

## Appendix 5.1 Option sifting tool

# West Of England Transport Assessments Option Assessment and Sifting Template

**Atkins**  
**WP1 South East Bristol and Whitchurch**

**22/01/2018**

Revision	Contents/Changes	Originated	Date	Checked	Date	Reviewed	Date	Authorised	Date
0.1	Template Created for distribution	P Gilg	11/12/2017	T Jarvis	11/12/2017	J Foster-Clark	11/12/2017	J Foster-Clark	11/12/2017
1	Final Draft: Template altered to remove average scores; summary page now text based	P Gilg	18/12/2017	T Jarvis	18/12/2017	A Chaudhrey	19/12/2017	J Foster-Clark	20/12/2017
1.1	First draft of populating template	M Hansen	21/12/2017						
1.2	Updated version	M Hansen	05/01/2018						
1.3	Version shared during client meeting	M Hansen	11/01/2018						
2	Version issued to client	M Hansen	19/01/2018	P Salvin	22/01/2018				
3	Updated version with client comments	M Hansen	13/02/2018	P Salvin					

Small changes internally should be marked with a version increase of 0.1  
 When a document is issued externally, the version should increase by 1

## Guide to using this workbook

Please read before using the workbook

### Colour coding of cells in this workbook:

Note	Information/Note
input	Input data
result	Do not amend - takes values using formulae

### Guide to the contents of each sheet:

Sheet	Description
Front cover and version	Includes version and QA information
Guidance	These are intended for the worksheet user and do not need to be printed (right click on them and select 'hide' before printing).
Assessment Guidance	
#REF!	Options are assessed against Strategic and Management Cases.
2nd Phase Assessment	Progressed options only are assessed against Economic and Financial Cases.
#REF!	A summary of all options' case's assessment.
#REF!	This displays only shortlisted options (which have passed both phases of assessment)

### Instructions:

Step	Action	Where	Further guidance
1	Fill in a long list of options	1st Phase Assessment: Columns A and C	This should include all modes. "Themes" refer to active travel/ metro bus / park and ride etc.
2	Fill in corridor objectives under the Strategic Case heading.	1st Phase Assessment: D4 to H4	Up to five permitted (can be less if appropriate). The first objective must relate to enabling or supporting SDL growth in SDL, as this is used as part of the sifting criteria.
3	Using the drop down menus, rate each option against the Strategic and Management Cases. Add brief comments to justify as appropriate.	1st Phase Assessment: Columns D to M	See Assessment Guidance tab.
4	Check you are satisfied with the pass/fail criteria (set at the top of the column) for the Strategic and Management Cases.	1st Phase Assessment: N5 to Q5	Criteria should be agreed with WECA Client Group.
5	Populate the last two columns to indicate whether each option will be taken forward and why.	1st Phase Assessment: Columns S and T	Column R presents the overall result of the Pass/Fail tests, but there is the opportunity to over-ride this (with justification). Only options with a 'Yes' input in Column S are taken through to the 2nd Phase Assessment.
6	Options which pass the 1st Phase are automatically populated on the 2nd Phase Assessment sheet. This will need to be manually updated, by pressing the 'Reapply' button on the Data ribbon (next to Filter button) or Ctrl + Alt + L.	2nd Phase Assessment: Reapply button under Data / Sort & Filter	The 2nd Phase Assessment sheet contains a hidden filter based on the output from 1st Phase (Column S). This needs to be manually updated following any change to the values on the 1st Phase tab.
7	Using the drop down menus, rate each option against the Economic and Financial Cases. Add brief comments to justify as appropriate.	2nd Phase Assessment: Columns E to L	See Assessment Guidance tab.
8	Check you are satisfied with the pass/fail criteria (set at the top of the column) for the Economic and Financial Cases.	2nd Phase Assessment: M5 to P5	Criteria should be agreed with WECA Client Group.
9	Populate the last two columns to indicate whether each option will be taken forward and why.	2nd Phase Assessment: Columns R and S	Column Q presents the overall result of the Pass/Fail tests, but there is the opportunity to over-ride this (with justification).
10	Review overall assessment in the Summary tab.	Summary	Do not change any values here - go back to 1st / 2nd Phase tabs if required to update assessment
11	Short-listed options appear in the Shortlist tab. Update the filter as in Step 6, by pressing the Reapply button on the Data tab or Ctrl + Alt + L.	Summary Shortlist	The Shortlist sheet contains a hidden filter based on the output from 2nd Phase (Column R). This needs to be manually updated following any change to the values on the 2nd Phase tab.

## Options scoring criteria

### Strategic Case

Each option is scored on 6-point system with respect to potential contribution to scheme objectives. The comments column should be used to briefly record any key points relevant to the Strategic Case.

Score	Summary	Impact
0	Neutral / adverse	Not anticipated to have a beneficial impact / more likely to have an adverse impact
1	Very small impact	Would have a very small beneficial impact, possibly with undesirable consequences
2	Minor impact	Would have a modest overall impact
3	Moderate impact	Expected to have a reasonably significant impact with respect to the identified objective or outcome
4	Significant impact	Expected to have a very significant impact with respect to the identified objective or outcome
5	Fully addressed	Expected to fully address the identified objective or outcome, without any undesirable consequences

### Management Case

The most likely timescales for implementation (5-year period) should be recorded, followed by an assessment of deliverability. The Key Risks / Issues column should be used to support the assessment - in particular any major risks or showstoppers leading to a score of 1 for deliverability should be identified. Equally, if the option is assessed as being unlikely to be delivered before 2036, brief explanation should be provided.

	Score	Summary
Estimated timescales for implementation (opening year)	1	Unlikely to be before 2036
	2	Most likely to be between 2026 and 2036
	3	Most likely to be before 2026
Deliverability	1	Unlikely to be deliverable - i.e. not practically feasible (for technical or possibly environmental reasons)
	2	Deliverable but relatively high complexity and risk - i.e. some significant technical/environmental risks but potential for these to be mitigated
	3	Deliverable with low complexity and risk - possibly some challenges but these can be overcome

### Economic Case

For each of economic growth, environment and well being, each option is scored on a 5-point scale. Where adverse impacts are likely, scoring should be based on the most adverse impact expected in each case post-mitigation (e.g. a minor adverse impact under air quality does not offset a major adverse impact under landscape). Where only beneficial impacts are likely, scoring should take into account the overall range of impacts rather than focusing on just one element. Any specific major adverse / beneficial impacts should be recorded in the comments column with brief justification provided.

Score	Summary	Further information
-2	Major adverse impact	This would indicate likelihood of a major adverse impact, which could not be satisfactorily mitigated.
-1	Minor / Moderate adverse impact	Moderate / minor adverse impacts - which can probably be satisfactorily mitigated through the design process.
0	Neutral	Only use if there is reasonable evidence that no beneficial or adverse impacts would occur.
1	Minor / Moderate beneficial impact	Use these if there is reasonable evidence of minor / moderate beneficial impacts overall, and no risk of adverse impacts. Beware of optimism bias in scoring!
2	Major beneficial impact	Would require strong evidence that the option would be genuinely transformative, and/or with regional-wide benefits, plus no risk of adverse impacts to achieve this score.

## Financial Case

Where possible, an estimate of likely capital costs including appropriate risk allowance should be made. Requirements for on-going revenue costs are assessed qualitatively, but could be entered into the comments column along with more detailed capital costs estimates if available. Finally, a qualitative assessment of overall affordability is made - primarily with the purpose of identifying any options that at this stage would be considered unaffordable - justification would be required for such an assessment and set out in the comments column.

	Score	Cost (current core costs including risk allowance)
Capital cost	1	> £ 100m
	2	£ 50-100m
	3	£ 25-50m
	4	£ 10-25m
	5	< £ 10m
Revenue costs	1	Likely requirement for ongoing revenue support for operation of transport services or facilities (e.g. over 5 years).
	2	Likely requirement for short-term revenue support for operation of transport services or facilities (e.g. up to 5 years).
	3	No requirement for revenue support / on-going costs limited to infrastructure maintenance only.
Affordability and financial risk	1	Not likely to be affordable, due to very high capital and/or revenue costs or associated financial risks.
	2	Likely to be affordable, but with potentially high capital and/or revenue costs; manageable financial risks.
	3	Affordable with relatively low capital and/or revenue costs, and low financial risk.

