

might eventually be greatly exceeded, more than ordinary precautions would be necessary here, to economise this fixed supply, and as much as possible to exempt it from the great waste by leakage so usual on other canals, where, the supply of water being in excess that waste cannot operate upon the trade. I have therefore estimated for a greater extent of puddling than is customary probably on any canals yet formed in the U. S. The embankments are supposed to be puddled throughout, the sides as well as the bottoms, or one half of the entire length has been assumed as requiring this precaution. In particularising the embankments it is not intended to say that the cuts are not equally liable to leakage; the leakage however which occurs there, results only in the waste of water, while the leakage which exists in the unconsolidated earths of embankments, in their early stages, causes hose slips or breaches in the banks which are so replete with expense to the company, and annoyance to the trade. The inside slopes of the canal are supposed to be paved throughout. The tow-path to be covered with broken stones throughout to the depth of one foot.

Cross sections had been taken at intervals of 100 feet on the entire route—the feeder routes as well as the canal route. In calculating however the quantities of embankment and excavation, the time at our disposal would not at all admit of our applying all these cross sections in succession. Tables were therefore constructed exhibiting the quantities due to four different cases of the natural slopes and every cross section has been estimated from the table approximating nearest to the actual slope.

It being obviously impossible in a first survey to trace the most advantageous ground in respect of economy, for our purpose, many of the excavations and embankments are doubtless of greater depth than would ultimately be found necessary: gross instances of this description have been reduced, but generally the profile has been left as it was originally taken. The correct characters of the excavations forms another item of uncertainty, which must largely effect all such preliminary estimates. The route passing over the ridge lands of the country, the earth or soil there, when compared with the low vallies on the Potomac, must lie thin over the natural rocks; the amount of rock cutting therefore may reasonably be expected to be greater here than on a route occupying a lower region of country. Over the entire route, with the exception of the immediate valleys of the streams' pieces of loose rock scattered everywhere on the surface, indicate that the rock below may be found solid at no great depth. How near the surface however it is impossible to say without having recourse to boring, or to the sinking of pits. In the deep cuts at the extremities of the tunnels we have assumed the solid rock to lie within 10 feet of the surface, and estimated accordingly. All other excavations and also the 10 feet of earth lying above the solid rocks, so assumed, of the deep cuts, we have estimated to consist, as in the majority of cases it undoubt-