













| 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 Landside | |
| Facing Downstream Side | |
|  | |
| Facing Upstream Side | |
|  | |
| Close View of Deformation | Not Applicable |
| Close View of Damages | Not Applicable |

| | | |
|---|---|--|
| | <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>  |

| | |
|---|--|
| | <p>Photo with 360° angles</p>  |
| <p>Downstream End of the Bund</p> | <p>General View</p> <p style="text-align: center;">Not Applicable</p> <p>Photo with 360° angles</p> <p style="text-align: center;">Not Applicable</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 ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 25/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Main river creek is located approximately 3 km from this location. • Metaled road runs along on top of Link bund • Cultivated area is observed on both sides of the bund  <p>Metaled road on top of Link bund</p>  <p>Cultivated area is present around the bund</p> | a |

⁴ 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

⁵ 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 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Pass | Floodplain length is about 9500 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. | |
| | Category | | | Proactive Type C | |
| | 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 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 0 | Floodplain length is about 9500 feet. |
| | Quality Score | | | 2/9 | |

Note) HGL: hydraulic gradient line

Bhakkar Flood Protection Bund at RD 56+000 to 57+000

Creation Date: 22/2/2024

| Province | Zone | Division | Circle |
|---|---|---|---------------------------------|
| Punjab | Sargodha Zone | Bhakkar Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-024a | Indus River | Indus River | Left |
| Bund Name | | R.D. | GPS Coordinates |
| Bhakkar Flood Protection Bund | | RD 56+000 to 57+000 and 72+000 to 73+000 and 80+000 to 92+000 | 31°61'71.43"N, 70°91'73.21"E |
| Name of Vulnerable Point | Bhakkar Flood Protection Bund at RD 56+000 to 57+000 and 72+000 to 73+000 and 80+000 to 92+000 1 | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> At present, the River Indus is striking the bund in between the RD 60+000 and RD 70+000 and the river trend is not in this reach. The said site is no longer vulnerable. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> No active flow conditions. | | |
| Site Condition in the Country Side ² | <ul style="list-style-type: none"> Cropped area on the country side. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³

| Category | Quality Score |
|-------------------------|---------------|
| Proactive Type R | 2/9 |






¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).


³ 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 | 554.80 feet | Not Applicable - |
| | H.F. L | 548.80 feet | |
| | Free Board Height | 6.00 feet | |
| | Top Width | 25 feet | |
| | River Side Slope | 1:3 | |
| | Country Side Slope | 1:2 | |
| | Longitudinal Length | 200 feet | |
| | Slope Protection Material | Earthen | |
| | Covering Material/ Pavement on the Top | Earthen | |
| | Embankment Material | Earthen | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | |
| Typical Cross Section | <p style="text-align: center;">RAISING AND STRENGTHENING BHAKKAR FLOOD PROTECTION BUND RD 8+500-10+500 & 42+000-76+000</p> <p style="text-align: center;">X-SECTION AT RD 56+000</p> | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| | Nil | | |
| | | | |
| | | | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |

| 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 Landside | |
| Facing Downstream Side | |
|  | |
| Facing Upstream Side | |
|  | |
| Close View of Deformation | Not Applicable |
| Close View of Damages | Not Applicable |
| Photo with 360° angles |  |

| | | |
|--|--|---|
| <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>  |
| <p>Photo with 360° angles</p>  | | |
| <p>Downstream End of the Bund</p> | <p>General View</p>  | |

| | |
|---------------------------------|---|
| | <p>Photo with 360⁰ 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 360⁰ angles</p>  |

| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 22/2/2024 | Visual Inspection | <ul style="list-style-type: none"> The River Indus is currently striking the bund between RD 60+000 and RD 70+000. Cultivated area is observed on the country side. Bottom level is Approximately 15 feet below the top level.  <p>Cultivated area is present on country side</p> | a |

⁴ 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

⁵ 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 2 feet) |
| | | | Flood Plain Length | Fail | Floodplain length is about 300 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. |
| | Category | | | Proactive Type R | |
| | 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 2 feet) |
| | | | Flood Plain Length | 1 | Floodplain length is about 300 feet. |
| | Quality Score | | | 2/9 | |

Note) HGL: hydraulic gradient line

Bhakkar Flood Bund RD 73+000 to 74+000

Creation Date: 23/2/2024

| Province | Zone | Division | Circle |
|---|--|---|---------------------------------|
| Punjab | Sargodha Zone | Bhakkar Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-024b | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Bhakkar Flood Protection Bund | | RD 56+000 to 57+000 and 72+000 to 73+000 and 80+000 to 92+000 | 31°58'29.68"N, 70°87'29.97"E |
| Name of Vulnerable Point | Bhakkar Flood Protection Bund at RD 56+000 to 57+000 and 72+000 to 73+000 and 80+000 to 92+000_2 | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> Previously, river flowed near to the protection bund. At present, the River Indus is approximately 3 km away from this location. The site is no longer considered vulnerable. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> No flow conditions. | | |
| Site Condition in the Country Side ² | Cultivated area is observed on the country side. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³

| Category | Quality Score |
|-------------------------|---------------|
| Proactive Type R | 2/9 |

¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.



² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).

³ 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 |
| | 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 | |
|  | |
| Close View of Deformation | Not Applicable |
| Close View of Damages | Not Applicable |

| | | |
|---|---|--|
| | <p>Photo with 360⁰ 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>  |
| | <p>Photo with 360⁰ angles</p>  | |

| | |
|---|--|
| <p>Downstream End of the Bund</p> | <p>General View</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 ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 23/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • River is Approximately 3 km away from the bund. • Cultivated area is observed on the country side. • Bottom level is Approximately 20 feet below the top level. • Between RD 73+000 to 74+000, there were 4 solid stone studs (non-vulnerable). This area is now silted, and the river has shifted away from the bund.  <p>Cultivated area is present on the country side</p>  <p>Solid stone stud can be observed at RD 73+000</p> | a |

⁴ 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

⁵ 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 2 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. |
| | Category | | | Proactive Type R | |
| | 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 2 feet) |
| | | | Flood Plain Length | 1 | Floodplain length is about 200 feet. |
| | Quality Score | | | 2/9 | |

Note) HGL: hydraulic gradient line

Bhakkar Flood Bund RD 80+000 to86+000

Creation Date: 23/2/2024




















| Province | Zone | Division | Circle |
|---|---|---|---------------------------------|
| Punjab | Sargodha Zone | Bhakkar Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-024c | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Bhakkar Flood Protection Bund | | RD 56+000 to 57+000 and 72+000 to 73+000 and 80+000 to 92+000 | 31°56'25.09"N, 70°87'63.38"E |
| Name of Vulnerable Point | Bhakkar Flood Protection Bund at RD 56+000 to 57+000 and 72+000 to 73+000 and 80+000 to 92+000 3 | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> • Previously, river flows near to the protection bund. At present, the River Indus is approximately 3 km away from this location. • The said site is no longer vulnerable. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> • No flow conditions. | | |
| Site Condition in the Country Side ² | Cultivated area and scattered settlements are observed on the country side. | | |
| Layout Plan (Source of Satellite Image: Google Earth) | | | |
| | | | |
| Evaluation ³ | | | |
| Category | Quality Score | | |
| Proactive Type C | 1/9 | | |


¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.





² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).


³ 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 | 549.20 feet | Not Applicable — |
| | H.F.L | 544.00 feet | |
| | Free Board Height | 5.20 feet | |
| | Top Width | 25 feet | |
| | River Side Slope | 1:3 | |
| | Country Side Slope | 1:2 | |
| | Longitudinal Length | 6000 | |
| | Slope Protection Material | Earthen | |
| | Covering Material/ Pavement on the Top | Earthen | |
| | Embankment Material | Earthen | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | |
| Typical Cross Section | | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| | Nil | | |
| | | | |
| | | | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |

| 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> 31.5626, 70.87636, 123.0m, 354°</td> <td></td> </tr> </table> | Facing Downstream Side | Facing Upstream Side |  31.5626, 70.87636, 123.0m, 354° |  |
| | Facing Downstream Side | Facing Upstream Side | | | |
| |  31.5626, 70.87636, 123.0m, 354° |  | | | |
| | General View of Landside | | | | |
| | <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 | Not Applicable | | | | |
| Close View of Damages | Not Applicable | | | | |
| 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  | | |

| | |
|---|--|
| <p>Downstream End of the Bund</p> | <p>General View</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 ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|--|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 23/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • River is situated approximately 3 km away from the bund. • Cultivated area is present on the country side. • Bottom level is approximately 20 feet below the top level.  <p>Cultivated area is present on the country side</p> | A |

⁴ 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

⁵ 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 5.2 feet. |
| | | | Bund Width | Pass | The soil cover thickness over HGL exceeds the guideline value (Soil Depth \geq 2 feet) |
| | | | Flood Plain Length | Pass | Floodplain length is about 9900 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. |
| | Category | | | Proactive Type C | |
| | For Evaluation Score | Bund Damage | | 0 | There is no significant damage at present. |
| | | Bund Dimension | Bund Height | 1 | Free board height is 5.2 feet. |
| | | | Bund Width | 0 | The soil cover thickness over HGL exceeds the guideline value (Soil Depth \geq 2 feet) |
| | | | Flood Plain Length | 1 | Floodplain length is about 9900 feet. |
| | Quality Score | | | 2/9 | |

Note) HGL: hydraulic gradient line

J-Head Spur at RD 58+800 of Bhakkar Flood Protection Bund

Creation Date: 22/2/2024






| Province | Zone | Division | Circle |
|---|--|------------------------|-----------------------------|
| Punjab | Sargodha Zone | Bhakkar Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-025 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Bhakkar Flood Protection Bund | | RD 58+800 | 31°61'86.67"N, 70°91'."E |
| Name of Vulnerable Point | J-Head Spur at RD 58+800 of Bhakkar Flood Protection Bund | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> Apron and stone pitching of the J-Head Spur were damaged during 2021 flood. Extreme Turbulent flow is observed in this reach as river drifting towards this side. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> Extreme Turbulent flow. 35000 cusecs discharge was observed along this spur. | | |
| Site Condition in the Country Side ² | <ul style="list-style-type: none"> River bed is on the both sides. | | |
| Layout Plan (Source of Satellite Image: Google Earth) | | | |
| | | | |
| Evaluation ³ | | | |
| Category | | Quality Score | |
| Proactive Type C | | 4/9 | |









¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.





² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).


