View of Top				
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	General View of Land side				
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Facing Downstream Side	Facing Upstream Side				
					
	Close View of Deformation				
	No noticeable deformations				
	Close View of Damages				
	No visible damages				









	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Landside</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup>			
(Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY Y	Inspection Type	Description and Photo	Damage <sup>5</sup>
05/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>• The water channel was located approximately 4 Kilometers away from bund.</li> <li>• Stone Pitching laid across the riverside slope of bund.</li> <li>• No current countermeasures in place.</li> <li>• No erosion or abnormalities observable or reported on site.</li> <li>• No deterioration of the Bund.</li> </ul>  <p>Picture 1: Riverside slope and stone pitching</p>	a

<sup>4</sup>Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	Pass	Floodplain length is about 14600 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	NO	It hasn't been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type C</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	0	Floodplain length is about 14600 feet.
	<b>Quality Score</b>			<b>1/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 5/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-100a	IndusRiver	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
Kuka Link Bund		9/4 to 20/6	24°34'87.71"N, 67°87'38.77"E
Name of Vulnerable Point	KUKa Link Bund 9/4 to 20/6_1		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of wave washing in 2022 and site being close to the sea.		
Flow Condition <sup>1</sup>	Distance between main channel and the bund was approximately 1.5 kilometers. Water touches the bund at around 250,000+ cusecs.		
Site Condition in the Country Side <sup>2</sup>	Agricultural activities and residential areas are situated on the landward side of the bund, with several villages scattered throughout the area.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Emergent Type R</b>	<b>4/9</b>

<sup>1</sup> Water Flow Direction (Rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase



Site Photo				
Vulnerable Section	General View of River Side			
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side	
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	General View of Top			
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Facing Downstream Side	Facing Upstream Side			
				
	General View of Land side			
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side	
Facing Downstream Side	Facing Upstream Side			
				
	Close View of Deformation No noticeable deformations			
	Close View of Damages No visible damages			








	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Landside</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY Y	Inspection Type	Description and Photo	Damage <sup>5</sup>
05/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>• The water channel was located approximately 1.5 kilometers away from bund.</li> <li>• Stone Pitching laid across the riverside slope of bund.</li> <li>• No current countermeasures at site.</li> <li>• No erosive damages or any abnormalities observed on site. However, seepage is a normal occurrence during high flood level as claimed by local staff.</li> <li>• No deformations observed at site.</li> <li>• No deterioration of the bund is apparent. However, raising the bund may prove beneficial.</li> </ul>  <p>Picture 1: Riverside slope pitching and plantation over slope</p>	L

<sup>4</sup>Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		YES	Seepage was observed.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	Pass	Floodplain length is about 8100 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Emergent Type R</b>	
	For Evaluation Score	Bund Damage		3	Seepage was observed.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	0	Floodplain length is about 8100 feet.
	<b>Quality Score</b>			<b>4/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-100b	Indus River	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
Kuka Link Bund		9/4 to 20/6	24°23'90.08"N, 67°79'26.24"E
Name of Vulnerable Point	Kuka Link Bund 9/4 to 20/6_2		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of wave washing during HFL of 2022 and site being close to the sea.		
Flow Condition <sup>1</sup>	Distance between main channel and bund was approximately 2 kilometers. Water touches the bund at around 400,000 cusecs.		
Site Condition in the Country Side <sup>2</sup>	Agricultural activities and residential areas are situated on the landward side of the bund, with several villages scattered throughout the area.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Proactive Type R</b>	<b>2/9</b>

<sup>1</sup> Water Flow Direction (Rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	26.10 feet	No Plan
	H.F. L	20.10 feet	No Plan
	Free Board Height	6.00 feet	No Plan
	Top Width	18.00 feet	No Plan
	River Side Slope	2:1	No Plan
	Country Side Slope	2:1	No Plan
	Longitudinal Length	11 Miles 2 furlongs	No Plan
	Slope Protection Material	Earth + Stone Pitching	No Plan
	Covering Material/ Pavement on the Top	Earth	No Plan
	Embankment Material	Earth	No Plan
Ancillary Structure (Drainage Ditch, and Spurs)	Bund	No Plan	
Typical Cross Section			
History of Damages			
<b>MM/YYYY</b>	<b>Type of Damage</b>	<b>Description</b>	
08/2022	Wave washing	Occurrence of wave washing during high flood level has led to damages towards the stone pitching.	
Record of Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
08/2022	Temporarily / emergency rehabilitation maintenance & repair work carried out as per site requirement including earthwork, raising and strengthening temporary improvement of stone pitching	N.A	Maintenance and Repair (Provincial Government)
Plan for Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A

