Environmental Impact Assessment

July 2017

PAK: Jalalpur Irrigation Project

Project No. 46528-002

Part 4 of 9 of the Main Report

Prepared by Irrigation Department, Government of Punjab for the Asian Development Bank (ADB).

Irrigation Department
Government of Punjab

DETAILED DESIGN OF JALALPUR IRRIGATION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

MAY 2017

5.5. Route Optimization at Detailed Design Stage

175. The detailed design Consultants reviewed the initial layout proposed in the feasibility studies (NDC-2008) and (NESPAK 2014-2015). With the help of latest topographical survey conducted in 2015-2016 the canal alignment has been now modified on the Natural Surface Level (NSL), physical features and other information contained in the survey. The alignment so marked was thoroughly reviewed viz. a viz. resettlement requirement which have been minimized. Proposed canal crossings are generally perpendicular to drains nullahs so as to minimize component of structural cost. Almost all graveyards have been avoided by realigning the canal so that minimum social problems arise during canal construction.

176. Following points have been considered while marking the updated canal alignment.

- All possible alignments examined (2008 and 2015) and studied and the best suited alignment finalized;
- Canal serves the entire area proposed to be irrigated;
- All the settlements have been avoided to the possible extent so that land acquisition and resettlement cost are minimized;
- Cost of construction including cross drainage works is minimum;
- Rinks and acute curves have been avoided;
- Where ever possible, the canal crosses the roads, railways lines and nullahs at 90^{o} angle so as to avoid skew bridges;
- Canal has been aligned such that broadly it is in partial cut and fill; and
- Excessive deep cutting has been avoided save in the head reach (RD 3+500 to 35+000) where no other alternative is available.

A brief detail for the route optimization is as follows;

5.5.1. Extension in Command Area

177. In order to increase the socio-economic benefits and maximum output from the proposed JIP, the command area along the canal has been increased by shifting the main Canal alignment upwards. This alignment change will bring more area under cultivation and increase the crop productivity in the Canal command area. The possibility of extending the command area is being studied at the detailed design stage. **Figure-5.2** shows snapshot of canal alignment optimization.