³ 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 | 552.50 feet | Not Applicable_e |
| | H.F. L | 548.24 feet | |
| | Free Board Height | 4.26 feet | |
| | Top Width | 30 feet | |
| | River Side Slope | 1:3 | |
| | Country Side Slope | 1:2 | |
| | Longitudinal Length | 2660 feet | |
| | Slope Protection Material | On both side of the Spur, Stone pitching, and Apron is in progress. | |
| | Covering Material/ Pavement on the Top | Earthen | |
| | Embankment Material | Earthen | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | |
| Typical Cross Section | <p style="text-align: center;">GUIDE-HEAD SPUR AT RD 58+800 OF BHAKKAR FLOOD PROTECTION BUND.</p> <p style="text-align: center;">X- SECTION AT RD 0+000. (Guide Portion).</p> | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| 2021 | Apron and stone pitching damage | Apron and stone pitching damaged in 2021 flood season | |
| | | | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| 2024 | Apron and stone pitching restoration at JHead Spur at RD 58+800 (in progress) | Rs. 350 Million | Maintenance and Repair works |
| | | | |
| | | | |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |

| 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 | | | |
|  |  | | | |
| Vulnerable Section | General View of Top | | | |
| | <table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td> 31.61861, 70.90974, 125.3m, 273°</td> <td></td> </tr> </table> | Facing Downstream Side | Facing Upstream Side |  31.61861, 70.90974, 125.3m, 273° |
| Facing Downstream Side | Facing Upstream Side | | | |
|  31.61861, 70.90974, 125.3m, 273° |  | | | |
| Vulnerable Section | General View of Landside | | | |
| | <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 | | | |
|  |  | | | |
| Vulnerable Section | Close View of Deformation | | | |
| |  <p>Stone pitching work in progress at spur</p> | | | |
| Vulnerable Section | Close View of Damages | | | |
| | Not Applicable | | | |

| | | |
|---|--|--|
| | <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>  | |
| | <p>Photo with 360° angles</p>  | |

| | |
|---|--|
| <p>Downstream End of the Bund</p> | <p>General View</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 ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 22/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • 35000 cusecs discharge is observed along this spur Restoration of the stone pitching and apron is underway on both sides of the spur. • The trend of river is towards this spur.  <p>31.61867, 70.90999, 125.2m, 277°</p> <p>Rehabilitation work in progress at site</p> | a |

⁴ 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

⁵ 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 4.3 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Proactive Type C | |
| | For Evaluation Score | Bund Damage | | 0 | There is no significant damage at present. |
| | | Bund Dimension | Bund Height | 1 | Free board height is 4.3 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 4/9 | |

Note) HGL: hydraulic gradient line

Bhakkar Flood Bund RD 60+000 to 70+000

Creation Date: 22/2/2024

| Province | Zone | Division | Circle |
|---|---|------------------------|---------------------------------|
| Punjab | Sargodha Zone | Bhakkar Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-026 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Bhakkar Flood Protection Bund | | RD 60+000 to 70+000 | 31°59'68.33"N, 70°88'32.71"E |
| Name of Vulnerable Point | Bhakkar Flood Bund RD 60+000 to 70+000: 5 structures in between these RDs | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> A Bela formation is observed at approximately one km from the protection bund. Due to this formation, the river's flow is shifted towards the said reach i.e. from RD 60+000 to 70+000 and the six allied structures present in this reach damaged. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> Extreme Turbulent flow was observed towards this reach. | | |
| Site Condition in the Country Side ² | Cultivated area was observed on the country side. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³

| Category | Quality Score |
|------------------------|---------------|
| Emergent Type C | 7/9 |







¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.




² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).

³ 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 | 554 feet | Not Applicable — |
| | H.F.L | 548.00 feet | |
| | Free Board Height | 6.00 feet | |
| | Top Width | 25 feet | |
| | River Side Slope | 1:3 | |
| | Country Side Slope | 1:2 | |
| | Longitudinal Length | 10000 feet (RD 60 to 70) | |
| | Slope Protection Material | Earthen | |
| | Covering Material/ Pavement on the Top | Earthen | |
| Embankment Material | Earthen | | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | |
| Typical Cross Section | | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| 2023 | Nose and Apron damage at RD 63+700 (Inverted hockey stud) | The nose and apron of the inverted hockey stud was damaged in 2023 flood at RD 63+700 | |
| | | | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| 2024 | Restoration of inverted hockey stud at RD 63+700 | Rs. 129Million (Estimate submitted) | Maintenance and Repair works |
| | | | |
| | | | |

| 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 Landside | | | |
| | <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 | | | |
|  |  | | | |
| | <p>Close View of Deformation</p>  <p>Erosion near Bhakkar Flood Bund at RD 663+000</p> | | | |

| | | |
|---|---|--|
| | <p>Close View of Damages</p>  <p>Apron, nose and stone pitching of the J head spur at RD 70+000 damaged</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>  |

| | |
|--|--|
| General View of Landside | |
| Facing Downstream Side | Facing Upstream Side |
| <p data-bbox="435 589 699 622">Photo with 360° angles</p>  | |
| Downstream End of the Bund | <p data-bbox="435 1021 592 1055">General View</p>  |
| <p data-bbox="435 1503 715 1536">Photo with 360° angles</p>  | |



Upstream End
of the Bund

General View (In the case that the VP is located near the end)




Photo with 360° angles



| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 22/2/2024 | Visual Inspection | <ul style="list-style-type: none"> Turbulent flow is observed near the solid stone inverted hockey stud at RD 60+250 (31°36.70 N, 70° 54.80 E). Turbulent flow is observed near the mole head spur at RD 60+700 (31°36.281 N, 70° 54.237 E). Extreme turbulent flow and erosion were observed at newly constructed solid stone studs (construction completed in 2023) at RD 62+500 (31°36.014 N, 70° 54.051 E) and RD 63+000 (31°35.96 N, 70°54.00 E) respectively. However, due to drifting of the river towards left side, these studs were under direct hit of the river. Apron and nose of inverted hockey stud at RD 63+700 (31°35.883 N, 70°53.866 E) were observed damaged. Also, Extreme turbulent flow and erosion observed at this stud. J-Head Spur (5462 feet length) at RD 70 +000 (31°35.810 N, 70°52.966 E) has also been under extreme turbulent flow and severe erosion. 2 newly constructed small studs at RD 34+05 and RD 39+05 of J-Head Spur also under extreme erosion (nose damaged). Apron, nose and stone pitching of the J-Head Spur at RD 70+000 also damaged. The estimate of which (187 Million) is under approval stage. | c |
| | |  <p>Erosive action at RD 62+500</p>  | |

⁴ 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

⁵ 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

| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|--|--|--|
| | | <p>Apron and nose of Inverted hockey stud at RD 63+700 observed</p>  <p>Apron, nose and stone pitching of the J-Head Spur at RD 70+000 damaged</p> | |

| 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 | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Emergent Type C | |
| | 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 | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | | Quality Score | | | 7/9 |

Note) HGL: hydraulic gradient line

Inverted Hockey Stud near Daggar Noon Village

Creation Date: 21/2/2024

| Province | Zone | Division | Circle |
|---|---|------------------------|---------------------------------|
| Punjab | Sargodha Zone | Khansar Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-027 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Inverted Hockey Stud near Daggar Noon Village | | | 32°11'78.33"N, 71°21'83.33"E |
| Name of Vulnerable Point | J-Head Spur Village Ravi at Kallurkot (Correct name: Inverted Hockey Stud near Daggar Noon Village) | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> • During 2022 flood, inverted portion of apron was damaged. • When discharge exceeds 275,000 cusecs, river flows toward the country side of the stud due to back water effect. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> • Standing water/pit observed towards country side. • Minor small creeks observed towards river side.. | | |
| Site Condition in the Country Side ² | Village Daggar Noon is situated approximately one km away from this stud. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³







| Category | Quality Score |
|-------------------|---------------|
| Monitoring | 4/9 |



¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.




² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).



³ 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 | 609.60 feet | Not Applicable — |
| | H.F. L | 603.60 feet | |
| | Free Board Height | 6.00 feet | |
| | Top Width | 30 feet. | |
| | River Side Slope | 1:3 | |
| | Country Side Slope | 1:2 | |
| | Longitudinal Length | 1109 | |
| | Slope Protection Material | Stone pitching on river side. 409' Curved portion stone pitched on country side. | |
| | Covering Material/ Pavement on the Top | 6-inch layer of single | |
| Embankment Material | Earthen | | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | |
| Typical Cross Section | <p>ESTIMATE FOR REPAIRING/MAINTAINING OF LAUNCHED APRON OF INVERTED HOCKEY AT RIVER INDUS IN KALLURKOT SECTION.</p> <p>X- SECTION AT RD 0+600</p> <p>Loose Stone Apron = 61.07' SR.</p> <p>Checked: [Signature] 14/5.</p> <p>Sub Engineer, Kallurkot Section, River Survey Sub Division, Kallurkot.</p> <p>Executive Engineer, Khansar Canal Division, Kallurkot.</p> <p>CHECKED [Signature] 14/5.</p> | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| 2022 | Apron damage | Apron damaged in 2022 flood season | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| 2023 | Apron restoration at village Daggar Noon Inverted Hockey Stud | Rs. 13.65 Million | Maintenace and repair works |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |

| 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 Landside | | |
| Facing Downstream Side | Facing Upstream Side | |
|  |  | |
| Close View of Deformation | | |
| Not Applicable | | |

| | | |
|---|--|-----------------------------|
| | <p>Close View of Damages</p> <p>Not Applicable</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> | |
| | <p>Facing Downstream Side</p> | <p>Facing Upstream Side</p> |
| | <p>Photo with 360° angles</p> | |
| <p>Downstream End of the Bund</p> | <p>General View</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 ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|--|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 21/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Reserve stock of stones is located near Village Daggar Noon, approximately one km away from the Stud. • River bed is observed on both sides of the stud. • Stone pitching is present on river side. • A 409 feet curved portion of stone pitching is observed on both sides.  <p>River bed observed on either side of the stud</p>  <p>Stone pitched side slopes observed on either side</p> | a |

⁴ 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

⁵ 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 | | No | The inundation analysis indicates that the flood damage is not 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 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Monitoring | |
| | 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 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 4/9 | |

Note) HGL: hydraulic gradient line

J-Head Spur Village Ravi at Kallurkot

Creation Date: 21/2/2024

| Province | Zone | Division | Circle |
|---|---|------------------------|---------------------------------|
| Punjab | Sargodha Zone | Khansar Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-028 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| J-Head Spur Village Ravi | | | 32°14'23.33"N, 71°24'83.33"E |
| Name of Vulnerable Point | J-Head Spur Village Ravi at Kallurkot | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> • In 2017 flood, apron of this spur damaged which restored in 2018. • This Spur was vulnerable in the past. At present, due to construction of Zimindara Bund on upstream side. This spur remained no longer vulnerable. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> • No flow conditions. | | |
| Site Condition in the Country Side ² | Crops are present on the country side, where Village Ravi is also located. Bottom level is approximately 15 feet from the top level. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³







| Category | Quality Score |
|-------------------|---------------|
| Monitoring | 3/9 |



¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.



² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).