N.A = Data is not provided by Irrigation Department

Site Photo					
Vulnerable Section	General View of River Side				
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side		
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	General View of Top				
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	General View of Land side				
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Facing Downstream Side	Facing Upstream Side				
					
	<p>Close View of Deformation</p> <p>No noticeable deformations</p>				
	<p>Close View of Damages</p> <p>No visible damages</p>				









	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Land side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY Y	Inspection Type	Description and Photo	Damage <sup>5</sup>
03/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>• The water channel was located approximately 3 kilometers away from the bund.</li> <li>• Stone Pitching laid across the riverside slope of the bund.</li> <li>• No history of erosion has been observed at site.</li> <li>• Temporary construction of topside of the bund is underway.</li> <li>• No deterioration of the bund.</li> </ul>  <p>Picture 1: Topside of bund and stone stocks kept for rehabilitation of topside of bund</p>	a

<sup>4</sup>Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 6 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	Fail	Floodplain length is about 2300 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	NO	#N/A
	<b>Category</b>			<b>Proactive Type R</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 6 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	1	Floodplain length is about 2300 feet.
	<b>Quality Score</b>			<b>2/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-101a	IndusRiver	Indus River	Left / Right
Bund Name		R.D.	GPS Coordinates
Kuka Link Retarded Bund		0/0 to 3/0	24°20'79.42"N, 67°75'35.46"E
Name of Vulnerable Point	Kuka Link Retarded Bund (M.V.P) 0/0 to 3/0_1		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of wave washing and site being close to the sea.		
Flow Condition <sup>1</sup>	Distance between main channel and the bund was approximately 2.5 kilometers. Water touches the bund at around 400,000 cusecs.		
Site Condition in the Country Side <sup>2</sup>	Agricultural activities are present on both land side and riverside of bund with a scattered population are residing adjacent to site.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Proactive Type C</b>	<b>3/9</b>

<sup>1</sup> Water Flow Direction (Rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	9.00 feet	No Plan
	H.F. L	6.00 feet	No Plan
	Free Board Height	3.00 feet	No Plan
	Top Width	15.50 feet	No Plan
	River Side Slope	2:1	No Plan
	Country Side Slope	2:1	No Plan
	Longitudinal Length	3 Miles	No Plan
	Slope Protection Material	Earth	No Plan
	Covering Material/ Pavement on the Top	Earth	No Plan
	Embankment Material	Earth	No Plan
	Ancillary Structure (Drainage Ditch, and Spurs)	None	No Plan
Typical Cross Section			
History of Damages			
<b>MM/YYYY</b>	<b>Type of Damage</b>	<b>Description</b>	
08/2022	Wave washing	Occurrence of wave washing during High Flood Level has that led to minor damages to the riverside slope.	
Record of Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
08/2022	Temporarily / emergency rehabilitation maintenance & repair work carried out as per site requirement that include earthwork, raising and strengthening	N.A	Maintenance and Repair (Provincial Government)
Plan for Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A

N.A = Data is not provided by Irrigation Department

Site Photo					
Vulnerable Section	General View of River Side				
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Facing Downstream Side	Facing Upstream Side				
					
	General View of Top				
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side		
Facing Downstream Side	Facing Upstream Side				
					
	General View of Land side				
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side		
Facing Downstream Side	Facing Upstream Side				
					
	Close View of Deformation				
	No noticeable deformations				
	Close View of Damages				
	No visible damages				









	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Landside</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 

Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY Y	Inspection Type	Description and Photo	Damage <sup>5</sup>
03/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>• The water channel was located approximately 2.5 Kilometers away from the bund.</li> <li>• No Pitching or slope protection across the riverside slope.</li> <li>• No current countermeasures in place.</li> <li>• No damages reported or observed at site after 2022.</li> <li>• No degradation of the embankment was observed, with the only anomaly being seepage reported by the local residents.</li> </ul>  <p>Picture 1: Topside of bund and plantation over both slopes</p>	a