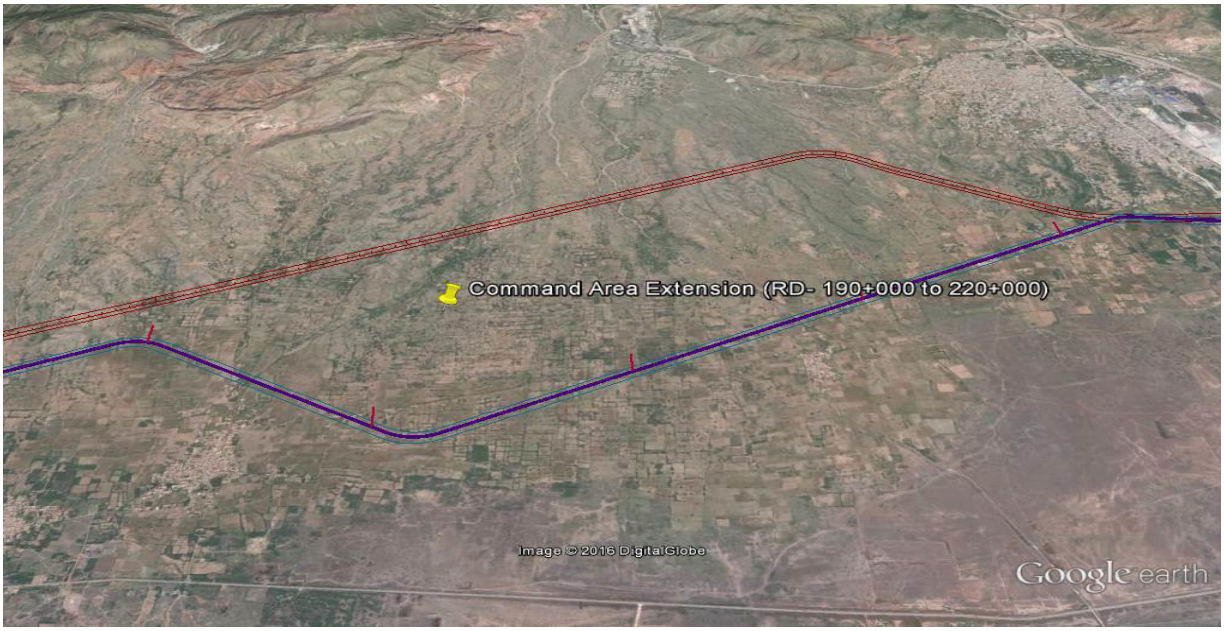

Figure-5.2: Tentative Additional Command Area RD 190+000 to 220+000

5.5.2. Minimum Earthwork to Economize Canal Design

178. The cut and fill (earthwork) of the canal has been optimized so that the excavated material can be re-used thereby minimizing the need for borrow material or spoil bank construction..

5.5.3. Minimize Social and Environmental Issues

179. Minimum earthwork will also help to reduce environmental issues such as air pollution and dust related effects due to the excessive cut and fill at some section of the alignment during construction. Environmental and social team in coordination with the design team optimized the route by considering following points:

- Avoid dense settlements (mostly considered already in PPTA, but need further refinement particularly between RD 0+000 to 35+000);
- Avoid religiously sensitive structures (graveyards, shrines etc.,) as far as possible;
- Avoid reserved forests, wildlife sanctuaries, protected areas, if any; and
- Any other environmentally sensitive hotspots identified during the Project to be avoided.

180. The above aspects were studied in detail. A snapshot of bypassing of a village settlement is shown in **Figure-5.3**.

Figure-5.3: Avoidance of Village Malakpur near RD 18+000

181. All these abovementioned environmental and social parameters were considered by the design team to finalize the main canal alignment.

182. The optimization during the detailed design has also considered the alignment marked by NDC in year 2008. Reach wise description of the canal alignment is explained below. The single blue colour line in the snapshots is the canal alignment marked by the NDC in 2008. While the alignment with red centre line and black ROWs is the alignment marked by the detailed design consultants.

5.5.4. Reach-1 RD 0+000 to 19+000:

183. In this reach mountains are on the right side of the canal while river Jhelum is on the left side of the canal making it the most difficult reach for construction, flood protection and slope stability. In order to avoid incidence of flood damage, the left bank of the canal up to Jalalpur Sharif will act as flood protection embankment. Spurs will be provided in this reach to guide the water away from the Flood Embankment. As the right bank is in cut, a stable slope or retaining walls will need to be provided to support the cut slopes in this area. Alignment of the Jalalpur main canal from RD 0+000 upto RD 19+000 is almost same as previously marked by the NDC consultants during their feasibility studies with minor change at RD 8+500 to avoid a graveyard of Maryala village. **Figure 5.4** shows reach-1.