³ 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 | 611.00 feet | Not Applicable - | | | | | | | | | | | | | | | | |
| | H.F. L | 605.60 feet | | | | | | | | | | | | | | | | | |
| | Free Board Height | 5.40 feet | | | | | | | | | | | | | | | | | |
| | Top Width | 30 feet | | | | | | | | | | | | | | | | | |
| | River Side Slope | 1:3 | | | | | | | | | | | | | | | | | |
| | Country Side Slope | 1:2 | | | | | | | | | | | | | | | | | |
| | Longitudinal Length | 1983 | | | | | | | | | | | | | | | | | |
| | Slope Protection Material | Stone pitching on river side, no stone pitching on country side. | | | | | | | | | | | | | | | | | |
| | Covering Material/ Pavement on the Top | 6-inch layer of single | | | | | | | | | | | | | | | | | |
| | Embankment Material | Earthen | | | | | | | | | | | | | | | | | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Main River creak is Approximately 1 km away. | | | | | | | | | | | | | | | | | | |
| Typical Cross Section | <p align="center">ESTIMATE FOR REPAIRING/MAINTAINING LAUNCHED APRON OF J-HEAD SPUR VILLAGE RAVI AT KALLURKOT.</p> <p align="center">X- SECTION AT RD 0+950</p> <p align="center">Loose Stone Apron = $(9+12)/2 \times 6 = 63.00$ Sq. Ft.</p> <p align="center">Sub Engineer Kallurkot Section.</p> <p align="center">Sub Divisional Officer River Survey Sub Division Kallurkot.</p> <p align="center">Executive Engineer Khansar Canal Division Kallurkot.</p> | | | | | | | | | | | | | | | | | | |
| | <p 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>2017</td> <td>Apron damage</td> <td>Apron was damaged during the 2017 flood events</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> | | | | MM/YYYY | Type of Damage | Description | 2017 | Apron damage | Apron was damaged during the 2017 flood events | | | | | | | | | |
| MM/YYYY | Type of Damage | Description | | | | | | | | | | | | | | | | | |
| 2017 | Apron damage | Apron was damaged during the 2017 flood events | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| <p align="center">Record of Rehabilitation/ Improvement</p> <table border="1"> <thead> <tr> <th>MM/YYYY</th> <th>Project Name and its Description</th> <th>Cost</th> <th>Source of Funding</th> </tr> </thead> <tbody> <tr> <td>2018</td> <td>Apron restoration at village Ravi J-Head Spur</td> <td>Not provided by field staff</td> <td>Maintenance and Repair works by PID</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | | | | MM/YYYY | Project Name and its Description | Cost | Source of Funding | 2018 | Apron restoration at village Ravi J-Head Spur | Not provided by field staff | Maintenance and Repair works by PID | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | | | | | | |
| 2018 | Apron restoration at village Ravi J-Head Spur | Not provided by field staff | Maintenance and Repair works by PID | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| <p align="center">Plan for Rehabilitation/ Improvement</p> <table border="1"> <thead> <tr> <th>MM/YYYY</th> <th>Project Name and its Description</th> <th>Cost</th> <th>Source of Funding</th> </tr> </thead> <tbody> <tr> <td></td> <td>Nil</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | | | | MM/YYYY | Project Name and its Description | Cost | Source of Funding | | Nil | | | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | | | | | | |
| | Nil | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

| 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 Landside | |
| Facing Downstream Side | |
|  | |
| Facing Upstream Side | |
|  32.1422, 71.24873, 147.9m, 183° | |
| Close View of Deformation | |
| Not Applicable | |

| | | |
|---|--|-----------------------------|
| | <p>Close View of Damages</p> <p style="text-align: center;">Not Applicable</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> | |
| | <p>Facing Downstream Side</p> | <p>Facing Upstream Side</p> |
| | <p>Photo with 360° angles</p> | |
| <p>Downstream End of the Bund</p> | <p>General View</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 ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 21/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • 100 % reserve stock of stones is distributed along the entire length of J-Head Spur. • Ravi village is located a approximately 300 meters situated away from the Spur. • Cultivated area has been observed on country side.  <p>Reserve stone stock on top of bund and cropped area of country side</p> | a |

⁴ 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

⁵ 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 | | No | The inundation analysis indicates that the flood damage is not severe. |
| | | Bund Damage | | NO | There is no significant damage at present. |
| | | Bund Dimension | Bund Height | Fail | Free board height is 5.4 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | Floodplain length is about 1100 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. | |
| | Category | | | Monitoring | |
| | For Evaluation Score | Bund Damage | | 0 | There is no significant damage at present. |
| | | Bund Dimension | Bund Height | 1 | Free board height is 5.4 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 1 | Floodplain length is about 1100 feet. |
| | Quality Score | | | 3/9 | |

Note) HGL: hydraulic gradient line

Sloping Spur at RD 37+750 Shah Wala Groyne

Creation Date: 24/2/2024

| Province | Zone | Division | Circle |
|---|--|-----------------------|---------------------------------|
| Punjab | Sargodha Zone | Layyah Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-029a | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Shahwala Groyne | | RD 35+000 to 42+000 | 30°78'35.63"N, 70°86'00.43"E |
| Name of Vulnerable Point | Shahwala Groyne RD 35+000 to 42+000_1 | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> A small creek of River Indus flows along the spur. When the discharge exceeds 100,000 cusecs, this creek becomes active and impact the spur leading to he erosion of apron and pitching. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> The inactive small creek passes approximately 10 feet away from the spur. | | |
| Site Condition in the Country Side ² | <ul style="list-style-type: none"> Cultivated area is observed in the river bed on the downstream of the river. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³

| Category | Quality Score |
|------------------------|---------------|
| Emergent Type C | 7/9 |




¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.


² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).



³ 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 | 466.58 feet (Sloping portion), 479.58 feet (Shank portion) | Not Applicable — | | | | | | | | | | | |
| | H.F.L | 473.51 feet | | | | | | | | | | | | |
| | Free Board Height | 6.07 feet | | | | | | | | | | | | |
| | Top Width | 25 feet | | | | | | | | | | | | |
| | River Side Slope | 1:2 | | | | | | | | | | | | |
| | Country Side Slope | 1:2 | | | | | | | | | | | | |
| | Longitudinal Length | 750 feet | | | | | | | | | | | | |
| | Slope Protection Material | Stone pitching on either side of spur | | | | | | | | | | | | |
| | Covering Material/ Pavement on the Top | Shingle on the top | | | | | | | | | | | | |
| | Embankment Material | Earthen (Silty clay) | | | | | | | | | | | | |
| | Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | | | | | | | | | | | |
| Typical Cross Section | | | | | | | | | | | | | | |
| | <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>2020</td> <td>Apron damage</td> <td>Apron of sloping spur was damaged during 2020 flood</td> </tr> <tr> <td>2023</td> <td>Apron damage</td> <td>Apron was damaged in 2023 flood season</td> </tr> <tr> <td>At present</td> <td>Apron and nose damage</td> <td>Apron and nose were observed damages due to small creek near the spur</td> </tr> </tbody> </table> | | | MM/YYYY | Type of Damage | Description | 2020 | Apron damage | Apron of sloping spur was damaged during 2020 flood | 2023 | Apron damage | Apron was damaged in 2023 flood season | At present | Apron and nose damage |
| MM/YYYY | Type of Damage | Description | | | | | | | | | | | | |
| 2020 | Apron damage | Apron of sloping spur was damaged during 2020 flood | | | | | | | | | | | | |
| 2023 | Apron damage | Apron was damaged in 2023 flood season | | | | | | | | | | | | |
| At present | Apron and nose damage | Apron and nose were observed damages due to small creek near the spur | | | | | | | | | | | | |
| Record of Rehabilitation/ Improvement | | | | | | | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | |
| 2021 | Apron restored | Not provided by field staff | Maintenance and repair works of PID | | | | | | | | | | | |
| Plan for Rehabilitation/ Improvement | | | | | | | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | |
| 2024 | A proposal for the restoration of the apron and nose damage has been submitted for approval. The new proposal includes changing the sloping spur into a J-head spur | 82 M | Maintenance and repair works of PID | | | | | | | | | | | |

| 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 Landside | | | | | |
| <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>Top width and side slopes short</p> | | | | |

| | | | | | | | | | | | | | | | | |
|---|--|--|----------------------------|--|------------------------|----------------------|---------------------|--|------------------------|----------------------|--------------------------|--|------------------------|----------------------|------------------------|--|
| | <p>Close View of Damages</p>  <p>30.78369, 70.85991, 99.6m, 51°</p> <p>Damaged apron</p> | | | | | | | | | | | | | | | |
| | <p>Photo with 360° angles</p>  | | | | | | | | | | | | | | | |
| <p>Typical Section (Adjacent to the Vulnerable Point)</p> | <table border="1"> <tr> <td colspan="2" data-bbox="437 1160 908 1211">General View of River Side</td> </tr> <tr> <td data-bbox="437 1211 908 1305">Facing Downstream Side</td> <td data-bbox="908 1211 1361 1305">Facing Upstream Side</td> </tr> <tr> <td colspan="2" data-bbox="437 1305 908 1357">General View of Top</td> </tr> <tr> <td data-bbox="437 1357 908 1451">Facing Downstream Side</td> <td data-bbox="908 1357 1361 1451">Facing Upstream Side</td> </tr> <tr> <td colspan="2" data-bbox="437 1451 908 1503">General View of Landside</td> </tr> <tr> <td data-bbox="437 1503 908 1576">Facing Downstream Side</td> <td data-bbox="908 1503 1361 1576">Facing Upstream Side</td> </tr> <tr> <td colspan="2" data-bbox="437 1576 908 1626">Photo with 360° angles</td> </tr> </table> | | 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 | |
| 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 | | | | | | | | | | | | | | | | |
| <p>Downstream End of the Bund</p> | <p>General View</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>Not Applicable</p> |
| | <p>Photo with 360° angles</p> <p>Not Applicable</p> |

| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|--|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 24/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Apron of the sloping spur is directly hit by the small creek of the river. • Nose portion is also damaged due to erosion. • Cultivated area are observed downstream of the river around the spur.  <p>Apron of the sloping spur is under direct impact of the small creek of river</p>  <p>Cultivated area is observed in the downstream of the river</p> | c |

⁴ 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

⁵ 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 | It was repaired after the 2020 flood but was damaged again in 2023 and remains damaged. |
| | | Bund Dimension | Bund Height | Fail | Free board height is 6.1 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Emergent Type C | |
| | For Evaluation Score | Bund Damage | | 3 | It was repaired after the 2020 flood but was damaged again in 2023 and remains damaged. |
| | | Bund Dimension | Bund Height | 1 | Free board height is 6.1 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 7/9 | |

Note) HGL: hydraulic gradient line

4 No. Solid Stone Studs RD 38+800 to 39+600

Creation Date: 24/2/2024

| Province | Zone | Division | Circle |
|---|--|-----------------------|---------------------------------|
| Punjab | Sargodha Zone | Layyah Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-029b | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Shahwala Groyne | | RD 35+000 to 42+000 | 30°77'86.41"N, 70°86'12.66"E |
| Name of Vulnerable Point | Shahwala Groyne RD 35+000 to 42+000_2 | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> The entire reach is directly impacted by the small river creek, which usually becomes active during low floods. Stud number 2 is completely damaged, while other studs are partly damaged due to stones settlement. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> Small creek was flowing near the studs. | | |
| Site Condition in the Country Side ² | <ul style="list-style-type: none"> River bed is present on the both sides. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³

| Category | Quality Score |
|------------------------|---------------|
| Emergent Type C | 7/9 |

¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).