<sup>4</sup>Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 3 feet.
			Bund Width	Fail	The HGL isn't exposed above the ground, but the soil cover thickness over HGL is less than the guideline value ( 2 feet > Soil Depth $\geq$ 4 feet ).
			Flood Plain Length	Fail	Floodplain length is about 2300 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	NO	It hasn't been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type C</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 3 feet.
			Bund Width	1	The HGL isn't exposed above the ground, but the soil cover thickness over HGL is less than the guideline value ( 2 feet > Soil Depth $\geq$ 4 feet ).
			Flood Plain Length	1	Floodplain length is about 2300 feet.
	<b>Quality Score</b>			<b>3/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Points

Creation Date: 3/3/2024

Province	Zone	Division	Circle
Sindh	Kotri Barrage Region	Lower Pinyari Division	Lower Pinyari
Sr. No.	River Name	River System	Bank
S-101b	IndusRiver	Indus River	Left/ Right
Bund Name		R.D.	GPS Coordinates
Kuka Link Retarded Bund		0/0 to 3/0	24°16'85.39"N, 67°74'43.78"E
Name of Vulnerable Point	Kuka Link Retarded Bund (M.V.P) 0/0 to 3/0_2		
Reason for the Vulnerability	Site considered vulnerable due to occurrence of wave washing and site being close to the sea.		
Flow Condition <sup>1</sup>	Distance between main channel and the bund was approximately 600 meters. However, currently it is less than that. 400,000 cusecs water touches toe of the bund.		
Site Condition in the Country Side <sup>2</sup>	Agricultural activities are present on both land side and riverside of the bund with a scattered population is situated adjacent to site.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Proactive Type R</b>	<b>3/9</b>

















<sup>1</sup> Water Flow Direction (Rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points






<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund			
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>
	Top Elevation	9.00 feet	No Plan
	H.F. L	6.00 feet	No Plan
	Free Board Height	3.00 feet	No Plan
	Top Width	15.50 feet	No Plan
	River Side Slope	2:1	No Plan
	Country Side Slope	2:1	No Plan
	Longitudinal Length	3 Miles	No Plan
	Slope Protection Material	Earth	No Plan
	Covering Material/ Pavement on the Top	Earth	No Plan
	Embankment Material	Earth	No Plan
	Ancillary Structure (Drainage Ditch, and Spurs)	None	No Plan
Typical Cross Section			
History of Damages			
<b>MM/YYYY</b>	<b>Type of Damage</b>	<b>Description</b>	
08/2022	Wave washing	Occurrence of wave washing during High Flood Level has that led to minor damages to the riverside slope.	
Record of Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A
Plan for Rehabilitation/ Improvement			
<b>MM/YYYY</b>	<b>Description/Project Name</b>	<b>Cost</b>	<b>Fund Source</b>
N.A	N.A	N.A	N.A

N.A = Data is not provided by Irrigation Department

Site Photo				
Vulnerable Section	General View of River Side			
	<table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Facing Downstream Side	Facing Upstream Side	
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	General View of Land side			
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Facing Downstream Side	Facing Upstream Side			
				
	Close View of Deformation			
				

	<p>Close View of Damages</p> <p>No visible damages</p>	
	<p>Photo with 360° angles</p> 	
<p>Typical Section (Adjacent to the Vulnerable Point)</p>	<p>General View of River Side</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Top</p>	
	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
	<p>General View of Landside</p>	

Facing Downstream Side




Facing Upstream Side



Photo with 360° angles



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY Y	Inspection Type	Description and Photo	Damage <sup>5</sup>
03/03/2024	Visual Inspection	<ul style="list-style-type: none"> <li>• The water channel was located approximately 600 meters from the bund.</li> <li>• No slope protection across the riverside slope of the bund.</li> <li>• No countermeasures in place in case of emergency.</li> <li>• Both sides of the slopes have experienced deformation primarily as a result of the site's historical lack of recognition as being vulnerable, a status which has only recently been challenged by the shifting course of the river.</li> <li>• There is no erosive activity, only deformation resulting from the site never undergoing rehabilitation throughout the history of the bund..</li> <li>• The condition of the site may deteriorate if it is not managed with proper care.</li> </ul>  <p>Picture 1: Deformation of slope due to untreated bund</p>	a