1st Phase Assessment

Themes	No.	Transport Option	Strategic Case					Overall Assessment	Comments (key points relevant to Strategic Case)	Management Case			Strategic Case		Management Case		Overall assessment (as calculated)	Taken forward to phase 2? (Manual entry)	Justification for option rejection or continuation to next stage			
			Degree to which problems would be solved							Estimated timescales for implementation (opening year)	Deliverability	Key Risks / Issues affecting deliverability and timescales	Does it support SDL objective (Column D)? Pass if >=	Does it support overall objectives? Pass if >=	Timescales Pass if >=	Deliverability Pass if >=						
			Objective 1	Objective 2	Objective 3	Objective 4																
Orbital MetroBus	1	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (via new transport link around South East Bristol) - Gold standard.	4, Significant impact	4, Significant impact	3, Moderate impact	4, Significant impact	4, Significant impact	Gold standard: offline bus lanes for full length and priority at all junctions/bus gates will encourage mode shift and reduce car journeys by providing reliable public transport journeys. May not be sufficient evidence to suggest high enough demand for orbital MetroBus to immediately go to a full offline route option - journey to work data suggests there are orbital movements but these are small compared with journeys into Bristol, and with more in the Whitchurch - Emersons Green direction than vice versa. There is however no direct or full orbital bus service at the moment, thus with increased population from SDL growth there is potential for mode shift if one is available.	2, 2026-2036	2, Deliverable but high complexity/risk	Dependent on the building of new link road. Emersons Green to Whitchurch is a very long route; unlikely to be able to have an offline bus route for the entire route. Will likely take longer than the delivery of the new roads. Very high cost. May be difficult to deliver in terms of land acquisition / construction requirements.	3, Moderate impact	3, Moderate impact	2, 2026-2036	2, Deliverable but high complexity/risk	Pass	Pass	Pass	Yes	May be potential hotspots where gold standard is not possible. Potential lack of sufficient evidence to suggest that it has the demand to justify it. Current A4174 Emersons Green to Hicks Gate is already dual carriageway - would require careful consideration of what is required above and beyond this.		
Orbital MetroBus	2	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (via new transport link around South East Bristol) - Silver standard.	3, Moderate impact	4, Significant impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	Silver standard: offline bus lanes where width permits and prioritised junctions may encourage mode shift and reduce car journeys by providing more reliable public transport journeys. May not be sufficient evidence to suggest high enough demand for orbital MetroBus to immediately go to a full offline route option - journey to work data suggests there are orbital movements but these are small compared with journeys into Bristol, and with more in the Whitchurch - Emersons Green direction than vice versa. There is however no direct or full orbital bus service at the moment, thus with increased population from SDL growth there is potential for mode shift if one is available.	2, 2026-2036	2, Deliverable but high complexity/risk	Dependent on the building of new link road. Will potentially take longer than the delivery of the new roads. High cost. May be difficult to deliver in terms of land acquisition / construction requirements.	3, Moderate impact	3, Moderate impact	2, 2026-2036	2, Deliverable but high complexity/risk	Pass	Pass	Pass	Yes	Unlikely to be able to deliver offline bus route for the entire route, but there will likely be sections where an offline bus route is possible and preferable. Current A4174 Emersons Green to Hicks Gate is already dual carriageway - would require careful consideration of what is required above and beyond this.		
Orbital MetroBus	3	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (via new transport link around South East Bristol) - Bronze standard.	3, Moderate impact	3, Moderate impact	2, Minor impact	2, Minor impact	2, Minor impact	Bronze standard: priority junctions/bus gates may encourage mode shift and reduce car journeys by providing more reliable public transport journeys. There is evidence for bus priority at junctions, as these are the points where delay occurs. Evidence suggests that the current pinch points of congestion are at junctions where there is limited space for improvements - bronze standard MetroBus would likely not address this.	2, 2026-2036	3, Deliverable with low complexity/risk	Dependent on the building of new link roads, but could be delivered at a similar time.	3, Moderate impact	3, Moderate impact	2, 2026-2036	3, Deliverable with low complexity/risk	Pass	Fail	Pass	Pass	No	The current ring road from Emersons Green to Hicks Gate is not a highly congested route, and the new A4-A37 link should provide sufficient highway capacity. It is the junctions that are the issue, and these are likely not to have space for 'easy' improvements as included in bronze standard.	
Orbital MetroBus	4	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (on existing roads, e.g. Whitchurch Lane/Stockwood Ln).	1, Very small impact	0, Neutral / adverse	0, Neutral / adverse	0, Neutral / adverse	0, Neutral / adverse	Existing infrastructure only, with no new link roads, would not provide a sufficient orbital route.	2, 2026-2036	1, Unlikely to be deliverable	Undeliverable because constraints on the current roads (widths) are high - would not be able to build a MetroBus standard route.	1, Very small impact	0, Neutral / adverse	2, 2026-2036	1, Unlikely to be deliverable	Fail	Fail	Pass	Fail	No	Existing infrastructure only, with no new link roads, would not provide a sufficient orbital route, and would not be up to a MetroBus standard.	
Orbital MetroBus	5	Improvements to city centre interchange between South Bristol and East Fringe bus services.	1, Very small impact	1, Very small impact	0, Neutral / adverse	0, Neutral / adverse	0, Neutral / adverse	Undesirable to have to go into the city centre to interchange - may be useful to improve city interchange but not for an orbital route.	3, Before 2026	3, Deliverable with low complexity/risk		1, Very small impact	1, Very small impact	3, Before 2026	3, Deliverable with low complexity/risk	Fail	Fail	Pass	Pass	No	Undesirable to have to go far out of the way into the city centre and change. This would not address the key issue of congestion on the route.	
Orbital MetroBus	6	Enhanced bus service on new orbital transport link.	3, Moderate impact	2, Minor impact	2, Minor impact	2, Minor impact	2, Minor impact	There is not currently a bus route which caters for movements from Whitchurch to the East Fringe or vice versa without having to go into the centre and change, or even for shorter orbital movements such as Emersons Green to Hicks Gate, as there are no bus services on the ring road. Whilst the impact would not be as strong as MetroBus, it may be sufficient for the level of patronage to offer a new online fast bus connection from Whitchurch to Emersons Green along the ring road and new A4-A37 link.	2, 2026-2036	3, Deliverable with low complexity/risk	Deliverable as long as the new link road is built.	3, Moderate impact	2, Minor impact	2, 2026-2036	3, Deliverable with low complexity/risk	Pass	Fail	Pass	Pass	Fail	Yes	Passed as although the benefits aren't huge, they may be sufficient for the demands of the corridor and the level of bus patronage that could be achieved.
Whitchurch P&R	7	Increase the capacity of existing sites only.	1, Very small impact	1, Very small impact	0, Neutral / adverse	0, Neutral / adverse	0, Neutral / adverse	There is no current site at Whitchurch.	3, Before 2026	1, Unlikely to be deliverable	Failed as this site has been identified as an SDL site.	1, Very small impact	1, Very small impact	3, Before 2026	1, Unlikely to be deliverable	Fail	Fail	Pass	Fail	Fail	No	The Brislington P&R needs to be relocated to make space for a new SDL site. The site is also not the most ideal location in terms of removing the most efficient amount of traffic on the A4.
Hicks Gate P&R	8	Increase the capacity of existing site only.	2, Minor impact	3, Moderate impact	0, Neutral / adverse	3, Moderate impact	2, Minor impact	Expanding existing site as Brislington would result in more traffic on the A4, and would increase congestion along that section.	3, Before 2026	1, Unlikely to be deliverable		2, Minor impact	3, Moderate impact	3, Before 2026	1, Unlikely to be deliverable	Fail	Fail	Pass	Fail	Fail	No	Fail as this scheme is simply not deliverable due to this land being designated for housing.
A4-A37 Link	9	On-line widening of existing route via A4 Bath Rd, A4174 Callington Rd, Airport Rd.	0, Neutral / adverse	0, Neutral / adverse	1, Very small impact	1, Very small impact	0, Neutral / adverse	Unlikely to be sufficient to meet the demands on the corridor as congestion would remain poor. Many local roads would still be used and are generally unsuitable as strategic routes.	3, Before 2026	3, Deliverable with low complexity/risk	Deliverable but not strategically useful.	0, Neutral / adverse	0, Neutral / adverse	3, Before 2026	3, Deliverable with low complexity/risk	Fail	Fail	Pass	Pass	Fail	No	Unlikely to be sufficient to meet the demands on the corridor as congestion would remain poor, with conflicting movements in/out of Bristol and orbitally.
West of A37 Link	10	New orbital corridor between Whitchurch and A38 at Barrow Common.	4, Significant impact	3, Moderate impact	3, Moderate impact	4, Significant impact	3, Moderate impact	Would be a strategically significant route.	1, After 2036	2, Deliverable but high complexity/risk	Needs substantial work to take it to consideration, and is likely to take longer to complete than the A38 - Hicks Gate section.	3, Moderate impact	3, Moderate impact	1, After 2036	2, Deliverable but high complexity/risk	Pass	Pass	Fail	Pass	Fail	No	This scheme has very significant delivery challenges, likely requiring a lengthy tunnel for both environmental and heritage/landscape reasons. Delivery within the plan period is unlikely. However, it is recognised that it remains a potential future aspiration, and would provide a suitable strategic link of higher quality than other options. At this stage the Whitchurch-Hicks Gate sections are the focus, however it is recognised that future proofing the routes for potential expansion to the A38 is essential.
A4-A37 Link	11	North Alignment 1 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - southerly route from Hicks Gate to Stockwood Lane - improvement to Stockwood Lane - parallel route to Stockwood avoiding Stockwood Vale valley. (Yellow/Blue)	4, Significant impact	3, Moderate impact	4, Significant impact	4, Significant impact	4, Significant impact	Would be a strategically significant route. How it links with the new SDL, P&Rs, and caters for the orbital MetroBus are essential factors to consider.	2, 2026-2036	2, Deliverable but high complexity/risk	Will likely have engineering constraints and environmental impacts, and impacts on utilities requires further investigation. This alignment requires significant gradient works (600m long climbing lane).	4, Significant impact	3, Moderate impact	2, 2026-2036	2, Deliverable but high complexity/risk	Pass	Pass	Pass	Pass	Pass	Yes	Passes because this route would have demand, as shown in the modelling from the G-BATS4 model - further assessment of the routes would be required to determine alignments. Modelling indicates that single carriageway would be sufficient for the level of car use demand.

