Low water delivery costs of major irrigation projects are critical to the potential return on investment for government and private sector investors. The fully pumped irrigation schemes would only be viable in circumstances of high prices or high-value products.

The Hells Gates Dam Feasibility Study by the Snowy Mountains Engineering Company (SMEC) is examining a $5.35 billion irrigated agricultural and power project on the upper Burdekin River. But is it the best design? Here I have annotated their current plan with what I think is a sustainable improvement, and also could be stage one of a larger Bradfield Scheme.

The current irrigation design is based on water being released from the Hells Gates Dam (purple) into the Burdekin River (green), where it will be captured in low on-river weirs adjacent to the agricultural zones (yellow). Water will be harvested out of these weirs using pumps to raise the water to the top of the bank where it will be held in temporary storage (SMEC).

Instead of pumping water up to the hill from weirs in the river, an aqueduct (light blue) at about the 350m contour could be run above the irrigation zones. This would allow irrigation channels (blue) to follow an approximate downhill path within the existing terrain to use gravity as the driver for water delivery, thereby avoiding pumping costs.

Finally, additional storages (red) associated with the aqueduct could capture flows from the Basalt and Hann Rivers providing additional flood storage or water capture.

The economic and environmental benefits of a gravity fed aqueduct are many:

1. Locating the dam lower on the Burdekin (red) at the Mt Foxton site would avoid inundation of the Gregory Development Road bridge over the Clarke River. This would give considerable saving on road relocation works.
2. The lower location is below the confluence with the Running River, providing additional stream capture.
3. Farmers would not need pumps will deliver water to on-farm distribution channels, considerably lowering their water costs.
4. Under the SMEC design, each zone will require the provision of a weir pool which potentially blocked the river to migrating fish. The alternative plan would not interfere with the natural Burdekin River downstream of the main dam wall.
5. Run-of-river power stations could be installed at the toe of the dam, and potentially along the aqueduct depending on fall. Power generation would likely take place over most of the year.

6. The aqueduct could continue on past Charters Towers and the Flinders Highway, providing water to mines of the Galilee Basin including Adani, town water and irrigation to the Mitchell Grass Downs, and even further to Blackall, St George and the Murray Darling Basin.
7. This could be the first stage of a greater Bradfield Scheme. Constructed stage by stage, the scheme would be virtually self-financing.

Another major difference between this and the current SMEC design is the location of the dam lower on the Burdekin at the Mt Foxton Site versus Hells Gate. The relative costs/benefits of these two sites have been tabulated in the study Table 1: Dam Location Options Analysis. The Hells Gate was thought to have fewer environmental and cultural heritage concerns but had a greater potential impact on the road infrastructure. The best siting of the dam should be revisited in view of an aqueduct delivery system.

Alternatively, the aqueduct could originate from an upper Hells Dam site instead of Mt Foxton, at a higher location, and follow a contour above 400m. The dam wall may also be raised to the maximum height, creating a mega-dam proposed by Sir Leo Heischler and Leon Ashby. These options have yet to be comprehensively examined.

Frequently, environmental and cultural heritage concerns are overblown, as there are well-established mechanisms for dealing with them. including offsets and agreements. Particularly in the case of projects of national significance, these would not present insurmountable impediments to projects.

In summary, the first financially viable stage of a Bradfield Scheme may be the development of a 2,100 GL storage dam and aqueduct in the upper Burdekin supporting 50,000 ha of irrigated horticulture, including fruit, vegetables, pulses/legumes, and broad-scale agriculture of both perennial and annual crops. There are various factors that increase the cost and the environmental impact of the SMEC proposal – the impact to downstream water flows, the Gregory Development Road innudation, and the cost of weirs and pumping – that are mitigated by delivering water in a gravity-fed aqueduct. I will endeavor to have this proposal examined before the Business Case and comprehensive Environmental Impact Statement (EIS) set the realization of the Hells Gates Dam project in concrete (so to speak).