<sup>4</sup>Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund


<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 3 feet.
			Bund Width	Fail	The HGL isn't exposed above the ground, but the soil cover thickness over HGL is less than the guideline value ( 2 feet > Soil Depth $\geq$ 4 feet ).
			Flood Plain Length	Fail	Floodplain length is about 1900 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type R</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 3 feet.
			Bund Width	1	The HGL isn't exposed above the ground, but the soil cover thickness over HGL is less than the guideline value ( 2 feet > Soil Depth $\geq$ 4 feet ).
			Flood Plain Length	1	Floodplain length is about 1900 feet.
	<b>Quality Score</b>			<b>3/9</b>	

Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Point

Creation Date: 18/2/2024

Province	Zone	Division	Circle
Sindh	Sukkur Barrage Right Bank Region Larkana	Shahbaz Irrigation Division Sehwan	Southern Sindh Circle Dadu
Sr. No.	River Name	River System	Bank
S-102	Indus River	Indus River	Left / Right
Bund Name		R.D.	GPS Coordinates
Sann Veedhari		11/6	25°90'76.9"N, 68°24'03.66"E
Name of Vulnerable Point	Sann Veehdari Bund mile 11/6 (V.P)		
Reason for the Vulnerability	Site is considered vulnerable due to parallel flow of river that led to damages in 2010.		
Flow Condition <sup>1</sup>	Distance between main channel and the bund was approximately 1 kilometer. Water reaches bund at around 200,000 cusecs.		
Site Condition in the Country Side <sup>2</sup>	Limited cultivable lands and population resides on landward side of the bund. Manjhand City is situated parallel to bund.		
Layout Plan (Source of Satellite Image: Google Earth)			
			
Evaluation <sup>3</sup>			
Category	Quality Score		
<b>Emergent Type R</b>	<b>7/9</b>		

<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points

<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund																								
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>																					
	Top Elevation	118.25 feet.	No Plan																					
	H.F. L	112.35 feet.	No Plan																					
	Free Board Height	5.90 feet.	No Plan																					
	Top Width	20 feet	No Plan																					
	River Side Slope	2:1	No Plan																					
	Country Side Slope	2:1 & 6:1	No Plan																					
	Longitudinal Length	500 ft	No Plan																					
	Slope Protection Material	Sweet Earth / Stone Pitching	No Plan																					
	Covering Material/ Pavement on the Top	Sweet Earth	No Plan																					
	Embankment Material	Sweet Earth	No Plan																					
	Ancillary Structure (Drainage Ditch, and Spurs)	None	No Plan																					
Typical Cross Section	<p style="text-align: center;"><b>Typical X-Section of Sann Veehdari Bund mile 11/6 (V.P)</b>            Shahbaz Irrigation Division Sehwan            of Southern Sindh Circle Dadu            of Sukkur Barrage Right Bank Region, Larkana</p>																							
	<p style="text-align: center;"><b>History of Damages</b></p> <table border="1"> <thead> <tr> <th>MM/YYYY</th> <th>Type of Damage</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>2010</td> <td>Direct Hit damage</td> <td>Direct hit of river course.</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Record of Rehabilitation/ Improvement</b></p> <table border="1"> <thead> <tr> <th>MM/YYYY</th> <th>Project Name with its Description</th> <th>Cost</th> <th>Source of Funding</th> </tr> </thead> <tbody> <tr> <td>N.A</td> <td>Temporarily / emergency rehabilitation maintenance &amp; repair work as per site requirement, including earthwork, Strengthening and Stone pitching improvement)</td> <td>N.A</td> <td>Maintenance &amp; Repair (Provincial Government)</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Plan for Rehabilitation/ Improvement</b></p> <table border="1"> <thead> <tr> <th>MM/YYYY</th> <th>Project Name with its Description</th> <th>Cost</th> <th>Source of Funding</th> </tr> </thead> <tbody> <tr> <td>N.A</td> <td>N.A</td> <td>N.A</td> <td>N.A</td> </tr> </tbody> </table>			MM/YYYY	Type of Damage	Description	2010	Direct Hit damage	Direct hit of river course.	MM/YYYY	Project Name with its Description	Cost	Source of Funding	N.A	Temporarily / emergency rehabilitation maintenance & repair work as per site requirement, including earthwork, Strengthening and Stone pitching improvement)	N.A	Maintenance & Repair (Provincial Government)	MM/YYYY	Project Name with its Description	Cost	Source of Funding	N.A	N.A	N.A
MM/YYYY	Type of Damage	Description																						
2010	Direct Hit damage	Direct hit of river course.																						
MM/YYYY	Project Name with its Description	Cost	Source of Funding																					
N.A	Temporarily / emergency rehabilitation maintenance & repair work as per site requirement, including earthwork, Strengthening and Stone pitching improvement)	N.A	Maintenance & Repair (Provincial Government)																					
MM/YYYY	Project Name with its Description	Cost	Source of Funding																					
N.A	N.A	N.A	N.A																					