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			Degree to which problems would be solved					Estimated timescales for implementation (opening year)	Deliverability	Key Risks / Issues affecting deliverability and timescales	Does it support SDL objective (Column D)? Pass if >=	Does it support overall objectives? Pass if >=	Timescales Pass if >=	Deliverability Pass if >=				
			Objective 1	Objective 2	Objective 3	Objective 4	Overall Assessment				Comments (key points relevant to Strategic Case)	3, Moderate impact	3, Moderate impact	2, 2026-2036				2, Deliverable but high complexity/risk
			Mitigate increased travel demand enabling planned growth (JSP and non-JSP)	Provide a range of convenient and attractive journey options for south-east Bristol to key destinations such as Bristol city centre and Keynsham, and for orbital movements, to enable mode shift	Increase orbital connectivity to improve access around south-east Bristol, reduce delays on the existing network and minimise inappropriate movements on local roads	Improve journey time reliability for public transport along the corridor and orbital movements												
A4-A37 Link	12	North alignment 2 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - southerly route from Hicks Gate to Stockwood Lane - parallel route to Stockwood avoiding Stockwood Vale valley. (Yellow/Red/Blue)	4, Significant impact	3, Moderate impact	4, Significant impact	4, Significant impact	4, Significant impact	4, Significant impact	2, 2026-2036	2, Deliverable but high complexity/risk	Will likely have engineering constraints and environmental impacts, and impacts on utilities requires further investigation. This alignment requires significant gradient works (600m long climbing lane).	Pass	Pass	Pass	Pass	Pass	Yes	Passes because this route would have demand, as shown in the modelling from the G-BATS4 model - further assessment of the routes would be required to determine alignments. Modelling indicates that single carriageway would be sufficient for the level of car use demand.
A4-A37 Link	13	North Alignment 3 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - south westerly route from Hicks Gate following topography - parallel route to Stockwood avoiding Stockwood Vale valley. (Blue)	4, Significant impact	3, Moderate impact	4, Significant impact	4, Significant impact	4, Significant impact	4, Significant impact	2, 2026-2036	2, Deliverable but high complexity/risk	Will likely have engineering constraints and environmental impacts, and impacts on utilities requires further investigation.	Pass	Pass	Pass	Pass	Pass	Yes	Passes because this route would have demand, as shown in the modelling from the G-BATS4 model - further assessment of the routes would be required to determine alignments. Modelling indicates that single carriageway would be sufficient for the level of car use demand.
West of A37 Link	14	Connect from the A37 (at the roundabout with the routes to the east) to Washing Pound Lane, north of the junction with Church Road. Washing Pound Lane would be widened with an improved junction created at the junction with Ridgeway Lane and Whitchurch Lane. (Grey)	4, Significant impact	2, Minor impact	4, Significant impact	2, Minor impact	3, Moderate impact	2, Minor impact	2, 2026-2036	2, Deliverable but high complexity/risk	To consider how route will interact with the local roads is important. Sensitivities with alignment through the village.	Pass	Pass	Pass	Pass	Pass	Yes	There is evidence of local roads being used instead of the main roads, and with the SDL and the new A4-A37 Link this is likely to only increase.
West of A37 Link	15	Connect from the A37 (at the roundabout with the routes to the east) to Stoneberry Road, which would connect via Half Acre Lane to Whitchurch Lane. It is assumed that Stoneberry Road and Half Acre Lane would be widened, with an improved junction at Whitchurch Lane. (Orange)	4, Significant impact	2, Minor impact	4, Significant impact	2, Minor impact	3, Moderate impact	2, Minor impact	2, 2026-2036	2, Deliverable but high complexity/risk	Sensitivities with alignment through the village.	Pass	Pass	Pass	Pass	Pass	Yes	There is evidence of local roads being used instead of the main roads, and with the SDL and the new A4-A37 Link this is likely to only increase.
West of A37 Link	16	Connect around the east of Whitchurch to connect back to the A37 near the boundary between Bristol and Bath & North East Somerset. Traffic towards Whitchurch Lane would then route along the A37 into Bristol and turn west (then south west) into Ridgeway Lane, which then continues as Whitchurch Lane to the west. (Pink)	1, Very small impact	2, Minor impact	2, Minor impact	2, Minor impact	2, Minor impact	2, Minor impact	2, 2026-2036	2, Deliverable but high complexity/risk	This alignment is not as suitable strategically as the others, as it would not capture a number of orbital movements (due to it being north of the SDL), and will likely result in increased traffic on some unsuitable local roads.	Fail	Fail	Pass	Pass	Fail	No	This option fails as would not stop traffic using residential roads in Whitchurch and thus scores poorly against objective 3. The issue being addressed here is not the north-south movement from the SDL but the orbital movement - the pink alignment does not address this. This alignment also does not cater for SDL movements to the west.
Hicks Gate Roundabout	17	At-grade junction improvement - link between A4 Keynsham and A4174.	3, Moderate impact	3, Moderate impact	3, Moderate impact	2, Minor impact	3, Moderate impact	3, Moderate impact	3, Before 2026	3, Deliverable with low complexity/risk	Issues with land ownership.	Pass	Pass	Pass	Pass	Pass	Yes	The modelled level of demand needs to be assessed in line with projected development and other interventions scenarios (such as with A4-A37 Link, with P&R, with enhanced bus consideration and how this changes the roundabout options) to determine which alignment would be preferable strategically.
Hicks Gate Roundabout	18	Grade separation with A4174 - A4 flyover.	3, Moderate impact	2, Minor impact	2, Minor impact	3, Moderate impact	2, Minor impact	3, Moderate impact	2, 2026-2036	2, Deliverable but high complexity/risk	Modelling suggests improvements to the right angle movement would reduce the congestion on the arms and allow more vehicles to pass through the junction. However this option doesn't include a left turn filter lane from the A4174 to the bypass, and modelling indicates this will result in much more queuing than an option with a left turn filter lane. Modelling suggests that by 2024, without a left turn filter lane, there will be a larger amount of queuing on the approach on the A4174, hindering movements in all directions.	Pass	Fail	Pass	Pass	Fail	No	Option fails as the lack of a left turn filter lane would result in substantial queuing on the A4174 by 2024, thus hindering orbital movements.
Hicks Gate Roundabout	19	Grade separation with A4-A4 flyover.	3, Moderate impact	1, Very small impact	2, Minor impact	2, Minor impact	2, Minor impact	2, Minor impact	2, 2026-2036	2, Deliverable but high complexity/risk	Although this option hasn't been modelled, modelling of the A4 throughabout suggests that it is not the vertical A4 movement that is the issue but the horizontal and perpendicular movements at the junction. Whilst this option would assist by removing some traffic from the roundabout so it could be optimised for other movements, it would not offer major benefits.	Pass	Fail	Pass	Pass	Fail	No	Failed as does not address the orbital movement issue sufficiently.
Hicks Gate Roundabout	20	At-grade junction improvement - A4 throughabout.	1, Very small impact	1, Very small impact	0, Neutral / adverse	1, Very small impact	1, Very small impact	1, Very small impact	3, Before 2026	3, Deliverable with low complexity/risk	Modelling suggests that a throughabout would offer little benefit, as it would still suffer from congestion due to the succeeding junctions, but would not offer improvements to orbital movement.	Fail	Fail	Pass	Pass	Fail	No	Failed as does not address the orbital movement issue sufficiently.
A37 Public Transport	21	MetroBus route from Whitchurch to the city centre - gold standard.	4, Significant impact	3, Moderate impact	2, Minor impact	4, Significant impact	3, Moderate impact	3, Moderate impact	2, 2026-2036	1, Unlikely to be deliverable	There is congestion along the corridor, however demand and predicted patronage are important factors to understand if the MetroBus would be required above and beyond enhanced bus services.	Pass	Pass	Pass	Fail	Fail	No	Unlikely to be deliverable in places due to key width constraints along the corridor.
A37 Public Transport	22	MetroBus route from Whitchurch to the city centre - silver standard.	4, Significant impact	3, Moderate impact	2, Minor impact	4, Significant impact	3, Moderate impact	3, Moderate impact	2, 2026-2036	1, Unlikely to be deliverable	There is congestion along the corridor, however demand and predicted patronage are important factors to understand if the MetroBus would be required above and beyond enhanced bus services.	Pass	Pass	Pass	Fail	Fail	No	Unlikely to be deliverable in places due to key width constraints along the corridor.
A37 Public Transport	23	MetroBus route from Whitchurch to the city centre - bronze standard.	3, Moderate impact	3, Moderate impact	2, Minor impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	2, 2026-2036	1, Unlikely to be deliverable	There is congestion along the corridor, however demand and predicted patronage are important factors to understand if the MetroBus would be required above and beyond enhanced bus services.	Pass	Pass	Pass	Fail	Fail	No	Unlikely to be deliverable in places due to key width constraints along the corridor.
A37 Public Transport	24	Enhanced bus service on the A37 corridor or via Callington Road Link.	3, Moderate impact	3, Moderate impact	2, Minor impact	2, Minor impact	3, Moderate impact	3, Moderate impact	3, Before 2026	3, Deliverable with low complexity/risk	There is congestion along the corridor however it is not as poor as similar corridors such as the A4, and it is possible that an enhanced bus service could encourage mode shift.	Pass	Pass	Pass	Pass	Pass	Yes	
Railway Path MetroBus and Cycle Route	25	Offline MetroBus route from Whitchurch to the city centre via the old Railway Path with strategic cycle route infrastructure.	4, Significant impact	3, Moderate impact	1, Very small impact	4, Significant impact	3, Moderate impact	3, Moderate impact	1, After 2036	1, Unlikely to be deliverable	Some sections of the old railway path have been built on, it is highly unlikely there will be space for a MetroBus route through these.	Pass	Pass	Fail	Fail	Fail	No	