³ 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 | 479.23 feet | Not Applicable - |
| | H.F.L | 473.23 feet | |
| | Free Board Height | 6.00 feet | |
| | Top Width | 20 feet | |
| | River Side Slope | 1:1 | |
| | Country Side Slope | 1:1 | |
| | Longitudinal Length | 100 feet | |
| | Slope Protection Material | Stones | |
| | Covering Material/ Pavement on the Top | Stones | |
| | Embankment Material | Stones | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | |
| Typical Cross Section | | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| 2023 | Stone settlement | Stud number 2 is completely damaged, while other studs have partly damaged due to stones settlement | |
| At present | Stone settlement | The situation is the same as in 2023. | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| 2024 | A proposal has been submitted for approval. Thenew proposal includes adding stone pitching on the river side.) | Rs. 91 Million | Maintenance and Repair works of PID |
| | | | |
| | | | |

| 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 | | | |
| | <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 Landside | | | |
| | <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>Partially damaged stone stud</p> | | | |

| | | |
|---|---|--|
| | <p>Close View of Damages</p>  <p>Damaged River Side Slope</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>  |

| | | |
|----------------------------|--|--|
| | General View of Landside | |
| | Facing Downstream Side  | Facing Upstream Side  |
| | Photo with 360° angles  | |
| Downstream End of the Bund | General View  | |
| | Photo with 360° angles  | |
| Upstream End of the Bund | General View (In the case that the VP is located near the end) Not Applicable | |
| | Photo with 360° angles N/A | |

| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 24/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Stud Number 2 is completely damaged due to Stone settlement • Stud Number 1, 3, and 4 are partially damaged. • Active turbulent flow is observed along either side of the studs.  <p>Damaged stone Stud No. 02</p>  <p>Partially damaged stone Stud No. 01</p> | c |

⁴ 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

⁵ 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 | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Emergent Type C | |
| | 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 | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 7/9 | |

Note) HGL: hydraulic gradient line

Sloping Spur at RD 40+700 Shah Wala Groyne

Creation Date: 24/2/2024
















| Province | Zone | Division | Circle |
|---|---|-----------------------|---------------------------------|
| Punjab | Sargodha Zone | Layyah Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-029c | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Shahwala Groyne | | RD 35+000 to 42+000 | 30°77'41.67"N, 70°86'12.99"E |
| Name of Vulnerable Point | Shahwala Groyne RD 35+000 to 42+000_3 | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> • Small creek of river Indus flows along the spur. • The sloping portion and apron of this spur were damaged during 2023 floods. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> • The inactive small creek passes along the spur. • Deep pit is observed upstream of this spur. | | |
| Site Condition in the Country Side ² | <ul style="list-style-type: none"> • Cultivated area is observed in the river bed on the downstream of the river. | | |
| Layout Plan (Source of Satellite Image: Google Earth) | | | |
| | | | |
| Evaluation ³ | | | |
| Category | | Quality Score | |
| Emergent Type C | | 7/9 | |



¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).




³ 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 | 472.75 feet (Solid portion), 478.25 feet (Shank portion) | Not Applicable — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | H.F.L | 472.73 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Free Board Height | 5.52 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Top Width | 25 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | River Side Slope | 1:2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Country Side Slope | 1:2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Longitudinal Length | 800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Slope Protection Material | Stone pitching on either side of spur. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Covering Material/ Pavement on the Top | Single on the top | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Embankment Material | Earthen (Silty clay) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Typical Cross Section | <table border="1"> <thead> <tr> <th colspan="2">Existing</th> <th colspan="2">Design</th> </tr> <tr> <th>Dist</th> <th>Elev</th> <th>Dist</th> <th>Elev</th> </tr> </thead> <tbody> <tr> <td>-17.00</td> <td>448.540</td> <td></td> <td></td> </tr> <tr> <td>-47.00</td> <td>450.540</td> <td></td> <td></td> </tr> <tr> <td>-17.00</td> <td>451.540</td> <td></td> <td></td> </tr> <tr> <td>-27.00</td> <td>457.540</td> <td></td> <td></td> </tr> <tr> <td>-22.00</td> <td>460.540</td> <td></td> <td></td> </tr> <tr> <td>-12.00</td> <td>463.540</td> <td></td> <td></td> </tr> <tr> <td>-0.00</td> <td>468.570</td> <td></td> <td></td> </tr> <tr> <td>0.00</td> <td>469.770</td> <td>0.00</td> <td>472.750</td> </tr> <tr> <td>13.00</td> <td>466.000</td> <td></td> <td></td> </tr> <tr> <td>11.00</td> <td>465.000</td> <td></td> <td></td> </tr> <tr> <td>15.00</td> <td>461.540</td> <td></td> <td></td> </tr> <tr> <td>21.00</td> <td>459.540</td> <td></td> <td></td> </tr> <tr> <td>23.00</td> <td>456.540</td> <td></td> <td></td> </tr> <tr> <td>43.00</td> <td>445.540</td> <td></td> <td></td> </tr> <tr> <td>51.00</td> <td>442.540</td> <td></td> <td></td> </tr> </tbody> </table> | | | Existing | | Design | | Dist | Elev | Dist | Elev | -17.00 | 448.540 | | | -47.00 | 450.540 | | | -17.00 | 451.540 | | | -27.00 | 457.540 | | | -22.00 | 460.540 | | | -12.00 | 463.540 | | | -0.00 | 468.570 | | | 0.00 | 469.770 | 0.00 | 472.750 | 13.00 | 466.000 | | | 11.00 | 465.000 | | | 15.00 | 461.540 | | | 21.00 | 459.540 | | | 23.00 | 456.540 | | | 43.00 | 445.540 | | | 51.00 | 442.540 | | |
| | Existing | | Design | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dist | Elev | Dist | Elev | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -17.00 | 448.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -47.00 | 450.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -17.00 | 451.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -27.00 | 457.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -22.00 | 460.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -12.00 | 463.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -0.00 | 468.570 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.00 | 469.770 | 0.00 | 472.750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13.00 | 466.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.00 | 465.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15.00 | 461.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21.00 | 459.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23.00 | 456.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 43.00 | 445.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51.00 | 442.540 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| History of Damages | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Type of Damage | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2023 | Apron and sloping portion damage | Apron and sloping portion damaged in 2023 flood season | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Record of Rehabilitation/ Improvement | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nil | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plan for Rehabilitation/ Improvement | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Project Name and Description | Cost | Source of Funding | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2024 | A proposal for the restoration of the apron and sloping portion damage has been submitted for approval. | Rs. 82 Million | Maintenance and eepair works of PID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| 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 Landside | | | | | |
| <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 | | | | | |
|  | | | | | |
| Nose portion and shank are not in completely aligned | | | | | |

| | | |
|---|--|--|
| | <p>Close View of Damages</p>  <p>Damaged apron of the spur</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 Not Applicable</p> | <p>Facing Upstream Side Not Applicable</p> |
| | <p>General View of Top</p> | |
| | <p>Facing Downstream Side Not Applicable</p> | <p>Facing Upstream Side Not Applicable</p> |
| | <p>General View of Landside</p> | |
| | <p>Facing Downstream Side Not Applicable</p> | <p>Facing Upstream Side Not Applicable</p> |
| | <p>Photo with 360° angles Not Applicable</p> | |

| | |
|---------------------------------------|---|
| <p>Downstream End of the Bund</p> | <p>General View</p>  |
| | <p>360 Degrees Photo</p>  |
| <p>Upstream End of the Bund</p> | <p>General View (In the case that the VP is located near the end)</p> <p>Not Applicable</p> |
| | <p>Photo with 360° angles</p> <p>Not Applicable</p> |

| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 24/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Apron of the sloping spur is under direct impact of the small creek of river. • Nose portion is damaged due to erosion. • Cultivated area is observed in the downstream of the river around the spur. • A pit/pond observed on the upstream side of the spur.  <p>Apron of the spur found damaged</p>  <p>Cultivated area is observed in the downstream of the river</p>  <p>A pit pond observed on the upstream side of the spur</p> | c |

⁴ 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

⁵ 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 5.5 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Emergent Type C | |
| | For Evaluation Score | Bund Damage | | 3 | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | 1 | Free board height is 5.5 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 7/9 | |

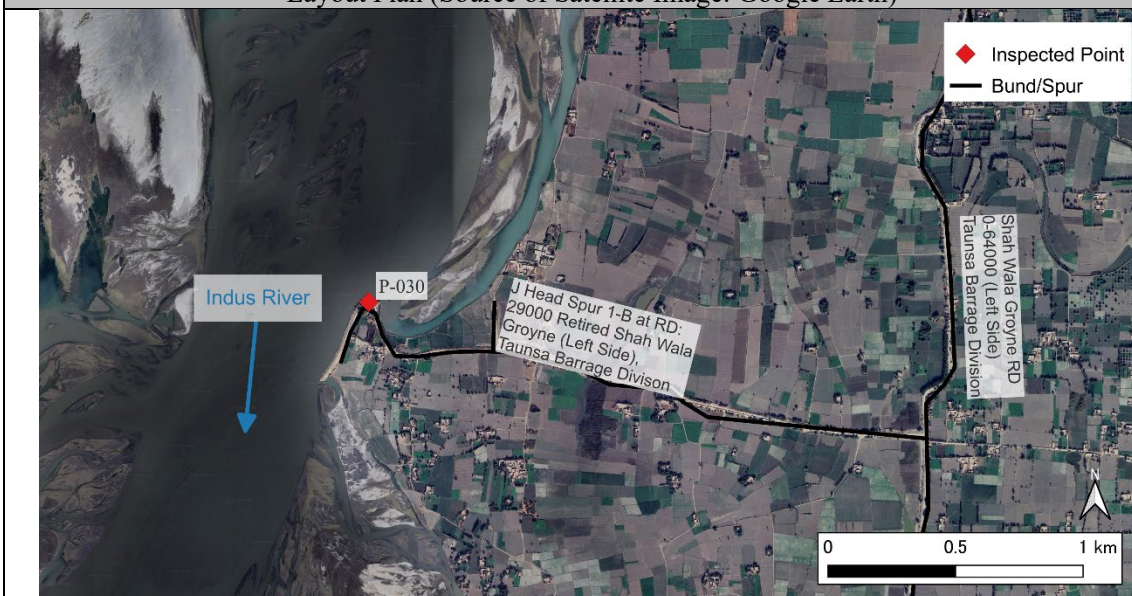
Note) HGL: hydraulic gradient line

Additional J-Head Spur 1-B at RD 29+000 Shah Wala Groyne

Creation Date: 24/2/2024

| Province | Zone | Division | Circle |
|---|---|-----------------------|------------------------------|
| Punjab | Sargodha Zone | Layyah Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-030 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Shahwala Groyne | | RD 29+000 | 30°81'12.58"N, 70°84'58.74"E |
| Name of Vulnerable Point | J-Head Spur 1-B at RD 29+000 Shah Wala Groyne | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> Apron of the J-Head Spur is directly impacted by the river, with continuous erosion occurring around the spur. Apron is damaged from RD 7+633 to RD 9+002. Nose portion is also completely damaged due to continuous erosion. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> The trend of the river is directly towards the J-Head Spur, with extreme turbulent flow is observed. | | |
| Site Condition in the Country Side ² | Cultivated area is observed in the river bed around the mole head portion. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³

| Category | Quality Score |
|------------------------|---------------|
| Emergent Type C | 7/9 |

¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.





² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).