N.A = Data not provided by Irrigation Department

Sweet earth = Silty clay without debris.

Site Photo				
Vulnerable Section	General View of River Side			
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Facing Downstream Side	Facing Upstream Side			
				
Close View of Deformation				
No noticeable deformations				
Close View of Damages				
No visible damages				

Photo with 360° angle



Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
18/02/2024	Visual Inspection	<ul style="list-style-type: none"> <li>The water channel is located approximately one kilometer away from bund.</li> <li>Stone pitching has been laid along the riverside slope of bund.</li> <li>No current countermeasures are in place for emergencies</li> <li>Damage caused by river directly impacting this point was reported in 2010. However, site has since been rehabilitated through Maintenance &amp; Repair Fund.</li> <li>No abnormalities or damages have been observed at the site since 2010.</li> </ul>  <p>Picture 1: Riverside slope and pitching</p>	a

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		NO	There is no significant damage at present.
		Bund Dimension	Bund Height	Fail	Free board height is 5.9 feet.
			Bund Width	Pass	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	Fail	Floodplain length is about 2500 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	NO	It hasn't been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Proactive Type C</b>	
	For Evaluation Score	Bund Damage		0	There is no significant damage at present.
		Bund Dimension	Bund Height	1	Free board height is 5.9 feet.
			Bund Width	0	The soil cover thickness over HGL exceeds the guideline value (Soil Depth $\geq$ 4 feet )
			Flood Plain Length	1	Floodplain length is about 2500 feet.
	<b>Quality Score</b>			<b>2/9</b>	