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			Degree to which problems would be solved					Estimated timescales for implementation (opening year)	Deliverability	Key Risks / Issues affecting deliverability and timescales	Does it support SDL objective (Column D)? Pass if >=	Does it support overall objectives? Pass if >=	Timescales Pass if >=	Deliverability Pass if >=						
			Objective 1	Objective 2	Objective 3	Objective 4	Overall Assessment													
			Mitigate increased travel demand enabling planned growth (JSP and non-JSP)	Provide a range of convenient and attractive journey options for south-east Bristol to key destinations such as Bristol city centre and Keynsham, and for orbital movements, to enable mode shift	Increase orbital connectivity to improve access around south-east Bristol, reduce delays on the existing network and minimise inappropriate movements on local roads	Improve journey time reliability for public transport along the corridor and orbital movements		Comments (key points relevant to Strategic Case)				3, Moderate impact	3, Moderate impact	2, 2026-2036	2, Deliverable but high complexity/risk	3, Moderate impact	3, Moderate impact	2, 2026-2036	2, Deliverable but high complexity/risk	
Railway Path MetroBus and Cycle Route	26	Strategic cycle route from Whitchurch to the city centre via the old Railway Path.	3, Moderate impact	3, Moderate impact	1, Very small impact	4, Significant impact	3, Moderate impact	This option would have benefits, particularly for enabling mode shift to cycling. There is currently a cycle route with broadly follows this alignment however it is a mixture of on-road and traffic separated with a number of junction crossings required, so it is not that desirable.	2, 2026-2036	2, Deliverable but high complexity/risk	Some sections of the old railway path have been built on so there are width constraints, however a route with only a cycle path is likely to be able to be accommodated.	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes	
Whitchurch P&R	27	Site 6 to the west of the A37 between Ridgeway Lane and Maggs Lane.	3, Moderate impact	3, Moderate impact	2, Minor impact	3, Moderate impact	3, Moderate impact	Should help to cater for the increased demand from the SDL, however being slightly north of the SDL this could lead to congestion on the A37 running up the P&R.	3, Before 2026	2, Deliverable but high complexity/risk	This site lies on steeply sloping ground adjacent to the stream and existing viaduct, and is a mixture of woodland scrub and grassland of some ecological interest.	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes	Although deliverable, the steepness of the ground is not ideal.
Whitchurch P&R	28	Site 7 between Fortfield Road and Bamfield, south of Asda Whitchurch store.	1, Very small impact	3, Moderate impact	1, Very small impact	2, Minor impact	2, Minor impact	The site is quite a distance from the A37, and access would be through a residential area. It is unlikely to cater that well for the SDL.	3, Before 2026	2, Deliverable but high complexity/risk	This site is deliverable but the access would be difficult due to it being through likely unsuitable residential areas.	Fail	Fail	Pass	Pass	Fail	Fail	Pass	No	The site is a long distance from the A37, and access would be through a residential area. It is unlikely to cater that well for the SDL.
Whitchurch P&R	29	Site 8 to the west of the A37 north of New Fossway Road.	2, Minor impact	3, Moderate impact	2, Minor impact	3, Moderate impact	3, Moderate impact	This site has good access from the A37, so is likely to be seen as a good option by travellers, as should reduce stress on some congested junctions further into the city.	3, Before 2026	1, Unlikely to be deliverable	Unlikely to be deliverable due to the site occupying school playing fields, which will probably be unacceptable as an option both politically and in terms of policy.	Fail	Pass	Pass	Fail	Fail	Fail	Fail	No	Fails due to delivery risk as site is currently school playing fields.
Whitchurch P&R	30	Site 9 at industrial estate on the corner of Hengrove Lane and Petherton Road.	1, Very small impact	3, Moderate impact	1, Very small impact	2, Minor impact	2, Minor impact	This site is quite a way from the A37, and is quite far away from the SDL.	3, Before 2026	1, Unlikely to be deliverable	This site is a thriving industrial estate - highly unlikely it will be favourable to transform this into a park and ride.	Fail	Fail	Pass	Fail	Fail	Fail	Fail	No	Fails due to delivery risk as site would require relocation of existing business premises.
Whitchurch P&R	31	Site 10 at sports ground north of the A4174 to the west of Tesco Extra.	1, Very small impact	2, Minor impact	1, Very small impact	1, Very small impact	1, Very small impact	This site would cater for traffic from both the A4 and A37 direction - however its proximity to the city means that there is congestion leading up to this site, and this would only increase with a P&R site.	3, Before 2026	2, Deliverable but high complexity/risk	This site lies within the corner of the sports ground at the junction of the ring road and A37. Some redevelopment has already occupied on the sports ground and it may not be possible to develop further within the context of existing agreements.	Fail	Fail	Pass	Pass	Fail	Fail	Fail	No	This site would cater for traffic from both the A4 and A37 direction - however its proximity to the city means that trips are still required to negotiate congested parts of the network. Short onward journey to P&R unlikely to be attractive option.
Whitchurch P&R	32	Site 11 south of Staunton Lane between Sleep Lane and Newlands.	3, Moderate impact	3, Moderate impact	2, Minor impact	3, Moderate impact	3, Moderate impact	Should help to cater for the increased demand from the SDL, however being slightly north of the SDL this could lead to congestion on the A37 running up the P&R. Also access is via a rural road which is unlikely to be suitable in current condition.	3, Before 2026	2, Deliverable but high complexity/risk	The site is high risk as has poor access currently, and is around farms and houses. Unknown land acquisition requirements.	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes	
Hicks Gate P&R	33	Site 1 NW quadrant of Hicks Gate roundabout.	2, Minor impact	3, Moderate impact	1, Very small impact	2, Minor impact	2, Minor impact	The biggest demand for this P&R is likely to be from the Bath direction, and this would require these users to not only cross Hicks Gate but also cross the A4 to enter the site.	3, Before 2026	2, Deliverable but high complexity/risk	Would be a high risk because much of the southern part of the field is in Flood Zone 3 (high risk of flooding). Unknown land acquisition requirements.	Fail	Fail	Pass	Pass	Fail	Fail	Pass	No	Greatest demand for this P&R is likely to be from the Bath direction, and this would require users to cross Hicks Gate junction and the A4 to enter the site. Significant environmental risks as much of the southern part of the site is in Flood Zone 3 (high risk of flooding).
Hicks Gate P&R	34	Site 2 NE quadrant of Hicks Gate roundabout.	3, Moderate impact	3, Moderate impact	1, Very small impact	2, Minor impact	2, Minor impact	This site would capture the demand from Bath on the A4, however it would require a right hand turning lane and there potential highway constraints for this.	3, Before 2026	2, Deliverable but high complexity/risk	Deliverable but potential lack of highway space for right turn lane into the site. There is also a motorcross track which may have land required to build a site of a large size. Unknown land acquisition requirements.	Pass	Fail	Pass	Pass	Fail	Fail	Pass	No	Constrained highway space for right turn lane into the site, thus fails due to poor access to site.
Hicks Gate P&R	35	Site 3 SE quadrant of Hicks Gate roundabout.	3, Moderate impact	3, Moderate impact	2, Minor impact	3, Moderate impact	3, Moderate impact	This site would be preferable for capturing some of the demand from the A4, with a left hand turn movement. It would however be more difficult to reach orbitally.	3, Before 2026	1, Unlikely to be deliverable	There is a fire station next to this site, which means it has little space to expand in the future and there are also potential access issues due to emergency vehicles. Unknown land acquisition requirements.	Pass	Pass	Pass	Fail	Fail	Fail	Pass	No	Site is too small to accommodate required capacity.
Hicks Gate P&R	36	Site 4 SW quadrant of Hicks Gate roundabout, next to Durlay Hill.	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	Although users from the A4 would need to cross Hick's Gate roundabout, having a left turn into the site is more preferable than other sites. This option has more potential to capture demand from Whitchurch.	3, Before 2026	2, Deliverable but high complexity/risk	This site would need to be considered carefully in regards to its interaction with the A4-A37 Link, and could be affected by its chosen alignment. Unknown land acquisition requirements.	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes	
Hicks Gate P&R	37	Site 5 SW quadrant of Hicks Gate roundabout, further from roundabout towards Bristol south of A4.	3, Moderate impact	3, Moderate impact	2, Minor impact	2, Minor impact	3, Moderate impact	No direct access from Hicks Gate roundabout. Would remove traffic from A4 towards Bristol, and could integrate with new link road movements.	3, Before 2026	3, Deliverable with low complexity/risk	There is room for expansion, however some of the site is in Flood Zone 3 and close to a farm and garden centre.	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes	
Hicks Gate P&R	38	Site 6 NW quadrant of Hicks Gate roundabout, further from roundabout towards Bristol north of A4.	3, Moderate impact	3, Moderate impact	1, Very small impact	2, Minor impact	2, Minor impact	No direct access from Hicks Gate roundabout. Would remove traffic from A4 towards Bristol.	3, Before 2026	3, Deliverable with low complexity/risk		Pass	Fail	Pass	Pass	Fail	Fail	Pass	No	Greatest demand for this P&R is likely to be from the Bath direction, and this would require users to cross Hicks Gate junction and the A4 to enter the site. No direct access from Hicks Gate roundabout, requires more highway space as would need a filter lane into the site.
Hicks Gate P&R	39	Site 7 SE quadrant of Hicks Gate roundabout, further from roundabout towards Bath south of A4.	3, Moderate impact	3, Moderate impact	1, Very small impact	2, Minor impact	2, Minor impact	No direct access from Hicks Gate roundabout. Awkward to get to if coming from north/south.	3, Before 2026	2, Deliverable but high complexity/risk	Within Flood Zone 3.	Pass	Fail	Pass	Pass	Fail	Fail	Pass	No	No direct access from Hicks Gate roundabout. Would not serve potential orbital trips.
A37 Public Transport	40	Extension to North Fringe Hengrove MetroBus.	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	This route would be a less direct route into the centre, however it would provide good orbital connectivity to the west. Need to consider whether their would be demand for this, or if current services direct into the centre would be preferable.	3, Before 2026	2, Deliverable but high complexity/risk	May be physical constraints to a MetroBus route - Whitchurch Lane is also quite rural.	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes	
West of A37 Link	41	Single carriageway road connecting the A37 to Bishop Avenue and Hawkfield Road in the west through an alignment south of Whitchurch village.	3, Moderate impact	3, Moderate impact	4, Significant impact	3, Moderate impact	3, Moderate impact	Would cater for the new SDL - although not as significantly as the other options as it is recognised that some vehicles would continue to use local roads in Whitchurch village - and orbital MetroBus, and potentially P&R site. Future-proofing should be considered in the long term, with how the section may connect onto a longer ring road route. Needs careful consideration of the suitability of Bishop Avenue and nearby roads for the additional traffic, and also the route vehicles would actually take off the link road.	2, 2026-2036	2, Deliverable but high complexity/risk	Potential issues with land ownership, and the alignment may have engineering constraints. There are housing constraints either side of the point on Bishop Avenue where the new link would join.	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Yes	This route has potential engineering constraints, and would run close to residential areas, particularly where it joins with Bishop Avenue. Would require careful consideration of the traffic from this alignment on the Bishop Avenue residential area.
Whitchurch P&R	42	Site 1 west of A37, south of Norton Lane, south of the cricket pitch.	2, Minor impact	2, Minor impact	2, Minor impact	3, Moderate impact	2, Minor impact	Site is quite far south, and to the west of the A37, so is unlikely to support the new SDL as much as nearer site.	3, Before 2026	2, Deliverable but high complexity/risk	Potential issues with land ownership, and proximity to the cricket pitch, plus how the site accesses the A37, and visual issues as the site is at the top of a hill. Site is in green belt land.	Fail	Fail	Pass	Pass	Fail	Fail	Pass	No	
Whitchurch P&R	43	Site 2 east of A37, land adjacent to the Cemetery.	2, Minor impact	2, Minor impact	2, Minor impact	3, Moderate impact	2, Minor impact	Site is quite far south, so is unlikely to support the new SDL as much as nearer site.	3, Before 2026	2, Deliverable but high complexity/risk	Potential issues with land ownership, and proximity to the cemetery. Site is in green belt land.	Fail	Fail	Pass	Pass	Fail	Fail	Pass	No	