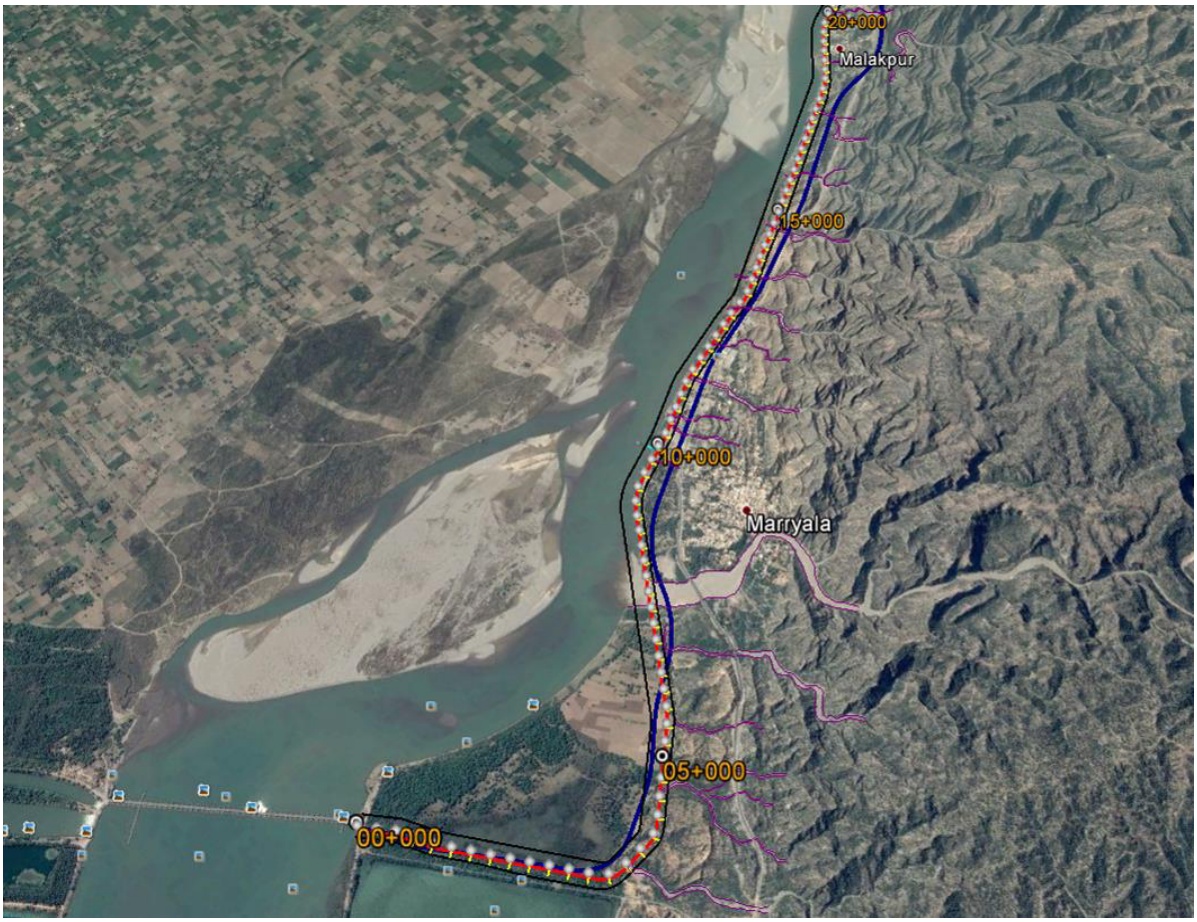

Figure 5.4: Main canal Alignment RD 0+000 to RD 19+000

5.5.5. Reach-2 RD 19+000 to 35+000:

184. In this reach NDC had shifted the alignment of the canal on the right side of the Pind Dadan Khan-Mandi Bahaudin road. With latest topographical survey conducted during 2015-16, it is clear that the levels on the right side of the road are very high from the canal Full Supply Level (FSL). This requires huge amount of earth work and slope stability which is hard to attain and uneconomical. Therefore, the detailed design consultants have shifted the alignment on the left side of the road as the NSLs here are almost equal to the designed FSL of the canal. Malakpur Village at RD 18+000-20+000 has been bypassed by the Consultants to minimize the resettlement issue of the people who are non-beneficiaries of the project. The alignment in this reach is finalized by routing it beyond the Village settlement. With this new alignment part of the RoW of the canal lies in the River Jhelum for which protection works would be provided. Similarly, NDC alignment passes through the Shah Kamil village which culminates into to Resettlement issues. This village resettlement has been avoided by the detailed design consultants with shifting of the alignment on the left side of the road. **Figure 5.5** shows Reach-2 of updated canal alignment.

Figure 5.5: Main canal Alignment RD 19+000 to RD 35+000

5.5.6. Reach-3 RD 35+000 to RD 75+000:

185. In this reach, detailed design consultants have shifted its alignment towards south (away from the mountains) from the one marked by the NDC. The Jhelum River is on left side and distance between canal centreline and river edge goes on increasing. NDC alignment in this reach passed through the middle of following villages; Jalalpur, Dheri, Ladwa, Chitti, Pir Chak, Nathial, Chakri and Thill Sharif thus cropping up social issues of multiple amplitude comprising of resettlement of people, public buildings, community structures and graveyards. In order to avoid all these issues, design Consultants have shifted the alignment on the south of all these villages and this ample space for the future extension of these villages have been made available. Design Consultants have saved all the graveyards, shrines, public places and saved huge cost of resettlement but while avoiding these villages, this section of the canal in this reach would be in filling. **Figures 5.6 & 5.7** shows the segments of Reach-3 of updated canal alignment.