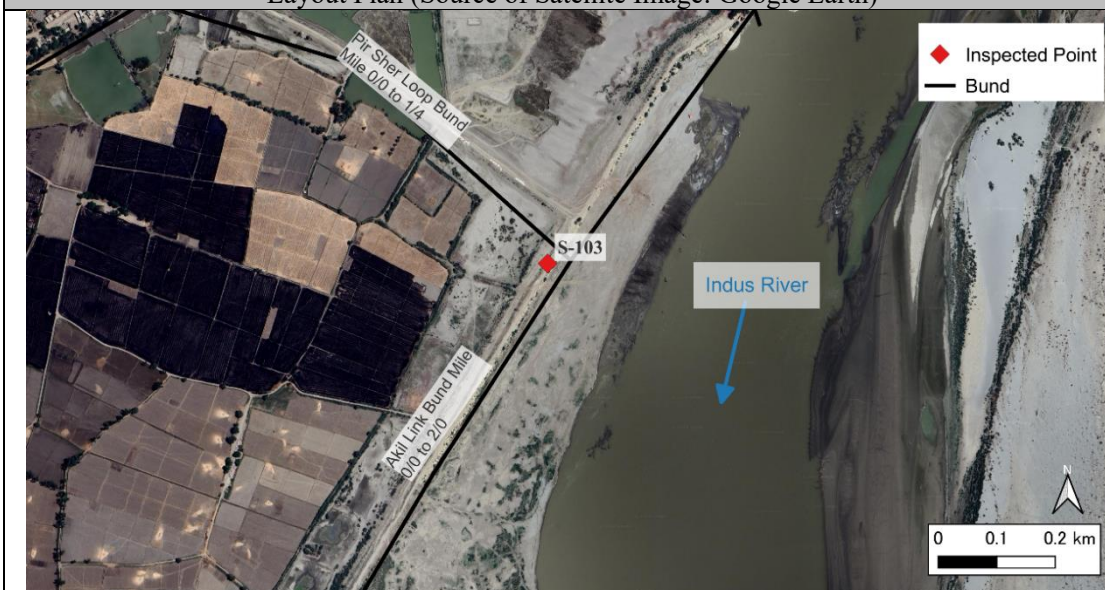
Note) HGL: hydraulic gradient line

Ledger Sheet of Vulnerable Point

Creation Date: 3/8/2023

Province	Zone	Division	Circle
Sindh	Sukkur Barrage Right Bank Region, Larkana	Northern Dadu Division @ Larkana	Western Sindh Circle Larkana
Sr. No.	River Name	River System	Bank
S – 103	Indus River	Indus River	Left / Right
Bund Name		R.D.	GPS Coordinates
Akil Link Bund		Mile 0/0 to 1/2	27°34'30.08"N 68°17'15.60"E
Name of Vulnerable Point	Akil Link Bund Mile 0/0 to 1/2		
Reason for the Vulnerability	Since leakage was observed during the Low Flood in 2023, this site is considered vulnerable against seepage by JICA Project Team.		
Flow Condition <sup>1</sup>	Water channel is located around the toe of the upstream side of the bund.		
Site Condition in the Country Side <sup>2</sup>	Agricultural activities and residential areas are present on landward side of the bund. Akil city is situated one kilometer away from the bund.		

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation<sup>3</sup>

Category	Quality Score
<b>Emergent Type R</b>	<b>6/9</b>




<sup>1</sup> Water Flow Direction (rough Distance Between Main Water Channel and the Bund) and Conditions During Floods Around the Listed Vulnerable Points





<sup>2</sup> Site Condition Around the Vulnerable Points (Land Use Behind the Point, Important Facility Adjacent to the Point)

<sup>3</sup> Emergent Type R: Emergent Phase Requiring Robust Countermeasures, Emergent Type C: Emergent Phase Requiring Common Countermeasures, Proactive Type R: Proactive Phase Requiring Robust Countermeasures, Proactive Type C: Proactive Phase Requiring Common Countermeasures, Monitoring: Monitoring Phase

Basic Information of the Bund								
Basic Dimensions and Materials	<b>Item</b>	<b>Existing</b>	<b>Proposed</b>					
	Top Elevation	181.9 feet.	183.0 Ft.					
	H.F. L	177.00 Ft.	177.00 Ft.					
	Free Board Height	4.90 feet.	6.00 Ft.					
	Top Width	20.0 feet.	30.0 Ft.					
	River Side Slope	1: 2.0	1: 2.0					
	Country Side Slope	5 ft back berm and 1:2.0-2.5	1: 3.0					
	Longitudinal Length	3.42km (11220 feet)	No Plan					
	Slope Protection Material	Stone Pitching	Same as the Left					
	Covering Material/ Pavement on the Top	Earthen Top	Same as the Left					
	Embankment Material	Not Obtained	Same as the Left					
	Ancillary Structure (Drainage Ditch, and Spurs)	A spur	No Plan					
Typical Cross Section	<p style="text-align: center;"><b>TYP: X-SEC: OF AKIL LINK BUND @ MILE 1/0</b></p>							
	<p style="text-align: center;"><b>History of Damages</b></p> <table border="1"> <thead> <tr> <th>MM/YYYY</th> <th>Type of Damage</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Floods 2022</td> <td>Seepage</td> <td>This reach of the bund were damaged due to the heavy seepage during the 2022 flood. The leakage from the river side was observed even during the Low Flood in 2023.</td> </tr> </tbody> </table>			MM/YYYY	Type of Damage	Description	Floods 2022	Seepage
MM/YYYY	Type of Damage	Description						
Floods 2022	Seepage	This reach of the bund were damaged due to the heavy seepage during the 2022 flood. The leakage from the river side was observed even during the Low Flood in 2023.						
<b>Record of Rehabilitation/ Improvement</b>								
<b>MM/YYYY</b>	<b>Project Name with its Description</b>	<b>Cost</b>	<b>Source of Funding</b>					
N.A	N.A	N.A	N.A					
<b>Plan for Rehabilitation/ Improvement</b>								
<b>MM/YYYY</b>	<b>Project Name with its Description</b>	<b>Cost</b>	<b>Source of Funding</b>					
N.A	Restoration Works along S.L. Bund Mile 38/0 to 40/5, Akil Link Bund. Llyas Loop Bund. Recoupment of Damaged Apron of J-spur Akil Link Bund and Construction of Protection Wall between Phulpota Minor and 1 <sup>st</sup> Defense Line of River Bund and Re-construction of Gauge Pillars in Northan Dadu Division Larkana	680.454 Million	N.A					