Themes	No.	Transport Option	Strategic Case					Management Case			Strategic Case		Management Case		Overall assessment (as calculated)	Taken forward to phase 2? (Manual entry)	Justification for option rejection or continuation to next stage		
			Degree to which problems would be solved					Estimated timescales for implementation (opening year)	Deliverability	Key Risks / Issues affecting deliverability and timescales	Does it support SDL objective (Column D)? Pass if >=	Does it support overall objectives? Pass if >=	Timescales Pass if >=	Deliverability Pass if >=					
			Objective 1	Objective 2	Objective 3	Objective 4	Overall Assessment				Comments (key points relevant to Strategic Case)								
			Mitigate increased travel demand enabling planned growth (JSP and non-JSP)	Provide a range of convenient and attractive journey options for south-east Bristol to key destinations such as Bristol city centre and Keynsham, and for orbital movements, to enable mode shift	Increase orbital connectivity to improve access around south-east Bristol, reduce delays on the existing network and minimise inappropriate movements on local roads	Improve journey time reliability for public transport along the corridor and orbital movements				3, Moderate impact	3, Moderate impact	2, 2026-2036	2, Deliverable but high complexity/risk						
Whitchurch P&R	44	Site 3 east of A37, north of Cemetery.	2, Minor impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	Site is south of the SDL, so is unlikely to support the new SDL as much as nearer site, however could link directly onto the new A4-A37 Link road (dependent on alignment).	3, Before 2026	2, Deliverable but high complexity/risk	Potential issues with land ownership, and proximity to the cemetery. Site is in green belt land. Dependent on alignment, deliverability of the access could be built in conjunction with the A4-A37 Link. Site is quite small and note much room for direct expansion.	Fail	Pass	Pass	Pass	Fail	No	
Whitchurch P&R	45	Site 4 west of A37, north of Norton Lane.	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	Should help to cater for increased demand from the SDL, and capture some current Whitchurch demand. Could directly link to the new link road depending on alignment. Careful consideration of the demand for certain routings needs to be considered - e.g. an orbital route up the A37, up the A37 & A4174 & A4. The A37 currently only as a long distance half hourly service - suggests there is scope for another service.	3, Before 2026	2, Deliverable but high complexity/risk	Potential issues with land ownership, and proximity to rugby club. Site is in green belt land, and new directly adjacent to the A37 so access deliverability would be more difficult.	Pass	Pass	Pass	Pass	Pass	Yes	Complexity of how this P&R site will fit in with the development of the SDL as it is to the west of the A37 and how it will provide service for this development. Would capture well the traffic coming up into Bristol from the south.
Whitchurch P&R	46	Site 5 west of A37, south of Church Road.	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	3, Moderate impact	Should help to cater for the increased demand from the SDL, as although it is on the west side of the A37 it is directly adjacent. Could directly link to the new link road depending on alignment. Careful consideration of the demand for certain routings needs to be considered - e.g. an orbital route up the A37, up the A37 & A4174 & A4. The A37 currently only as a long distance half hourly service - suggests there is scope for another service.	3, Before 2026	2, Deliverable but high complexity/risk	Deliverable but there is the complexity of how this P&R site will fit in with the development of the SDL and how it will provide service for this development. Land is green belt land.	Pass	Pass	Pass	Pass	Pass	Yes	Complexity of how this P&R site will fit in with the development of the SDL as it is to the west of the A37 and how it will provide service for this development. Would capture well the traffic coming up into Bristol from the south.
A4-A37 Link	47	South Alignment 1 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - takes a direct alignment through the potential SDL. 40mph link providing access to the SDL and significant measures to provide connectivity across the link. Connecting to the A37 south of Staunton Lane. Not compatible with future dualling. (Purple)	4, Significant impact	3, Moderate impact	4, Significant impact	4, Significant impact	4, Significant impact	4, Significant impact	Would be a strategically significant route. How it links with the new SDL, P&Rs, and caters for the orbital MetroBus are essential factors to consider.	2, 2026-2036	2, Deliverable but high complexity/risk	Will likely have engineering constraints and environmental impacts, and impacts on utilities requires further investigation. This alignment requires significant gradient works (600m long climbing lane).	Pass	Pass	Pass	Pass	Pass	Yes	Passes because this route would have demand, as shown in the modelling from the G-BATS4 model. Modelling indicates that single carriageway would be sufficient for the level of car use demand.
A4-A37 Link	48	South Alignment 2 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - takes a direct alignment through the potential SDL. 50mph link with no access to the SDL and limited measures to provide connectivity across the link. Connecting to the A37 south of Staunton Lane. Potentially compatible with future dualling. (Purple)	4, Significant impact	3, Moderate impact	4, Significant impact	4, Significant impact	4, Significant impact	4, Significant impact	Would be a strategically significant route. How it links with the new SDL, P&Rs, and caters for the orbital MetroBus are essential factors to consider.	2, 2026-2036	2, Deliverable but high complexity/risk	Will likely have engineering constraints and environmental impacts, and impacts on utilities requires further investigation. This alignment requires significant gradient works (600m long climbing lane).	Pass	Pass	Pass	Pass	Pass	Yes	Passes because this route would have demand, as shown in the modelling from the G-BATS4 model. Modelling indicates that single carriageway would be sufficient for the level of car use demand.
A4-A37 Link	49	South Alignment 3 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - takes an alignment around the southern eastern extent of the potential SDL. 50mph link with no access to the SDL and limited measures to provide connectivity across the link. Connecting to the A37 north of Gibbet Lane. Potentially compatible with future dualling. (Dotted green)	4, Significant impact	3, Moderate impact	4, Significant impact	4, Significant impact	4, Significant impact	4, Significant impact	Would be a strategically significant route. How it links with the new SDL, P&Rs, and caters for the orbital MetroBus are essential factors to consider.	2, 2026-2036	2, Deliverable but high complexity/risk	Will likely have engineering constraints and environmental impacts, and impacts on utilities requires further investigation.	Pass	Pass	Pass	Pass	Pass	Yes	Passes because this route would have demand, as shown in the modelling from the G-BATS4 model. Modelling indicates that single carriageway would be sufficient for the level of car use demand.
A4-A37 Link	50	Dual carriageway - all alignments	4, Significant impact	3, Moderate impact	4, Significant impact	4, Significant impact	4, Significant impact	4, Significant impact	At this stage modelling indicates that a dual carriageway would not be required - however demand may increase in the future.	2, 2026-2036	2, Deliverable but high complexity/risk	Will likely have engineering constraints and environmental impacts, and impacts on utilities requires further investigation.	Pass	Pass	Pass	Pass	Pass	Yes	At this stage modelling indicates that a dual carriageway would not be required to meet demand, however this does not include potential demand for this route if the full orbital corridor to Airport Road is realised, and it may be desirable to build or future proof for a dual route.