³ 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 | 472.30 feet (Sloping portion), 477.3 feet (Shank portion) | Not Applicable - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | H.F.L | 475.61 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Free Board Height | 1.69 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Top Width | 30 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | River Side Slope | 1:2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Country Side Slope | 1:3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Longitudinal Length | 3510 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Slope Protection Material | Stone pitching on river side. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Covering Material/ Pavement on the Top | Single on the top | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Embankment Material | Earthen (Silty clay) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Typical Cross Section | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Design | | Existing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dist | Elev | Dist | Elev | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 472.30 | | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0+00 | 472.30 | 0+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10+00 | 472.30 | 10+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20+00 | 472.30 | 20+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30+00 | 472.30 | 30+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40+00 | 472.30 | 40+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50+00 | 472.30 | 50+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 60+00 | 472.30 | 60+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 70+00 | 472.30 | 70+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 80+00 | 472.30 | 80+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 90+00 | 472.30 | 90+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100+00 | 472.30 | 100+00 | 471.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| History of Damages | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Type of Damage | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2022 | Apron damage | Apron was damaged during 2022 flood season | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2023 | Apron damage | Apron was damaged during 2023 flood season | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| At present | Apron and nose damage | Apron and nose were observed damaged due to river shifting towards the spur | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Record of Rehabilitation/ Improvement | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2022 | Apron restored after 2022 flood. | Not available | Maintenance and repair works of PID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plan for Rehabilitation/ Improvement | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2024 | A proposal for the restoration of the apron and nose damage has been submitted for approval. | Rs. 100.404 Million | Maintenance and repair works of PID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| 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> <p>30.81118, 70.84549, 99.9m, 41°</p> </td> <td> <p>30.81112, 70.84549, 103.3m, 222°</p> </td> </tr> </table> | Facing Downstream Side | Facing Upstream Side |  <p>30.81118, 70.84549, 99.9m, 41°</p> |  <p>30.81112, 70.84549, 103.3m, 222°</p> |
| | Facing Downstream Side | Facing Upstream Side | | | |
| |  <p>30.81118, 70.84549, 99.9m, 41°</p> |  <p>30.81112, 70.84549, 103.3m, 222°</p> | | | |
| | General View of Landside | | | | |
| | <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 | Not Applicable | | | | |
| Close View of Damages |  <p>30.81115, 70.84545, 101.3m, 284°</p> <p>Damaged apron of the spur</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>30.80976, 70.85205, 106.5m, 81°</p> | <p>Facing Upstream Side</p>  |
| | <p>General View of Landside</p> | |
| | <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  |
| | <p>Photo with 360° angles</p>  | |

| | |
|---|---|
| <p>Downstream End of the Bund</p> | <p>General View</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 ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 24/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • A reserve stock of stones is present along the entire length of J-Head Spur. • The trend of the river is directly towards the J-Head Spur. Extreme turbulent flow observed. • Apron of the J-Head Spur is under direct hit of the river and continuous erosion occurring around the spur. • Nose portion is completely damaged due to continuous erosion. • Cultivated area is observed in the river bed around the mole head portion.  <p>Reserve stock of stones present throughout the length of J-Head Spur</p>  <p>Damaged apron of the spur</p>  <p>Cultivated area is observed in the river bed around the mole head portion.</p> | c |

⁴ 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

⁵ 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 1.7 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Emergent Type C | |
| | For Evaluation Score | Bund Damage | | 3 | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | 1 | Free board height is 1.7 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 7/9 | |

Note) HGL: hydraulic gradient line

RD 58+000 to 62+000 Shah Wala Groyne

Creation Date: 24/2/2024

| Province | Zone | Division | Circle |
|---|---|-----------------------|---------------------------------|
| Punjab | Sargodha Zone | Layyah Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-031 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Shahwala Groyne | | RD 58+000 to 62+000 | 30°72'54.34"N, 70°85'32.95"E |
| Name of Vulnerable Point | X Spur at RD 58+000 to 62+000 Shah Wala Groyne | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> • X Spur at RD 60 +000 of Shah Wala Groyne Apron and stone pitching damaged over a length of 180 feet. • X Spur at RD 62+000 of Shah Wala Groyne; slope, nose portion upstream, and downstream apron and pitching portion damaged in 2023 flood. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> • Extreme Turbulent flow observed. | | |
| Site Condition in the Country Side ² | Cultivated area is observed in this reach. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³

| Category | Quality Score |
|------------------------|---------------|
| Emergent Type C | 6/9 |





















¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).



³ 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 | Not Item | Existing | Proposed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Top Elevation | 474.79 feet | Not Applicable — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | H.F. L | 466.79 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Free Board Height | 8.00 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Top Width | 25 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | River Side Slope | 1:2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Country Side Slope | 1:3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Longitudinal Length | 4000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Slope Protection Material | Stone pitching on river side | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Covering Material/ Pavement on the Top | Shingle on the top | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Embankment Material | Earthen (Silty clay) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Typical Cross Section | <p>ESTIMATE FOR THE RESTORATION OF SHAH WALA GROUYNE PROTECTION BUND ALONG WITH ALLIED RIVER TRAINING WORKS. Water Level = 461.36 Dated 27-09-2023 RD : 58+000 Shah Wala-Groyne</p> <p>Top Width = 20 Ft Top R.L. = 474.79</p> <p>Cutting = 152.24 Ft Apron = 165.75 Ft</p> <table border="1"> <thead> <tr> <th>Design</th> <th>Ditch</th> <th>Elev.</th> </tr> </thead> <tbody> <tr> <td>11.000</td> <td>474.790</td> <td>474.790</td> </tr> <tr> <td>11.000</td> <td>474.800</td> <td>474.800</td> </tr> <tr> <td>11.000</td> <td>474.810</td> <td>474.810</td> </tr> <tr> <td>11.000</td> <td>474.820</td> <td>474.820</td> </tr> <tr> <td>11.000</td> <td>474.830</td> <td>474.830</td> </tr> <tr> <td>11.000</td> <td>474.840</td> <td>474.840</td> </tr> <tr> <td>11.000</td> <td>474.850</td> <td>474.850</td> </tr> <tr> <td>11.000</td> <td>474.860</td> <td>474.860</td> </tr> <tr> <td>11.000</td> <td>474.870</td> <td>474.870</td> </tr> <tr> <td>11.000</td> <td>474.880</td> <td>474.880</td> </tr> <tr> <td>11.000</td> <td>474.890</td> <td>474.890</td> </tr> <tr> <td>11.000</td> <td>474.900</td> <td>474.900</td> </tr> <tr> <td>11.000</td> <td>474.910</td> <td>474.910</td> </tr> <tr> <td>11.000</td> <td>474.920</td> <td>474.920</td> </tr> <tr> <td>11.000</td> <td>474.930</td> <td>474.930</td> </tr> <tr> <td>11.000</td> <td>474.940</td> <td>474.940</td> </tr> <tr> <td>11.000</td> <td>474.950</td> <td>474.950</td> </tr> <tr> <td>11.000</td> <td>474.960</td> <td>474.960</td> </tr> <tr> <td>11.000</td> <td>474.970</td> <td>474.970</td> </tr> <tr> <td>11.000</td> <td>474.980</td> <td>474.980</td> </tr> <tr> <td>11.000</td> <td>474.990</td> <td>474.990</td> </tr> <tr> <td>11.000</td> <td>475.000</td> <td>475.000</td> </tr> </tbody> </table> <p>CHECKED Draftsman Layyah Irrigation Division LAYYAH</p> <p>Sub Divisional Officer Flood Byrd Sub Division Shahwala Groyne Layyah</p> <p>CHECKED DRAFTSMAN Sargodha Irrigation Zone Sargodha</p> <p>Executive Engineer Layyah Irrigation Division Layyah</p> | | | Design | Ditch | Elev. | 11.000 | 474.790 | 474.790 | 11.000 | 474.800 | 474.800 | 11.000 | 474.810 | 474.810 | 11.000 | 474.820 | 474.820 | 11.000 | 474.830 | 474.830 | 11.000 | 474.840 | 474.840 | 11.000 | 474.850 | 474.850 | 11.000 | 474.860 | 474.860 | 11.000 | 474.870 | 474.870 | 11.000 | 474.880 | 474.880 | 11.000 | 474.890 | 474.890 | 11.000 | 474.900 | 474.900 | 11.000 | 474.910 | 474.910 | 11.000 | 474.920 | 474.920 | 11.000 | 474.930 | 474.930 | 11.000 | 474.940 | 474.940 | 11.000 | 474.950 | 474.950 | 11.000 | 474.960 | 474.960 | 11.000 | 474.970 | 474.970 | 11.000 | 474.980 | 474.980 | 11.000 | 474.990 | 474.990 | 11.000 | 475.000 | 475.000 |
| Design | Ditch | Elev. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.790 | 474.790 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.800 | 474.800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.810 | 474.810 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.820 | 474.820 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.830 | 474.830 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.840 | 474.840 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.850 | 474.850 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.860 | 474.860 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.870 | 474.870 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.880 | 474.880 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.890 | 474.890 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.900 | 474.900 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.910 | 474.910 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.920 | 474.920 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.930 | 474.930 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.940 | 474.940 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.950 | 474.950 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.960 | 474.960 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.970 | 474.970 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.980 | 474.980 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 474.990 | 474.990 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.000 | 475.000 | 475.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| History of Damages | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Type of Damage | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2023 | Apron and stone pitching damage | X spur at RD 60+000 of Shah Wala Groyne Apron and stone pitching damaged in a length of 180 feet. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2023 | Slope, nose portion upstream and downstream Apron and pitching portions are damaged | X spur at RD 62+000 of Shah Wala Groyne; slope, nose portion upstream and downstream Apron and pitching portion damaged in 2023 flood. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nil | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plan for Rehabilitation/ Improvement | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2024 | Proposal submitted for approval | Rs. 46 Million | Maintenance and repair works of PID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| 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>  <p>30.72553, 70.85327, 106.2m, 257°</p> </td> </tr> </table> | <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  <p>30.72553, 70.85327, 106.2m, 257°</p> |
| | <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  <p>30.72553, 70.85327, 106.2m, 257°</p> | |
| | <p>General View of Top</p> <table border="1"> <tr> <td> <p>Facing Downstream Side</p>  </td> <td> <p>Facing Upstream Side</p>  <p>30.72552, 70.85328, 106.1m, 104°</p> </td> </tr> </table> | <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  <p>30.72552, 70.85328, 106.1m, 104°</p> |
| | <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  <p>30.72552, 70.85328, 106.1m, 104°</p> | |
| <p>General View of Landside</p> <table border="1"> <tr> <td> <p>Facing Downstream Side</p>  <p>30.72545, 70.85331, 105.2m, 234°</p> </td> <td> <p>Facing Upstream Side</p>  <p>30.7255, 70.8533, 106.2m, 93°</p> </td> </tr> </table> | <p>Facing Downstream Side</p>  <p>30.72545, 70.85331, 105.2m, 234°</p> | <p>Facing Upstream Side</p>  <p>30.7255, 70.8533, 106.2m, 93°</p> | |
| <p>Facing Downstream Side</p>  <p>30.72545, 70.85331, 105.2m, 234°</p> | <p>Facing Upstream Side</p>  <p>30.7255, 70.8533, 106.2m, 93°</p> | | |
| <p>Close View of Deformation</p>  <p>30.72547, 70.85332, 105.6m, 155°</p> <p>Nose portion lower than the Shank portion</p> | | | |

| | | | | |
|---|---|--|---|--|
| | <p>Close View of Damages</p>  <p>Apron damaged</p> | | | |
| | <p>Photo with 360° angles</p>  | | | |
| <p>Typical Section (Adjacent to the Vulnerable Point)</p> | <p>General View of River Side</p> <table border="1" data-bbox="437 1211 1361 1451"> <tr> <td data-bbox="437 1211 908 1451"> <p>Facing Downstream Side</p>  </td> <td data-bbox="908 1211 1361 1451"> <p>Facing Upstream Side</p>  </td> </tr> </table> | | <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  |
| <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  | | | |
| | <p>General View of Top</p> <table border="1" data-bbox="437 1503 1361 1742"> <tr> <td data-bbox="437 1503 908 1742"> <p>Facing Downstream Side</p>  </td> <td data-bbox="908 1503 1361 1742"> <p>Facing Upstream Side</p>  </td> </tr> </table> | | <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  |
| <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  | | | |
| | <p>General View of Landside</p> <table border="1" data-bbox="437 1794 1361 2024"> <tr> <td data-bbox="437 1794 908 2024"> <p>Facing Downstream Side</p>  </td> <td data-bbox="908 1794 1361 2024"> <p>Facing Upstream Side</p>  </td> </tr> </table> | | <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  |
| <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  | | | |

| | |
|---------------------------------------|--|
| | <p>Photo with 360° angles</p>  |
| <p>Downstream End of the Bund</p> | <p>General View</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 style="text-align: center;">Not Applicable</p> <hr/> <p>Photo with 360° angles</p> <p style="text-align: center;">Not Applicable</p> |

| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|--|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 24/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Cultivated area is observed on the country side of this reach. • Main river directly impacts the spurs in this reach. • Extreme turbulent flow is observed.  <p>Nose portion lower than the shank portion</p>  <p>Cultivated area is observed on the country side</p> | c |

⁴ 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

⁵ 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 | Pass | Free board height is 8 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Emergent Type C | |
| | For Evaluation Score | Bund Damage | | 3 | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | 0 | Free board height is 8 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 6/9 | |

Note) HGL: hydraulic gradient line

Inverted Hockey Spur at RD 66+000 of Shah Wala Groyne

Creation Date: 24/2/2024

| Province | Zone | Division | Circle |
|---|--|-----------------------|---------------------------------|
| Punjab | Sargodha Zone | Layyah Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-032 | Indus River | Indus River | Left |
| Bund Name | | R.D. | GPS Coordinates |
| Shahwala Groyne | | RD 66+000 | 30°70'34.29"N, 70°85'80.32"E |
| Name of Vulnerable Point | Inverted Hockey Spur at RD 66+000 of Shah Wala Groyne | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> • Apron is damaged during 2024 at the time of inspection. • River directly hits the spur in this reach. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> • Extreme turbulent flow is observed. | | |
| Site Condition in the Country Side ² | Cultivated area is observed on the downstream side of the spur. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³

| Category | Quality Score |
|------------------------|---------------|
| Emergent Type C | 7/9 |







¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).