NA = Data not provided by Irrigation Department

Site Photo			
Vulnerable Section	<p>General View of River Side</p> <table border="1"> <tr> <td> <p>Facing Downstream Side</p>  </td> <td> <p>Facing Upstream Side</p>  </td> </tr> </table>	<p>Facing Downstream Side</p> 	<p>Facing Upstream Side</p> 
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Observation Record <sup>4</sup> (Current status, effect of countermeasure, development of erosion, deformation, and deterioration)			
DD/MM/YYYY	Inspection Type	Description and Photo	Damage <sup>5</sup>
3/8/2023	Visual Inspection	<ul style="list-style-type: none"> <li>The water channel is located in front of the bund under the low flood conditions.</li> <li>Leakage was observed at several points around the landward side toe of the bund was observed at the several points. During this observation, the flood condition was “low flood” and the water level was about to touching the toe of the bund.</li> <li>Erosion on the landward slope of the bund was noted, caused by rainfall .</li> </ul>   <p>Photo 1: Landside slope      Photo 2: Leakage from the landside slope</p>	d
6/11/2023	Visual Inspection	<ul style="list-style-type: none"> <li>A trace of erosion around the river side toe of the slope was observed.</li> <li>Leakage from the landward side slope was not observed. However, the situation around the landward side slope has not been changed after the inspection on 3/8/2023.</li> </ul>   <p>Photo 3: Trace of erosion around riverside slope      Photo 4: Landside slope</p>	d (No change from the above)

<sup>4</sup> Current Status, Effect of the Existing Structural Countermeasure Such As Spurs/studs, Sheet Piles for Seepage Control etc and Development of Erosion, Deformation, Deterioration of the Existing Bund

<sup>5</sup> a: No Deformation, b: No deformations are observed on the bund body, except for gully erosion caused by raindrops or the detachment of the bund's stone pitching, c: The bund or the apron has been damaged, and L: Leakage from the bund has been identified

Evaluation Process					
DD/MM/YYYY	Item		Result	Reason	
	Criteria For Evaluation Flow	Flood Damage		Yes	The inundation analysis indicates that the flood damage is severe
		Bund Damage		YES	Seepage was observed.
		Bund Dimension	Bund Height	Fail	Free board height is 4.9 feet.
			Bund Width	Fail	The HGL isn't exposed above the ground, but the soil cover thickness over HGL is less than the guideline value ( 2 feet > Soil Depth $\geq$ 4 feet ).
			Flood Plain Length	Fail	Floodplain length is about 600 feet.
		Topographic Feature	Breach Record	NO	There is no breach record.
			Flow Impact	YES	It's been affected by strong water flow since before 2010 flood.
	<b>Category</b>			<b>Emergent Type R</b>	
	For Evaluation Score	Bund Damage		3	Seepage was observed.
		Bund Dimension	Bund Height	1	Free board height is 4.9 feet.
			Bund Width	1	The HGL isn't exposed above the ground, but the soil cover thickness over HGL is less than the guideline value ( 2 feet > Soil Depth $\geq$ 4 feet ).
			Flood Plain Length	1	Floodplain length is about 600 feet.
	<b>Quality Score</b>			<b>6/9</b>	

Note) HGL: hydraulic gradient line