2nd Phase Assessment

Phase 1 result	Themes	No.	Transport Option	Economic Case				Financial Case				Economic Case			Financial Case	Overall assessment (as calculated)	To be taken forward?	Additional Justification for Pass or Fail
				Economic Growth	Environment	Well being	Comments - explain any specific major impacts (both adverse and beneficial)	Capital Costs	Revenue Costs	Affordability and financial risk	Comments - include capital / revenue cost estimates where known, plus explain affordability assessment	Economy. Pass if >=	Environment. Pass if >=	Well being. Pass if >=	Affordability. Pass if >=			
				Connectivity / Reliability / Wider economic impacts / Resilience/ Delivery of housing /	Air quality / Noise / Carbon emissions / Landscape & Townscape / Biodiversity / Heritage / Water environment	Physical activity / Journey quality / Accidents / Security / Access to services / Affordability / Severance						-1 , Minor / Moderate	-1 , Minor / Moderate	-1 , Minor / Moderate	2, Affordable, but potentially high			
Yes	Orbital MetroBus	1	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (via new transport link around South East Bristol) - Gold standard.	2 , Major beneficial impact	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact		2, £ 50-100m	1, Ongoing revenue support required (> 5 years)	1, Not affordable / very high financial risk	Likely to be very expensive to have a gold standard MetroBus on the entire orbital route, and this will be a high financial risk as the benefits it will bring will likely not be much greater than a silver standard MetroBus. Another key risk for orbital services is the potential level of subsidy required and whether there would be sufficient patronage to justify them.	Pass	Pass	Pass	Fail	Fail	No	High financial risk, as there does not seem to be the evidence to support that a gold standard MetroBus route is necessary and that it could support itself financially.
Yes	Orbital MetroBus	2	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (via new transport link around South East Bristol) - Silver standard.	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact		3, £ 25-50m	1, Ongoing revenue support required (> 5 years)	2, Affordable, but potentially high costs + financial risk	This assumes the A4-A37 is constructed. A key risk for orbital services is the potential level of subsidy required and whether there would be sufficient patronage to justify them.	Pass	Pass	Pass	Pass	Pass	Yes	MetroBus of silver standard would be preferable, as this aims for bus lanes in all locations where constraints aren't too high.
Yes	Orbital MetroBus	6	Enhanced bus service on new orbital transport link.	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact		5, < £ 10m	1, Ongoing revenue support required (> 5 years)	3, Affordable with relatively low costs + financial risk	This assumes the A4-A37 Link is constructed. Costs would be relatively low as little infrastructure, aside from for example bus stop infrastructure, would be required to be built.	Pass	Pass	Pass	Pass	Pass	Yes	A strong orbital bus service may be sufficient to cater for the demands of the corridor if the new link road is built, although it depends on the level of congestion that is experienced at junctions.
Yes	A4-A37 Link	11	North Alignment 1 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - southerly route from Hicks Gate to Stockwood Lane - improvement to Stockwood Lane - parallel route to Stockwood avoiding Stockwood Vale valley. (Yellow/Blue)	2 , Major beneficial impact	-2 , Major adverse impact	-1 , Minor / Moderate adverse impact	Fails on environment, as this would require a steep 600m climbing line with significant cutting, which is significant when compared with a different alignment that requires no climbing lane section.	3, £ 25-50m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk		Pass	Fail	Pass	Pass	Fail	No	Fails on the environment section of the economic case as this option alignment would require a climbing lane and significant cutting and earthworks.
Yes	A4-A37 Link	12	North alignment 2 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - southerly route from Hicks Gate to Stockwood Lane - parallel route to Stockwood avoiding Stockwood Vale valley. (Yellow/Red/Blue)	2 , Major beneficial impact	-2 , Major adverse impact	-1 , Minor / Moderate adverse impact	Fails on environment, as this would require a steep 600m climbing line with significant cutting, which is significant when compared with a different alignment that requires no climbing lane section.	3, £ 25-50m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk		Pass	Fail	Pass	Pass	Fail	No	Fails on the environment section of the economic case as this option alignment would require a climbing lane and significant cutting and earthworks.
Yes	A4-A37 Link	13	North Alignment 3 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - south westerly route from Hicks Gate following topography - parallel route to Stockwood avoiding Stockwood Vale valley. (Blue)	2 , Major beneficial impact	-1 , Minor / Moderate adverse impact	-1 , Minor / Moderate adverse impact		3, £ 25-50m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk		Pass	Pass	Pass	Pass	Pass	Yes	Passes as this is the best option alignment in the economic case. The alignment however is still quite general and will require consideration of utilities when considering specific route.
Yes	West of A37 Link	14	Connect from the A37 (at the roundabout with the routes to the east) to Washing Pound Lane, north of the junction with Church Road. Washing Pound Lane would be widened with an improved junction created at the junction with Ridgeway Lane and Whitchurch Lane. (Grey)	1 , Minor / Moderate beneficial impact	-1 , Minor / Moderate adverse impact	-1 , Minor / Moderate adverse impact		4, £ 10-25m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk		Pass	Pass	Pass	Pass	Pass	Yes	Passes as there is the need for a route to the west of Whitchurch, as there is evidence of local roads being used instead of the main roads, and with the SDL and potential orbital route A4-A37 Link this issue could worsen. Careful consideration required of how Whitchurch Lane will be impacted by this option and the potential orbital route A4-A37 Link.
Yes	West of A37 Link	15	Connect from the A37 (at the roundabout with the routes to the east) to Stoneberry Road, which would connect via Half Acre Lane to Whitchurch Lane. It is assumed that Stoneberry Road and Half Acre Lane would be widened, with an improved junction at Whitchurch Lane. (Orange)	1 , Minor / Moderate beneficial impact	-1 , Minor / Moderate adverse impact	-1 , Minor / Moderate adverse impact		4, £ 10-25m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk		Pass	Pass	Pass	Pass	Pass	Yes	Passes as there is the need for a route to the west of Whitchurch, as there is evidence of local roads being used instead of the main roads, and with the SDL and potential orbital route A4-A37 Link this issue could worsen. Careful consideration required of how Whitchurch Lane will be impacted by this option and the potential orbital route A4-A37 Link.

Phase 1 result	Themes	No.	Transport Option	Economic Case				Financial Case				Economic Case			Financial Case	Overall assessment (as calculated)	To be taken forward?	Additional Justification for Pass or Fail
				Economic Growth	Environment	Well being	Comments - explain any specific major impacts (both adverse and beneficial)	Capital Costs	Revenue Costs	Affordability and financial risk	Comments - include capital / revenue cost estimates where known, plus explain affordability assessment	Economy. Pass if >=	Environment. Pass if >=	Well being. Pass if >=	Affordability. Pass if >=			
				Connectivity / Reliability / Wider economic impacts / Resilience/ Delivery of housing /	Air quality / Noise / Carbon emissions / Landscape & Townscape / Biodiversity / Heritage / Water environment	Physical activity / Journey quality / Accidents / Security / Access to services / Affordability / Severance						-1 , Minor / Moderate	-1 , Minor / Moderate	-1 , Minor / Moderate	2, Affordable, but potentially high			
Yes	Hicks Gate Roundabout	17	At-grade junction improvement - link between A4 Keynsham and A4174.	1 , Minor / Moderate beneficial impact	-1 , Minor / Moderate adverse impact	0 , Neutral		5, < £ 10m	3, No revenue support required / maintenance only	3, Affordable with relatively low costs + financial risk		Pass	Pass	Pass	Pass	Pass	Yes	Need to consider potential interaction with new Hicks Gate P&R, Orbital MetroBus, A4 MetroBus and new A4-A37 link. The best option will likely be determined by which other schemes are progressed, and may change depending on the package of schemes taken forward.
Yes	A37 Public Transport	24	Enhanced bus service on the A37 corridor or via Callington Road Link.	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact		5, < £ 10m	3, No revenue support required / maintenance only	3, Affordable with relatively low costs + financial risk		Pass	Pass	Pass	Pass	Pass	Yes	With the development of the Whitchurch SDL, it is likely there is demand for more frequent direct services into the city centre. The exact route needs to be determined, also in the context of other schemes taken forward and how this impacts the level of traffic on different roads.
Yes	Railway Path MetroBus and Cycle Route	26	Strategic cycle route from Whitchurch to the city centre via the old Railway Path.	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact	2 , Major beneficial impact	Enabling mode shift to cycling - improving well-being, physical activity and journey quality	4, £ 10-25m	1, Ongoing revenue support required (> 5 years)	2, Affordable, but potentially high costs + financial risk	Cost is relative to the length and quality of the bus route. Potential higher cost depending on e.g. the cutting required, bridges required etc. Also potential high risk of not having the patronage expected.	Pass	Pass	Pass	Pass	Pass	Yes	This option is deliverable as there is already a cycle route along the Railway Path, it is just not of a consistent standard.
Yes	Whitchurch P&R	27	Site 6 to the west of the A37 between Ridgeway Lane and Maggs Lane.	1 , Minor / Moderate beneficial impact	-2 , Major adverse impact	1 , Minor / Moderate beneficial impact	The site has ecological value., The site is highly visible from nearby properties, and would be seen as intrusive within the urban context.	5, < £ 10m	2, Short-term revenue support required (<5 years)	3, Affordable with relatively low costs + financial risk		Pass	Fail	Pass	Pass	Fail	No	Fails due to environmental factors, as the site has ecological value and generate significant townscape impact on nearby properties.
Yes	Whitchurch P&R	32	Site 11 south of Staunton Lane between Sleep Lane and Newlands.	1 , Minor / Moderate beneficial impact	-2 , Major adverse impact	1 , Minor / Moderate beneficial impact	The site is located immediately next to a number of frames and houses, and the access for these is via only a small road. This P&R would be very intrusive for these residents.	5, < £ 10m	2, Short-term revenue support required (<5 years)	3, Affordable with relatively low costs + financial risk		Pass	Fail	Pass	Pass	Fail	No	Fails due to environmental factors, as this site would be visible by a number of houses and farms in close proximity, and would be intrusive on these residents.
Yes	Hicks Gate P&R	36	Site 4 SW quadrant of Hicks Gate roundabout, next to Durlley Hill.	1 , Minor / Moderate beneficial impact	0 , Neutral	1 , Minor / Moderate beneficial impact	Potential for disturbance of local farm and shop.	5, < £ 10m	2, Short-term revenue support required (<5 years)	3, Affordable with relatively low costs + financial risk	Relatively low cost, and as Brislington P&R runs well it could be assumed this one would provide successful revenue.	Pass	Pass	Pass	Pass	Pass	Yes	This area has the least constraints in terms of access to the site and environment (flood zones). There is also the potential for a direct link to any orbital route between the A4 and A37
Yes	Hicks Gate P&R	37	Site 5 SW quadrant of Hicks Gate roundabout, further from roundabout towards Bristol south of A4.	-1 , Minor / Moderate adverse impact	-1 , Minor / Moderate adverse impact	-1 , Minor / Moderate adverse impact	Potential for disturbance of local farm and garden centre.	5, < £ 10m	2, Short-term revenue support required (<5 years)	3, Affordable with relatively low costs + financial risk	Relatively low cost, and as Brislington P&R runs well it could be assumed this one would provide successful revenue.	Pass	Pass	Pass	Pass	Pass	Yes	This area has the least constraints in terms of access to the site and environment (flood zones). There is also the potential for a direct link to any orbital route between the A4 and A37
Yes	A37 Public Transport	40	Extension to North Fringe Hengrove MetroBus.	1 , Minor / Moderate beneficial impact	-1 , Minor / Moderate adverse impact	1 , Minor / Moderate beneficial impact	Route would be on a local road and pass through a residential area	5, < £ 10m	2, Short-term revenue support required (<5 years)	3, Affordable with relatively low costs + financial risk	Route would be relatively low cost, as it is only a short section, and as it is just an extension of another route, as long as that goes ahead it would not be low risk as an extension.	Pass	Pass	Pass	Pass	Pass	Yes	Requires further assessment to determine the relative attractiveness of this route compared to other route options. Engineering challenges to achieve MetroBus standard route to Hengrove, but remainder of route already a committed scheme.
Yes	West of A37 Link	41	Single carriageway road connecting the A37 to Bishop Avenue and Hawkfield Road in the west through an alignment south of Whitchurch village.	1 , Minor / Moderate beneficial impact	-2 , Major adverse impact	-1 , Minor / Moderate adverse impact	The road alignment would require significant cutting into an environmentally sensitive area, with significant negative impacts on the landscape and heritage. It would be visible from Maes Knoll, a scheduled ancient monument.	3, £ 25-50m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk	Likely to be significantly more expensive than the other options due to the length and cutting required, however could save money in the long run as being the first step to an A38 link.	Pass	Fail	Pass	Pass	Fail	No	Significant adverse environmental impacts, including negative noise and air quality impacts for the residential area it would pass through. This route has potential engineering constraints, and would run close to residential areas, particularly where it joins with Bishop Avenue. Would require careful consideration of the traffic from this alignment on the Bishport Avenue residential area. Likely to be significantly more expensive than the other options due to the length and cutting required, however could form part of a potential future A38 link.
Yes	Whitchurch P&R	45	Site 4 west of A37, north of Norton Lane.	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact	The site would have good access from the A37, although it isn't directly adjacent. Part of Whitchurch would be within walking distance of the site, and part of the SDL may well be as well, or there may be opportunity to link a service through the SDL with the P&R site. The site would be an extension of the current Whitchurch village, so would have smaller environmental impacts., although it would still have some visibility across the landscape.	5, < £ 10m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk		Pass	Pass	Pass	Pass	Pass	Yes	The site would be an extension of the current Whitchurch village, so would have smaller environmental impacts., although it would still have some negative impact on the landscape. Site has good access to the A37. Further discussion is still required with the Whitchurch masterplanners in regards to the the specific location of the Whitchurch P&R.
Yes	Whitchurch P&R	46	Site 5 west of A37, south of Church Road.	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact	The site would have excellent access direct from the A37. Part of Whitchurch would be within walking distance of the site, and part of the SDL may well be as well, or there may be opportunity to link a service through the SDL with the P&R site. The site would be an extension of the current Whitchurch village, so would have smaller environmental impacts., although it would still have some visibility across the landscape.	5, < £ 10m	2, Short-term revenue support required (<5 years)	3, Affordable with relatively low costs + financial risk		Pass	Pass	Pass	Pass	Pass	Yes	The site would be an extension of the current Whitchurch village, so would have smaller environmental impacts., although it would still have some negative impact on the landscape. Site has good access to the A37. Further discussion is still required with the Whitchurch masterplanners in regards to the the specific location of the Whitchurch P&R.