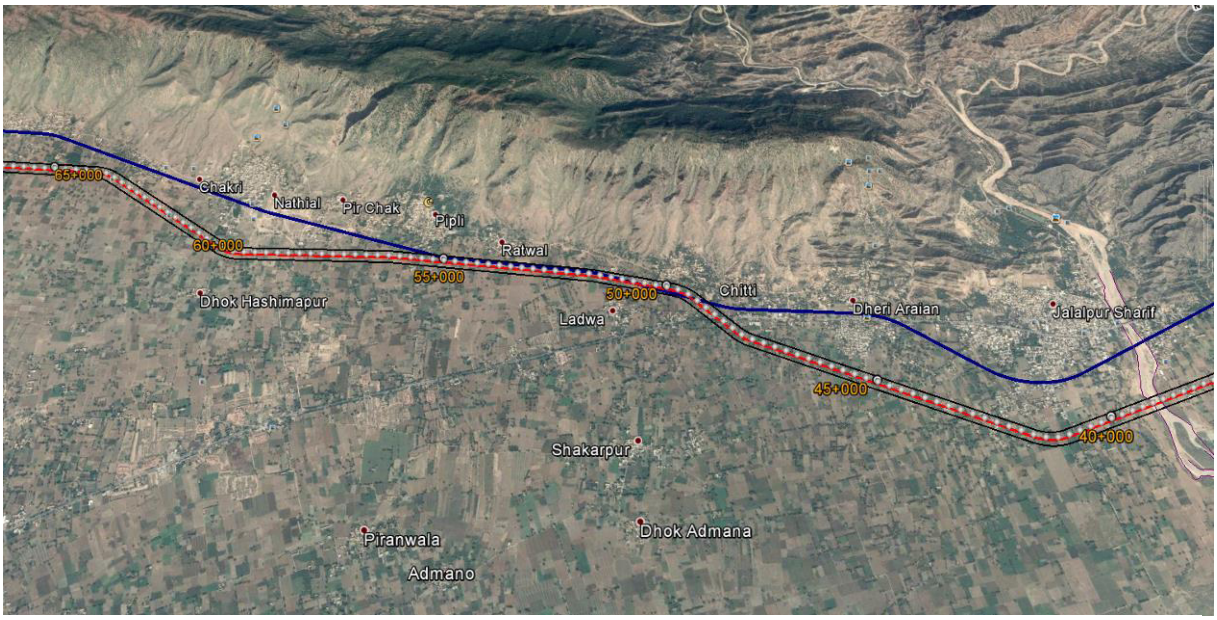

Figure 5.6: Main canal Alignment RD 35+000 to RD 65+000

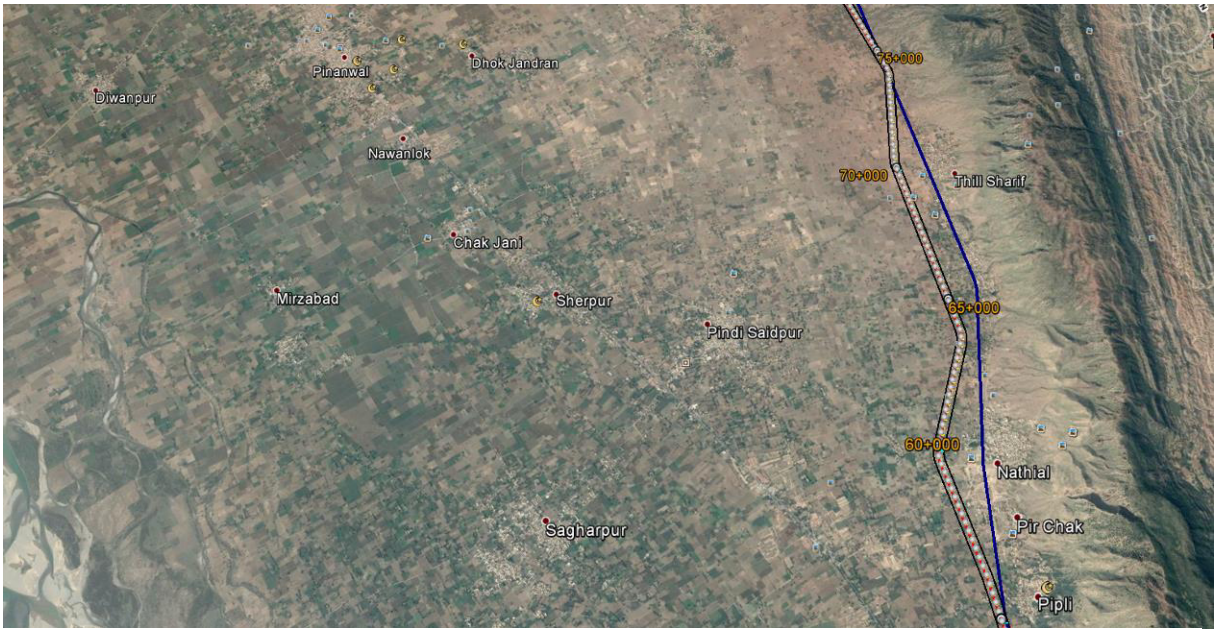

Figure 5.7: Main canal Alignment RD 60+000 to RD 75+000

5.5.7. Reach-4 RD 75+000 to 125+000:

186. In this reach alignment of both NDC and NESPAK are almost identical with minor changes. These changes have been suggested in view of the latest survey which allowed us to move on the north of the previous marked alignment. Also, almost all houses and tube wells have been avoided in this reach which were earlier in the proposed alignment of NDC. **Figure 5.8** shows Reach-4 of updated canal alignment.

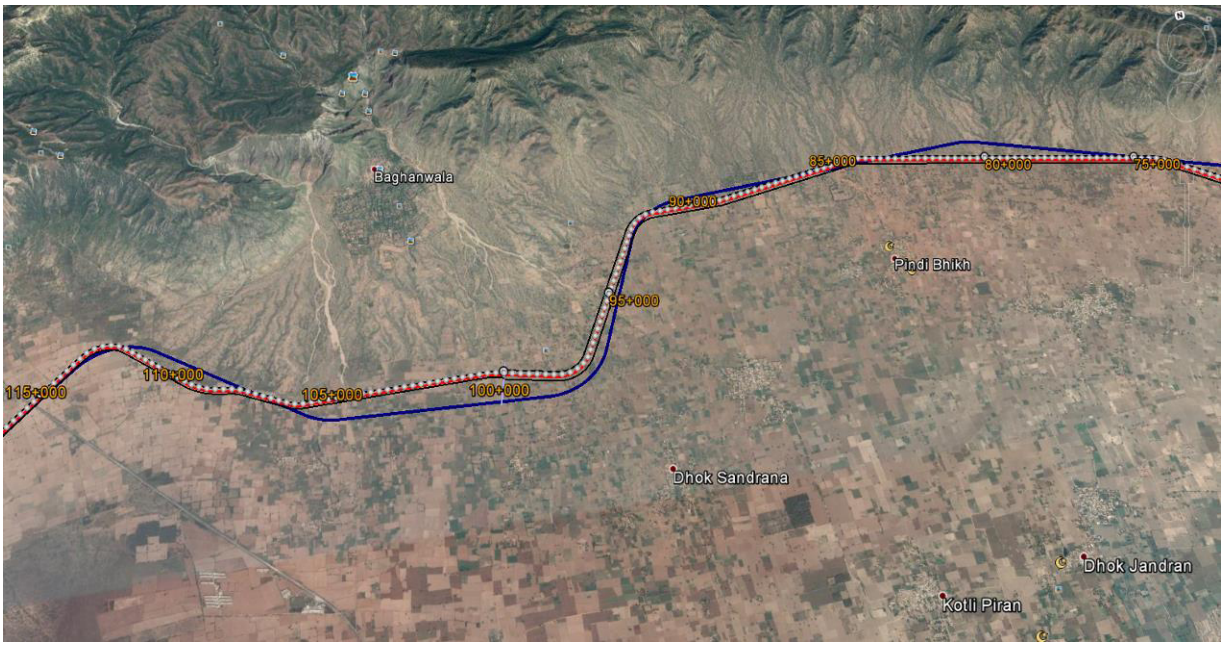

Figure 5.8: Main canal Alignment RD 75+000 to RD 125+000

5.5.8. Reach-5 RD 125+000 to 210+000:

187. From RD 125+000 to 180+000, design consultants have shifted the alignment partly to the north and to the south side of the NDC alignment in view of recent topographic survey. Agricultural land belonging to all villages has been brought in the command to avoid any social issues. Original alignment was passing from the center of Sadhowal and Chak Shafi villages which have been now avoided as the alignment has been shifted on the south of these villages. Moreover few other settlements, structures and graveyard have been also avoided in this reach. Design Consultants have also kept in mind the impact and nature of cross drainage structures on the main canal. While shifting the alignment on either side, Super-passages have been proposed instead of siphons in order to avoid head loss. **Figures 5.9, 5.10 and 5.11** show the segments of Reach-5 of updated canal alignment.