³ 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 | 468.00feet | Not Applicable — |
| | H.F.L | 465.95 feet | |
| | Free Board Height | 2.05 feet | |
| | Top Width | 25 feet | |
| | River Side Slope | 1:2 | |
| | Country Side Slope | 1:3 | |
| | Longitudinal Length | 4900 | |
| | Slope Protection Material | Stone pitching on river side 500 feet end portion stone pitched on country side. | |
| | Covering Material/ Pavement on the Top | Shingle on the top | |
| Embankment Material | Earthen (Silty clay) | | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | |
| Typical Cross Section | <p>I.P.C NO 2. FOR THE RESTORATION OF INVERTED HOCKEY SPUR AT RD 66+000 OF SHAHWALA GROVNE. X-SECTION AT RD 4+875</p> <p>COUNTRY SIDE SLOPE: 1:2 RIVER SIDE SLOPE: 1:2</p> <p>Existing Filling = 254.03 SR As Built Filling = 252.60 SR</p> <p>Existing Apron = 262.48 SR As built Apron = 253.93 SR</p> <p>Sub Engineer: [Signature] Sub Divisional Officer, [Signature] District Engineer, [Signature]</p> | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| 2023 | Apron damage | Apron of the spur damaged in 2023 flood | |
| | | | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| 2024 | Proposal is under consideration. Not submitted | Not provided by field staff | Maintenance and repair works |
| | | | |
| | | | |

| 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 |  |  |
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| |  |  | | | |
| | General View of Landside | | | | |
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| Facing Downstream Side | Facing Upstream Side | | | | |
|  |  | | | | |
| Close View of Deformation | | | | | |
|  | | | | | |
| Country side slope damaged | | | | | |

| | | |
|---|---|--|
| | <p>Close View of Damages</p>  <p>30.70338, 70.85796, 97.0m, 318°</p> <p>Damaged apron of the spur</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> <table border="1" data-bbox="443 197 1388 515"> <tr> <td data-bbox="443 197 922 515"> <p>Facing Downstream Side</p>  </td> <td data-bbox="922 197 1388 515"> <p>Facing Upstream Side</p>  </td> </tr> </table> <p>Photo with 360° angles</p>  | <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  |
| <p>Facing Downstream Side</p>  | <p>Facing Upstream Side</p>  | | |
| <p>Downstream End of the Bund</p> | <p>General View</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) N/A</p> <p>Photo with 360° angles N/A</p> | | |

| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|--|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 24/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Village is approximately one km away from the spur. • Cultivated area is observed on the country side. • Main river is directly impacting the spur. • Extreme turbulent flow is observed.  <p>Cultivated area is observed on the country side</p>  <p>Main river directly impacting the spur</p> | c |

⁴ 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

⁵ 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 2 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Emergent Type C | |
| | For Evaluation Score | Bund Damage | | 3 | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | 1 | Free board height is 2 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 7/9 | |

Note) HGL: hydraulic gradient line

RD 9+500 to 10+200 of Bhakri Ahmad Khan Protection Bund

Creation Date: 24/2/2024

| Province | Zone | Division | Circle |
|---|---|-----------------------|---------------------------------|
| Punjab | Sargodha Zone | Layyah Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-033 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Bhakri Ahmad Khan | | RD 9+500 to 10+200 | 30°73'04.93"N, 70°84'94.11"E |
| Name of Vulnerable Point | Bhakri Ahmad Khan Protection Bund at RD 9+500 to 10+200 | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> Inverted hockey spur is directly impacted by the river, with continuous erosion occurring around the spur. 480 feet apron of solid stone portion plus nose portion is damaged. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> Extreme turbulent flow observed along both sides of spur. | | |
| Site Condition in the Country Side ² | Cultivated area is observed along the spur. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³








| Category | Quality Score |
|------------------------|---------------|
| Emergent Type C | 7/9 |

¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).

³ 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 | 474.79 feet | Not Applicable — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | H.F. L | 468.19 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Free Board Height | 6.60 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Top Width | 20 feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | River Side Slope | 1:2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Country Side Slope | 1:2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Longitudinal Length | 700 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Slope Protection Material | No stone pitching | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Covering Material/ Pavement on the Top | Shingle on the top | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Embankment Material | Earthen (Silty clay) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Typical Cross Section | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <p>ESTIMATE FOR THE RESTORATION OF BHAKRI AHMED KHAN PROTECTION BUND ALONG WITH ALLIED RIVER TRAINING WORKS.</p> <p>Water Level = 461.36 Dated 27-09-2023 RD : 9+500</p> <p>Bhakri Ahmed Khan Protection Bund.</p> <p>Top Width = 20 Ft Top R.L. = 474.79</p> <p>Cutting = 151.08 Sd Apron = 121.22 Sd</p> <table border="1"> <thead> <tr> <th rowspan="2">Design</th> <th rowspan="2">Date</th> <th rowspan="2">Elev.</th> <th colspan="2">Existing</th> <th colspan="2">Proposed</th> </tr> <tr> <th>Date</th> <th>Elev.</th> <th>Date</th> <th>Elev.</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td>01/08/2023</td> <td>474.79</td> <td>01/08/2023</td> <td>474.79</td> </tr> <tr> <td></td> <td></td> <td></td> <td>01/08/2023</td> <td>468.19</td> <td>01/08/2023</td> <td>468.19</td> </tr> <tr> <td></td> <td></td> <td></td> <td>01/08/2023</td> <td>461.36</td> <td>01/08/2023</td> <td>461.36</td> </tr> <tr> <td></td> <td></td> <td></td> <td>01/08/2023</td> <td>454.76</td> <td>01/08/2023</td> <td>454.76</td> </tr> <tr> <td></td> <td></td> <td></td> <td>01/08/2023</td> <td>448.16</td> <td>01/08/2023</td> <td>448.16</td> </tr> <tr> <td></td> <td></td> <td></td> <td>01/08/2023</td> <td>441.56</td> <td>01/08/2023</td> <td>441.56</td> </tr> </tbody> </table> <p>Sub Engineer Sub Divisional Officer Executive Engineer Flood Bund Sub Division Layyah Canal Division Shahwala Groyne Layyah Layyah</p> | | | Design | Date | Elev. | Existing | | Proposed | | Date | Elev. | Date | Elev. | | | | 01/08/2023 | 474.79 | 01/08/2023 | 474.79 | | | | 01/08/2023 | 468.19 | 01/08/2023 | 468.19 | | | | 01/08/2023 | 461.36 | 01/08/2023 | 461.36 | | | | 01/08/2023 | 454.76 | 01/08/2023 | 454.76 | | | | 01/08/2023 | 448.16 | 01/08/2023 | 448.16 | | | | 01/08/2023 | 441.56 | 01/08/2023 |
| Design | Date | Elev. | Existing | | | | Proposed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | Date | Elev. | Date | Elev. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 01/08/2023 | 474.79 | 01/08/2023 | 474.79 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 01/08/2023 | 468.19 | 01/08/2023 | 468.19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 01/08/2023 | 461.36 | 01/08/2023 | 461.36 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 01/08/2023 | 454.76 | 01/08/2023 | 454.76 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 01/08/2023 | 448.16 | 01/08/2023 | 448.16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 01/08/2023 | 441.56 | 01/08/2023 | 441.56 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| History of Damages | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Type of Damage | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2023 | Studs damage | All 4 Studs were damaged due to settlement of stones during July 2023 flood | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2023 | Studs damage | Stud Number 1 is completely washed away settlement of stone in 2023 flood. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Record of Rehabilitation/ Improvement | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2023 | The studs were restored immediately after the damage in the July 2023 flood but were again damaged in October 2023. | Not provided by field staff | Maintenance and repair works of PID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plan for Rehabilitation/ Improvement | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2024 | A proposal for the restoration of the studs, apron, and solid stone portion damage has been submitted for approval. | Rs. 153 Million | Maintenance & Repair works of PID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| 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 Landside | | | | | |
| <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>Damaged stone stud</p> | | | | |

| | | |
|---|--|--|
| | <p>Close View of Damages</p>  <p>Damaged side slopes of bund</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>  |

| | |
|--|---|
| General View of Landside | |
| Facing Downstream Side | Facing Upstream Side |
|  |  |
| Photo with 360° angles | |
|  | |
| Downstream End of the Bund | <p data-bbox="408 1458 1361 1518">General View</p>  <p data-bbox="408 1458 1361 1518">Photo with 360° angles</p>  |



Upstream
End of the
Bund

General View (In the case that the VP is located near the end)



Photo with 360° angles



| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|--|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 24/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Cultivated area is observed on the country side of this reach. • Main River directly impacts the studs, causing repeated damage. • Extreme turbulent flow is observed.  <p>Damaged stone stud</p>  <p>Cropped area observed on the country side</p> | c |

⁴ 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

⁵ 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 6.6 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Emergent Type C | |
| | For Evaluation Score | Bund Damage | | 3 | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | 1 | Free board height is 6.6 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 7/9 | |

Note) HGL: hydraulic gradient line

Add Vulnerable RD 3+700 to 5+700 of Protection Bund Bakhri Ahmad Khan

Creation Date: 24/2/2024

| Province | Zone | Division | Circle |
|---|--|-----------------------|---------------------------------|
| Punjab | Sargodha Zone | Layyah Canal Division | Bhakkar Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-034 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Bhakri Ahmad Khan | | RD 3+700 to 5+700 | 30°74'23.38"N, 70°83'83.81"E |
| Name of Vulnerable Point | Bakhri Ahmad Khan Protection Bund at RD 3+700 to 5+700 | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> • Inverted Hockey Spur is directly impacted by the river, with continuous erosion occurring around the spur. • 480 feet apron of solid stone portion, along s with the nose portion is damaged. • Four solid stone studs in between RD 4+400 to RD 5+700 of protection bund is directly hit by the main river. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> • Extreme turbulent flow is observed. | | |
| Site Condition in the Country Side ² | Cultivated area is observed around this reach. | | |

Layout Plan (Source of Satellite Image: Google Earth)



Evaluation³









| Category | Quality Score |
|------------------------|---------------|
| Emergent Type C | 7/9 |

¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).