Phase 1 result	Themes	No.	Transport Option	Economic Case				Financial Case				Economic Case			Financial Case	Overall assessment (as calculated)	To be taken forward?	Additional Justification for Pass or Fail
				Economic Growth	Environment	Well being	Comments - explain any specific major impacts (both adverse and beneficial)	Capital Costs	Revenue Costs	Affordability and financial risk	Comments - include capital / revenue cost estimates where known, plus explain affordability assessment	Economy. Pass if >=	Environment. Pass if >=	Well being. Pass if >=	Affordability. Pass if >=			
				Connectivity / Reliability / Wider economic impacts / Resilience/ Delivery of housing /	Air quality / Noise / Carbon emissions / Landscape & Townscape / Biodiversity / Heritage / Water environment	Physical activity / Journey quality / Accidents / Security / Access to services / Affordability / Severance						-1 , Minor / Moderate	-1 , Minor / Moderate	-1 , Minor / Moderate	2, Affordable, but potentially high			
Yes	A4-A37 Link	47	South Alignment 1 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - takes a direct alignment through the potential SDL. 40mph link providing access to the SDL and significant measures to provide connectivity across the link. Connecting to the A37 south of Staunton Lane. Not compatible with future dualling. (Purple)	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact	-1 , Minor / Moderate adverse impact		3, £ 25-50m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk		Pass	Pass	Pass	Pass	Pass	Yes	Passes as this is the best option alignment in the economic case. The detailed alignment will require consideration of utilities when considering specific route. Modelling indicates that single carriageway would be sufficient for the level of demand. Note this approach would include features to avoid greater severance of the SDL and would not be compatible with a future dual carriageway option.
Yes	A4-A37 Link	48	South Alignment 2 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - takes a direct alignment through the potential SDL. 50mph link with no access to the SDL and limited measures to provide connectivity across the link. Connecting to the A37 south of Staunton Lane. Potentially compatible with future dualling. (Purple)	1 , Minor / Moderate beneficial impact	1 , Minor / Moderate beneficial impact	-1 , Minor / Moderate adverse impact	If the route is going through the SDL, it would need to be seen as an urban road and not designed as a rural type A road otherwise would cause high severance.	3, £ 25-50m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk		Pass	Pass	Pass	Pass	Pass	Yes	Passes as this is the best option alignment across the cases. The detailed alignment will require consideration of utilities when considering specific route. This approach risks a degree of severance of the SDL, although appropriate design of crossing opportunities and adjacent land use could mitigate this. Strategically it offers good impact against objectives. Modelling indicates that single carriageway would be sufficient for the level of car use demand at this time – but this option allows for the future consideration of dual carriageway, although the risk of severance would increase.
Yes	A4-A37 Link	49	South Alignment 3 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - takes an alignment around the southern eastern extent of the potential SDL. 50mph link with no access to the SDL and limited measures to provide connectivity across the link. Connecting to the A37 north of Gibbet Lane. Potentially compatible with future dualling. (Dotted green)	2 , Major beneficial impact	-2 , Major adverse impact	-1 , Minor / Moderate adverse impact	Significant environmental constraints to the south of the SDL, including steep gradients and valuable heritage land.	3, £ 25-50m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk		Pass	Fail	Pass	Pass	Fail	Yes	Fails as would be a much more expensive alignment, requiring a long and indirect route around the SDL with high environmental constraints. To achieve this alignment around the potential SDL, either the link, or SDL are required to be located where they result in significant environmental harm.
Yes	A4-A37 Link	50	Dual carriageway – all alignments	2 , Major beneficial impact	-2 , Major adverse impact	-2 , Major adverse impact	Dual carriageway route through the SDL would have a very high negative impact on severance, as it would split the new community. It may also increase accidents, and would have adverse air quality and noise impacts.	2, £ 50-100m	3, No revenue support required / maintenance only	2, Affordable, but potentially high costs + financial risk		Pass	Fail	Fail	Pass	Fail	No	At this stage modelling indicates that demand for a dual carriageway would be well below the expected level for a dual carriageway route. However this demand is only modelled with Local Plan committed development and therefore does not include SDL growth and does not include potential demand for this route if the full orbital corridor to the Airport is realised with M4 J18A – therefore there may be much greater demand in the future. The low demand for dual carriageway at this stage and the uncertainty about the level of demand in the future with potential development, results in this option failing on the financial case due to high risk costs which are not required. However it may be desirable to future proof for a dual carriageway route. Furthermore, there is concern that a dual carriageway route is not in line with the subsequent route to the west, e.g. would result in more usage of Whitchurch Lane.