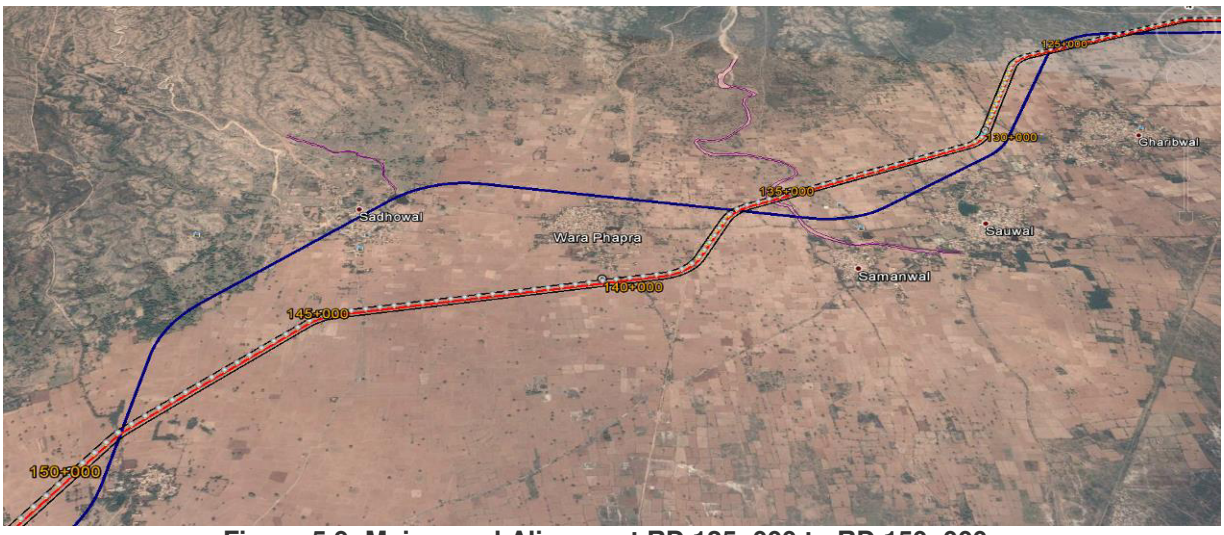

Figure 5.9: Main canal Alignment RD 125+000 to RD 150+000

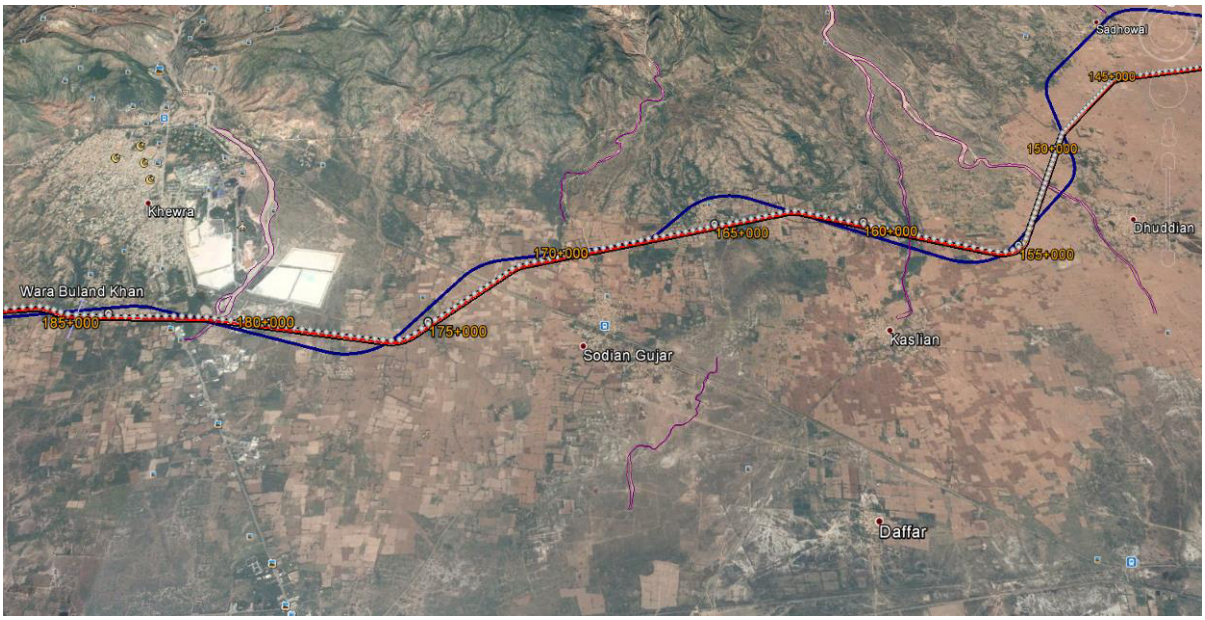

Figure 5.10: Main canal Alignment RD 150+000 to RD 185+000

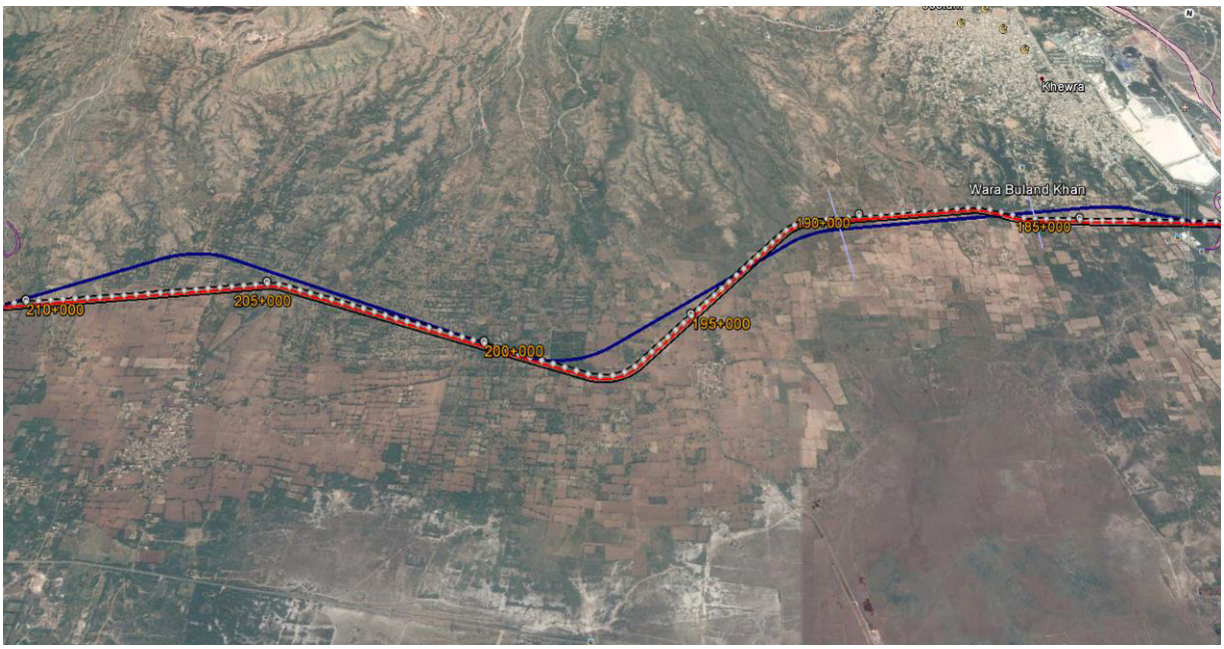

Figure 5.11: Main canal Alignment RD 185+000 to RD 210+000

5.5.9. Reach-6 RD 210+000 to 255+000:

188. More area of villages Golpur, Kaura and Chauran, Bhelowal, Saroba, Ather has been brought under the command of the canal in this reach which was earlier not in command area. Houses and other public places in the Bhelowal and Saroba villages, falling within RoW of canal have been avoided. **Figures 5.12 and 5.13** show the segments of Reach-6 of updated canal alignment.