³ 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 | 474.79 feet | Not Applicable — |
| | H.F.L | 469.59 feet | |
| | Free Board Height | 5.20 feet | |
| | Top Width | 20 feet | |
| | River Side Slope | 1:2 | |
| | Country Side Slope | 1:2 | |
| | Longitudinal Length | 2000 | |
| | Slope Protection Material | Stone pitching on river side. | |
| | Covering Material/ Pavement on the Top | Shingle on the top | |
| | Embankment Material | Earthen (Silty clay) | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Nil | | |
| Typical Cross Section | | | |
| | History of Damages | | |
| MM/YYYY | Type of Damage | Description | |
| 2023 | Apron and solid stone portion damage | Apron and solid stone portion of inverted hockey spur were damaged during 2023 flood season | |
| 2023 | Studs damage | Settlement of stone in 2023 flood. | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| 2023 | The structure was restored immediately after the damage from the July 2023 flood but was again damaged in October 2023. | Not provided by field staff | Maintenance and repair works of PID |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| 2024 | A proposal for the restoration of the studs, apron, and solid stone portion damage has been submitted for approval. | Rs. 153 Million | Maintenance and repair works of PID |
| | | | |

| 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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|  |  | | | |
| | General View of Landside | | | |
| | <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 | | | |
|  |  | | | |
| | <p>Close View of Deformation</p>  <p>Damaged apron of the bund at RD 4+400</p> | | | |

Close View of Damages



Damaged apron of the spur

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 | |
| Downstream End of the Bund | General View | |
| | Photo with 360° angles | |



| | |
|--------------------------------|--|
| Upstream End of the Bund | General View (In the case that the VP is located near the end)  |
| | Photo with 360° angles  |

| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|--|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 24/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Cultivated area is observed on the country side of this reach. • Bottom level is approximately 10 feet below the top level. • Inverted hockey spur is under direct impact of the river and continuous erosion occurring around the spur. • 480 feet apron of solid stone portion plus nose portion damaged. • 4 solid stone studs in between RD 4+400 to RD 5+700 of protection bund is directly impacted from the main river. • Extreme turbulent flow was observed.  <p>Cultivated area is observed on the country side</p>  <p>Damaged apron of the spur</p>  <p>Solid stone studs are directly hit from the main river</p> | c |

⁴ 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


⁵ 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 5.2 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Emergent Type C | |
| | For Evaluation Score | Bund Damage | | 3 | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | 1 | Free board height is 5.2 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 7/9 | |

Note) HGL: hydraulic gradient line

Alluwali Guide Spur

Creation Date: 19/2/2024




















| Province | Zone | Division | Circle |
|---|--|-------------------------|---------------------------------|
| Punjab | Sargodha Zone | Mianwali Canal Division | Thal Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-035 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Alluwali Guide Spur | | - | 32°36'31.29"N, 71°39'84.86"E |
| Name of Vulnerable Point | Alluwali Guide Spur (site No. 1) | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> Before the construction of this spur, Alluwali town/village was directly impacted by River Indus. The purpose of this spur is to divert the river away from Alluwali village. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> Turbulent flow in the immediate vicinity of the spur. | | |
| Site Condition in the Country Side ² | <ul style="list-style-type: none"> Crops were present on the countryside in the riverbed. | | |
| Layout Plan (Source of Satellite Image: Google Earth) | | | |
|  | | | |
| Evaluation ³ | | | |
| Category | Quality Score | | |
| Monitoring | 6/9 | | |







¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.



² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).

³ 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 | 630.00 feet | Not Applicable — |
| | H.F.L | 623.00 feet | |
| | Free Board Height | 7.00 feet | |
| | Top Width | 30 feet | |
| | River Side Slope | 1:2 | |
| | Country Side Slope | 1:3 | |
| | Longitudinal Length | Spur is under construction and 1400 feet was completed | |
| | Slope Protection Material | Stone pitching on river Side | |
| | Covering Material/ Pavement on the Top | 6-inch layer of Shingle | |
| Embankment Material | Earthen | | |
| Ancillary Structure (Drainage Ditch, and Spurs) | No | | |
| Typical Cross Section | | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| | Nil | | |
| | | | |
| | | | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |

| 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 Landside | | | | | |
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| Facing Downstream Side | Facing Upstream Side | | | | |
|  |  | | | | |
| Close View of Deformation |  <p>32.3632, 71.39801, 152.0m, 210°</p> <p>Side slopes on downstream side of the spur found damaged</p> | | | | |

| | | |
|---|--|--|
| | <p>Close View of Damages</p>  <p>Nose portion depressed than the shank portion</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>  |

| | |
|----------------------------------|--|
| General View of Landside | |
| Facing Downstream Side | Facing Upstream Side |
| Photo with 360° angles | |
| Downstream End of the Bund | <p data-bbox="438 1021 598 1055">General View</p>  <p data-bbox="438 1406 724 1440">Phot with 360° angles o</p>  |


Upstream End
of the Bund

General View (In the case that the VP is located near the end)



Photo with 360° angles



| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 19/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Reserve stock of stones is available throughout the under-construction J-Head Spur. • Alluwali village is approximately 15 feet above the top level of Spur. • Spur is under construction, with 1400 feet completed. The remaining portion is in the model study phase.  <p>Reserve stock of stone lying throughout the shank portion of spur</p> | c |

⁴ 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

⁵ 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 | | No | The inundation analysis indicates that the flood damage is not severe. |
| | | Bund Damage | | YES | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | Pass | Free board height is 7 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Monitoring | |
| | For Evaluation Score | Bund Damage | | 3 | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | 0 | Free board height is 7 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 6/9 | |

Note) HGL: hydraulic gradient line

Guide Head Spur Village Dhingana

Creation Date: 19/2/2024



















| Province | Zone | Division | Circle |
|---|--|-------------------------|---------------------------------|
| Punjab | Sargodha Zone | Mianwali Canal Division | Thal Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-036 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Dhingana Guide Head Spur | | - | 32°34'64.28"N, 71°38'79.85"E |
| Name of Vulnerable Point | Reach between Alluwalil Guide Spur and J-Head Spur No. 3 in between Dhingana-Doaba Villages. (Site No. 2) | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> The old J-Head Spur was breached in 2010 flood. Only the nose of old J-Head Spur was present at the site. The said site is considered as vulnerable to save Village Dhingana. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> Turbulent flow in the immediate vicinity. | | |
| Site Condition in the Country Side ² | <ul style="list-style-type: none"> Crops were present on the countryside in the riverbed. | | |
| Layout Plan (Source of Satellite Image: Google Earth) | | | |
| | | | |
| Evaluation ³ | | | |
| Category | Quality Score | | |
| Monitoring | 6/9 | | |

¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).

³ 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 | 630.00 feet | Not Applicable — |
| | H.F.L | 623.00 feet | |
| | Free Board Height | 7.00 feet | |
| | Top Width | 30 feet | |
| | River Side Slope | 1:2 | |
| | Country Side Slope | 1:3 | |
| | Longitudinal Length | 2300 feet | |
| | Slope Protection Material | Stone pitching on either side of bund | |
| | Covering Material/ Pavement on the Top | Yet to be laid. Earthen at present | |
| Embankment Material | Earthen | | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Not Applicable | | |
| Typical Cross Section | | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| 2010 | Breaching | Old J-Head Spur was breached during 2010 flood | |
| | | | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| 2024 | Guide Head Spur Village Dhingana (in progress) | Not provided by field staff | Maintenance and repair works |
| | | | |
| | | | |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |

| 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> 32.34643, 71.38781, 152.0m, 79°</td> </tr> </table> | Facing Downstream Side | Facing Upstream Side |  |  32.34643, 71.38781, 152.0m, 79° |
| Facing Downstream Side | Facing Upstream Side | | | | |
|  |  32.34643, 71.38781, 152.0m, 79° | | | | |
| General View of Landside | | | | | |
| <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 | Not Applicable | | | | |

| | | |
|---|--|--|
| | <p>Close View of Damages</p>  <p>Apron found damaged</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>  |

| | |
|--|--|
| General View of Landside | |
| Facing Downstream Side | Facing Upstream Side |
|  |  |
| Photo with 360° angles | |
|  | |
| Downstream End of the Bund | General View |
| |  |
| | Photo with 360° angles |
| |  |


Upstream End
of the Bund

General View (In the case that the VP is located near the end)



Photo with 360° angles



| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 19/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • The construction of Dhingana Guide Head Spur started in 2018. • The 1400 feet shank portion (97 %) has been completed. • The PC-1 of head portion of spur (900 feet) is under approval. • Stone pitching with wire crates was observed at apron of the newly constructed shank portion of spur.  <p>32.34652, 71.38788, 152.4m, 74°</p> <p>Stone pitching on side slopes and wire crates for apron</p> | c |

⁴ 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

⁵ 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 | | No | The inundation analysis indicates that the flood damage is not severe. |
| | | Bund Damage | | YES | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | Pass | Free board height is 7 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. |
| | Category | | | Monitoring | |
| | For Evaluation Score | Bund Damage | | 3 | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | 0 | Free board height is 7 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 6/9 | |

Note) HGL: hydraulic gradient line

J-Head Spur Village Doaba

Creation Date: 19/2/2024



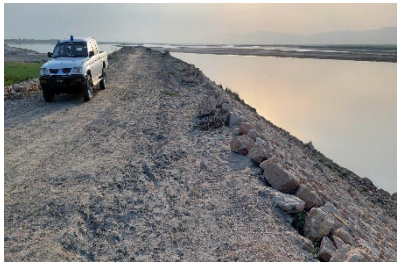



| Province | Zone | Division | Circle |
|---|---|-------------------------|---------------------------------|
| Punjab | Sargodha Zone | Mianwali Canal Division | Thal Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-037 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| J-Head Spur No. 3 Doaba | | - | 32°33'28.33"N, 71°37'66.67"E |
| Name of Vulnerable Point | J-Head Spur No.3 in between Dhingana-Doaba Villages. (Site No. 3) | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> The purpose of Spur is to divert river away from Doaba Village and Sher Shah Sori Road. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> Turbulent flow in the immediate vicinity. | | |
| Site Condition in the Country Side ² | The cultivated area was observed towards the country side. | | |
| Layout Plan (Source of Satellite Image: Google Earth) | | | |
| | | | |
| Evaluation ³ | | | |
| Category | Quality Score | | |
| Monitoring | 6/9 | | |

¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

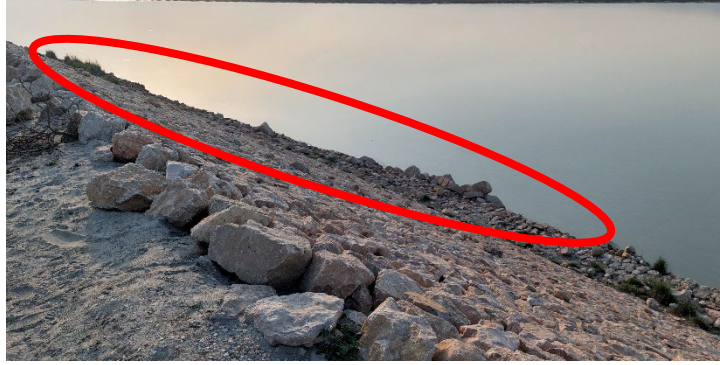
² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).

³ 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 | 630.00 feet | Not Applicable — |
| | H.F.L | 623.00 feet | |
| | Free Board Height | 7.00 feet | |
| | Top Width | 30 feet | |
| | River Side Slope | 1:2 | |
| | Country Side Slope | 1:3 | |
| | Longitudinal Length | 1840 feet | |
| | Slope Protection Material | Stone pitching on either side of spur | |
| | Covering Material/ Pavement on the Top | Earthen | |
| | Embankment Material | Earthen | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Not Applicable | | |
| Typical Cross Section | <p>ESTIMATE FOR THE CONSTRUCTION OF 3-HEAVY SPUR AT STA. 55+45.00</p> <p>AREA EARTH FILLING = 4338.75 SQ.</p> <p>AREA STONE PITCHING = 1086.50 SQ. LEFT SIDE = 1086.50 SQ. RIGHT SIDE = 1086.50 SQ. TOTAL = 2173.00 SQ.</p> <p>AREA WATER CRATES = 36.00 SQ. LEFT SIDE = 36.00 SQ. RIGHT SIDE = 36.00 SQ. TOTAL = 72.00 SQ.</p> <p>X-SECTION RD-3+635</p> <p>CRUSHED STONE FILTER = 1/8" - 1/2" CRUSHED STONE FILTER = 1/2" - 2" STONE PITCHING = 1:1</p> <p>EL. 630.00 EL. 623.00 EL. 616.00</p> <p>30.0 38.0 38.0</p> <p>1:2 1:3</p> <p>NSL RD 120 581.00 0.0 581.00 120 581.00</p> <p>CHECKED H. S. S. S. S. Sub-Professional Officer, PUNJAB CANAL DIVISION KARNAL</p> <p>DESIGNED S. S. S. S. S. Executive Engineer, PUNJAB CANAL DIVISION KARNAL</p> <p>CS Cant. S. S. S. S. S.</p> | | |
| | History of Damages | | |
| MM/YYYY | Type of Damage | Description | |
| | Nil | | |
| | | | |
| | | | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |

| 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 Landside | |
| Facing Downstream Side | |
|  | |
| Facing Upstream Side | |
|  | |
| Close View of Deformation | |
| Not Applicable | |

Close View of Damages



Apron found damaged at the nose of the spur

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 | |
|  | |
| Downstream End of the Bund | General View |
|  | |
| Photo with 360° angles | |
|  | |



Upstream End
of the Bund

General View (In the case that the VP is located near the end)



Photo with 360° angles



| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|--|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 19/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • The construction of Doaba J-Head spur started in 2018. • Stone pitching with wire crates at apron was observed in newly constructed spur portion. • Cultivated area was observed along country side.  <p>Stone pitching on side slopes</p>  <p>Cultivated area is present on country side</p> | c |

⁴ 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

⁵ 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 | | No | The inundation analysis indicates that the flood damage is not severe. |
| | | Bund Damage | | YES | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | Pass | Free board height is 7 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | The river touch the bund |
| | | 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. | |
| | Category | | | Monitoring | |
| | For Evaluation Score | Bund Damage | | 3 | The bund body is currently damaged. |
| | | Bund Dimension | Bund Height | 0 | Free board height is 7 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 2 | The river touch the bund |
| | Quality Score | | | 6/9 | |

Note) HGL: hydraulic gradient line

J-Head Spur Village Piplan

Creation Date: 19/2/2024




















| Province | Zone | Division | Circle |
|---|---|-------------------------|---------------------------------|
| Punjab | Sargodha Zone | Mianwali Canal Division | Thal Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-038 | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| J-Head Spur at Piplan | | - | 32°29'49.77"N, 71°35'31.06"E |
| Name of Vulnerable Point | J-Head Spur at Piplan (Site No. 4) | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> The aim of spur is to protect Piplan Town (Tehsil Head Office) from the aggressive behavior of River Indus. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> No flow condition on either side of spur. River is approximately 1 km away from spur. | | |
| Site Condition in the Country Side ² | The cultivated area is observed towards the country side. | | |
| Layout Plan (Source of Satellite Image: Google Earth) | | | |
| | | | |
| Evaluation ³ | | | |
| Category | Quality Score | | |
| Monitoring | 2/9 | | |

¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).

³ 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 | 630.00 feet | Not Applicable |
| | H.F.L | 623.00 feet | |
| | Free Board Height | 7.00 feet | |
| | Top Width | 30 feet | |
| | River Side Slope | 1:2 | |
| | Country Side Slope | 1:3 | |
| | Longitudinal Length | 3514 feet | |
| | Slope Protection Material | Earthen | |
| | Covering Material/ Pavement on the Top | 6-inch Shingle layer | |
| | Embankment Material | Earthen | |
| Ancillary Structure (Drainage Ditch, and Spurs) | Not Applicable | | |
| Typical Cross Section | | | |
| | <p>AREA WIRE CRATES = 4.00 SR LEFT SIDE = 18.00 SR RIGHT SIDE = 36.00 SR Total = 54.00 SR</p> <p>X-SECTION RD: 2+400</p> <p>EL: 630.00</p> <p>H.F.L: 623.00</p> <p>CRUSHED STONE FILTER = 1/8" - 1/2"</p> <p>CRUSHED STONE FILTER = 1/2" - 2"</p> <p>STONE PITCHING = 1.5"</p> <p>NSL 596.00</p> <p>RD 120 596.00</p> <p>RD 0.0 596.00</p> <p>RD 120 596.00</p> <p>SUB-DIVISIONAL OFFICER, BUNDARA SUB-DIVISION, MURSHIDABAD</p> <p>EXECUTIVE ENGINEER, CANAL DIVISION, MURSHIDABAD</p> | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| | Nil | | |
| | | | |
| | | | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |
| | | | |
| | | | |

| 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> 32.29493, 71.35277, 147.1m, 77°</td> </tr> </table> | Facing Downstream Side | Facing Upstream Side |  |  32.29493, 71.35277, 147.1m, 77° |
| | Facing Downstream Side | Facing Upstream Side | | | |
| |  |  32.29493, 71.35277, 147.1m, 77° | | | |
| | 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 Landside | | | | |
| | <table border="1"> <tr> <td>Facing Downstream Side</td> <td>Facing Upstream Side</td> </tr> <tr> <td> 32.29488, 71.35276, 151.4m, 242°</td> <td> <i>J head Spur Pipplan</i> 32.29489, 71.35277, 151.5m, 97°</td> </tr> </table> | Facing Downstream Side | Facing Upstream Side |  32.29488, 71.35276, 151.4m, 242° |  <i>J head Spur Pipplan</i> 32.29489, 71.35277, 151.5m, 97° |
| Facing Downstream Side | Facing Upstream Side | | | | |
|  32.29488, 71.35276, 151.4m, 242° |  <i>J head Spur Pipplan</i> 32.29489, 71.35277, 151.5m, 97° | | | | |
| Close View of Deformation | Not Applicable | | | | |
| Close View of Damages | Not Applicable | | | | |
| Photo with 360° angles |  | | | | |

| | | |
|--|--|--|
| <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>  | |
| <p>Photo with 360° angles</p>  | | |
| <p>Downstream End of the Bund</p> | <p>General View</p>  <p>32.29493, 71.35278, 150.5m, 238°</p> | |

Photo with 360° angles





Upstream End of the Bund

General View (In the case that the VP is located near the end)



Photo with 360° angles



| Observation Record ⁴ (Current status, effect of countermeasure, development of erosion, deformation, deterioration) | | | |
|---|-------------------|---|---------------------|
| DD/MM/YYYY | Inspection Type | Description and Photo | Damage ⁵ |
| 19/2/2024 | Visual Inspection | <ul style="list-style-type: none"> • Cultivated area is observed on both sides of the spur. • Reserve stock of stones was present on the river side of the bund.  <p>32.29494, 71.35278, 151.3m, 279°</p> <p>Cultivated area is observed</p>  <p>Reserve stock of stone on top of the bund</p> | a |

⁴ 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

⁵ 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 | | No | The inundation analysis indicates that the flood damage is not severe. |
| | | Bund Damage | | NO | There is no significant damage at present. |
| | | Bund Dimension | Bund Height | Pass | Free board height is 7 feet. |
| | | | Bund Width | Fail | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | Fail | Floodplain length is about 600 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. | |
| | Category | | | Monitoring | |
| | For Evaluation Score | Bund Damage | | 0 | There is no significant damage at present. |
| | | Bund Dimension | Bund Height | 0 | Free board height is 7 feet. |
| | | | Bund Width | 1 | Evaluation is not possible based on the typical cross-section. |
| | | | Flood Plain Length | 1 | Floodplain length is about 600 feet. |
| Quality Score | | | 2/9 | | |

Note) HGL: hydraulic gradient line

Left Guide Bund in between RD 1+000

Creation Date: 17/2/2024

| Province | Zone | Division | Circle |
|---|--|-----------------------------|---------------------------------|
| Punjab | Sargodha Zone | Kalabagh Headworks Division | Thal Canal Circle |
| Sr. No. | River Name | River System | Bank |
| P-039a | Indus River | Indus River | Left |
| Bund Name | | R.D | GPS Coordinates |
| Left Guide Bund | | RD 0+000 to 4+099 | 32°91'81.48"N, 71°52'96.37"E |
| Name of Vulnerable Point | Breach to left guide bund upstream RD 0+000 to 4+099_1 | | |
| Reason for the Vulnerability | <ul style="list-style-type: none"> There was a complete breach (overflow) of left guide bund from RD 1+000 to RD 4+000 during 2010 flood. | | |
| Flow Condition ¹ | <ul style="list-style-type: none"> Turbulent flow was observed on the river side. The water flows in close vicinity to the bund. | | |
| Site Condition in the Country Side ² | <ul style="list-style-type: none"> Standing/Still water (pond) was observed on the country side. Throughout reserved stock of stones was observed on the river side. | | |
| Layout Plan (Source of Satellite Image: Google Earth) | | | |
| | | | |
| Evaluation ³ | | | |
| Category | Quality Score | | |
| Proactive Type R | 5/9 | | |

¹ Water Flow Direction and Conditions During Floods Around the Listed Vulnerable Points.

² Site Condition Around the Vulnerable Points (Rough Distance Between Main Water Channel and the Bund, Land Use Behind the Point, Important Facility Adjacent to the Point).

³ 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 | 706.00 feet | Not Applicable — |
| | H.F.L | 701.30 feet | |
| | Free Board Height | 4.70 feet | |
| | Top Width | 30 feet | |
| | River Side Slope | 1:2 | |
| | Country Side Slope | 1:3 | |
| | Longitudinal Length | 4099 feet | |
| | Slope Protection Material | Stone pitching on river side of the bund | |
| | Covering Material/ Pavement on the Top | 1 feet Shingle | |
| Embankment Material | Earthen (Silty sand and Clay) | | |
| Ancillary Structure (Drainage Ditch, and Spurs) | 1000 feet from barrage gates. | | |
| Typical Cross Section | | | |
| History of Damages | | | |
| MM/YYYY | Type of Damage | Description | |
| 07/2010 | Breaching | There was a complete breach of left guide bund from RD 1+000 to RD 4+000 during 2010 flood. Additionally, a deep pit was formed during 2010 flood along country side. | |
| Record of Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| 2010 | Complete restoration of LGB from RD 1+000 to RD 4+000 | Not provided from the field staff. | Maintenance and repair works from PID. |
| Plan for Rehabilitation/ Improvement | | | |
| MM/YYYY | Project Name and its Description | Cost | Source of Funding |
| | Nil | | |