Summary

Themes	No.	Transport Option	Strategic Case				Overall Assessment	Management Case		Taken forward to Phase 2?	Economic Case			Financial Case			Taken forward for detailed assessment?
			Objective 1	Objective 2	Objective 3	Objective 4		Estimated timescales for implementation (opening year)	Deliverability		Economic Growth	Environment	Well being	Capital Costs	Revenue Costs	Affordability and financial risk	
			Mitigate increased travel demand enabling planned growth (JSP and non-JSP)	Provide a range of convenient and attractive journey options for south-east Bristol to key	Increase orbital connectivity to improve access around south-east Bristol, reduce delays on	Improve journey time reliability for public transport along the corridor and orbital											
Orbital MetroBus	1	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (via new transport link around South East Bristol) - Gold standard.	Significant impact	Significant impact	Moderate impact	Significant impact	Significant impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	£ 50-100m	Ongoing revenue support required (> 5 years)	Not affordable / very high financial risk	No
Orbital MetroBus	2	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (via new transport link around South East Bristol) - Silver standard.	Moderate impact	Significant impact	Moderate impact	Moderate impact	Moderate impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	£ 25-50m	Ongoing revenue support required (> 5 years)	Affordable, but potentially high costs + financial risk	Yes
Orbital MetroBus	3	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (via new transport link around South East Bristol) - Bronze standard.	Moderate impact	Moderate impact	Minor impact	Minor impact	Minor impact	2026-2036	Deliverable with low complexity/risk	No							
Orbital MetroBus	4	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (on existing roads, e.g. Whitchurch Lane/Stockwood Ln).	Very small impact	Neutral / adverse	Neutral / adverse	Neutral / adverse	Neutral / adverse	2026-2036	Unlikely to be deliverable	No							
Orbital MetroBus	5	Improvements to city centre interchange between South Bristol and East Fringe bus services.	Very small impact	Very small impact	Neutral / adverse	Neutral / adverse	Neutral / adverse	Before 2026	Deliverable with low complexity/risk	No							
Orbital MetroBus	6	Enhanced bus service on new orbital transport link.	Moderate impact	Minor impact	Minor impact	Minor impact	Minor impact	2026-2036	Deliverable with low complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	< £ 10m	Ongoing revenue support required (> 5 years)	Affordable with relatively low costs + financial risk	Yes
Whitchurch P&R	7	Increase the capacity of existing sites only.	Very small impact	Very small impact	Neutral / adverse	Neutral / adverse	Neutral / adverse	Before 2026	Unlikely to be deliverable	No							
Hicks Gate P&R	8	Increase the capacity of existing site only.	Minor impact	Moderate impact	Neutral / adverse	Moderate impact	Minor impact	Before 2026	Unlikely to be deliverable	No							
A4-A37 Link	9	On-line widening of existing route via A4 Bath Rd, A4174 Callington Rd, Airport Rd.	Neutral / adverse	Neutral / adverse	Very small impact	Very small impact	Neutral / adverse	Before 2026	Deliverable with low complexity/risk	No							
West of A37 Link	10	New orbital corridor between Whitchurch and A38 at Barrow Common.	Significant impact	Moderate impact	Moderate impact	Significant impact	Moderate impact	After 2036	Deliverable but high complexity/risk	No							

Themes	No.	Transport Option	Strategic Case				Overall Assessment	Management Case		Taken forward to Phase 2?	Economic Case			Financial Case			Taken forward for detailed assessment?
			Objective 1 Mitigate increased travel demand enabling planned growth (JSP and non-JSP)	Objective 2 Provide a range of convenient and attractive journey options for south-east Bristol to key	Objective 3 Increase orbital connectivity to improve access around south-east Bristol, reduce delays on	Objective 4 Improve journey time reliability for public transport along the corridor and orbital		Estimated timescales for implementation (opening year)	Deliverability		Economic Growth	Environment	Well being	Capital Costs	Revenue Costs	Affordability and financial risk	
A4-A37 Link	11	North Alignment 1 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 – southerly route from Hicks Gate to Stockwood Lane – parallel route to Stockwood Lane – parallel route to Stockwood avoiding Stockwood Vale valley. (Yellow/Blue)	Significant impact	Moderate impact	Significant impact	Significant impact	Significant impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Major adverse impact	Minor / Moderate adverse impact	£ 25-50m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	No
A4-A37 Link	12	North alignment 2 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - southerly route from Hicks Gate to Stockwood Lane – parallel route to Stockwood avoiding Stockwood Vale valley. (Yellow/Red/Blue)	Significant impact	Moderate impact	Significant impact	Significant impact	Significant impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Major adverse impact	Minor / Moderate adverse impact	£ 25-50m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	No
A4-A37 Link	13	North Alignment 3 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 – south westerly route from Hicks Gate following topography – parallel route to Stockwood avoiding Stockwood Vale valley. (Blue)	Significant impact	Moderate impact	Significant impact	Significant impact	Significant impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	Minor / Moderate adverse impact	£ 25-50m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes
West of A37 Link	14	Connect from the A37 (at the roundabout with the routes to the east) to Washing Pound Lane, north of the junction with Church Road. Washing Pound Lane would be widened with an improved junction created at the junction with Ridgeway Lane and Whitchurch Lane. (Grey)	Significant impact	Minor impact	Significant impact	Minor impact	Moderate impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	Minor / Moderate adverse impact	£ 10-25m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes
West of A37 Link	15	Connect from the A37 (at the roundabout with the routes to the east) to Stoneberry Road, which would connect via Half Acre Lane to Whitchurch Lane. It is assumed that Stoneberry Road and Half Acre Lane would be widened, with an improved junction at Whitchurch Lane. (Orange)	Significant impact	Minor impact	Significant impact	Minor impact	Moderate impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	Minor / Moderate adverse impact	£ 10-25m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes

Themes	No.	Transport Option	Strategic Case				Overall Assessment	Management Case		Taken forward to Phase 2?	Economic Case			Financial Case			Taken forward for detailed assessment?
			Objective 1 Mitigate increased travel demand enabling planned growth (JSP and non-JSP)	Objective 2 Provide a range of convenient and attractive journey options for south-east Bristol to key	Objective 3 Increase orbital connectivity to improve access around south-east Bristol, reduce delays on	Objective 4 Improve journey time reliability for public transport along the corridor and orbital		Estimated timescales for implementation (opening year)	Deliverability		Economic Growth	Environment	Well being	Capital Costs	Revenue Costs	Affordability and financial risk	
West of A37 Link	16	Connect around the east of Whitchurch to connect back to the A37 near the boundary between Bristol and Bath & North East Somerset. Traffic towards Whitchurch Lane would then route along the A37 into Bristol and turn west (then south west) into Ridgeway Lane, which then continues as Whitchurch Lane to the west. (Pink)	Very small impact	Minor impact	Minor impact	Minor impact	Minor impact	2026-2036	Deliverable but high complexity/risk	No							
Hicks Gate Roundabout	17	At-grade junction improvement - link between A4 Keynsham and A4174.	Moderate impact	Moderate impact	Moderate impact	Minor impact	Moderate impact	Before 2026	Deliverable with low complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	Neutral	< £ 10m	No revenue support required / maintenance only	Affordable with relatively low costs + financial risk	Yes
Hicks Gate Roundabout	18	Grade separation with A4174 - A4 flyover.	Moderate impact	Minor impact	Minor impact	Moderate impact	Minor impact	2026-2036	Deliverable but high complexity/risk	No							
Hicks Gate Roundabout	19	Grade separation with A4-A4 flyover.	Moderate impact	Very small impact	Minor impact	Minor impact	Minor impact	2026-2036	Deliverable but high complexity/risk	No							
Hicks Gate Roundabout	20	At-grade junction improvement - A4 throughabout.	Very small impact	Very small impact	Neutral / adverse	Very small impact	Very small impact	Before 2026	Deliverable with low complexity/risk	No							
A37 Public Transport	21	MetroBus route from Whitchurch to the city centre - gold standard.	Significant impact	Moderate impact	Minor impact	Significant impact	Moderate impact	2026-2036	Unlikely to be deliverable	No							
A37 Public Transport	22	MetroBus route from Whitchurch to the city centre - silver standard.	Significant impact	Moderate impact	Minor impact	Significant impact	Moderate impact	2026-2036	Unlikely to be deliverable	No							
A37 Public Transport	23	MetroBus route from Whitchurch to the city centre - bronze standard.	Moderate impact	Moderate impact	Minor impact	Moderate impact	Moderate impact	2026-2036	Unlikely to be deliverable	No							
A37 Public Transport	24	Enhanced bus service on the A37 corridor or via Callington Road Link.	Moderate impact	Moderate impact	Minor impact	Minor impact	Moderate impact	Before 2026	Deliverable with low complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	< £ 10m	No revenue support required / maintenance only	Affordable with relatively low costs + financial risk	Yes
Railway Path MetroBus and Cycle Route	25	Offline MetroBus route from Whitchurch to the city centre via the old Railway Path with strategic cycle route infrastructure.	Significant impact	Moderate impact	Very small impact	Significant impact	Moderate impact	After 2036	Unlikely to be deliverable	No							
Railway Path MetroBus and Cycle Route	26	Strategic cycle route from Whitchurch to the city centre via the old Railway Path.	Moderate impact	Moderate impact	Very small impact	Significant impact	Moderate impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	£ 10-25m	Ongoing revenue support required (> 5 years)	Affordable, but potentially high costs + financial risk	Yes
Whitchurch P&R	27	Site 6 to the west of the A37 between Ridgeway Lane and Maggs Lane.	Moderate impact	Moderate impact	Minor impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Major adverse impact	Minor / Moderate beneficial impact	< £ 10m	Short-term revenue support required (<5 years)	Affordable with relatively low costs + financial risk	No
Whitchurch P&R	28	Site 7 between Fortfield Road and Bamfield, south of Asda Whitchurch store.	Very small impact	Moderate impact	Very small impact	Minor impact	Minor impact	Before 2026	Deliverable but high complexity/risk	No							
Whitchurch P&R	29	Site 8 to the west of the A37 north of New Fossway Road.	Minor impact	Moderate impact	Minor impact	Moderate impact	Moderate impact	Before 2026	Unlikely to be deliverable	No							
Whitchurch P&R	30	Site 9 at industrial estate on the corner of Hengrove Lane and Petherton Road.	Very small impact	Moderate impact	Very small impact	Minor impact	Minor impact	Before 2026	Unlikely to be deliverable	No							

Themes	No.	Transport Option	Strategic Case				Overall Assessment	Management Case		Taken forward to Phase 2?	Economic Case			Financial Case			Taken forward for detailed assessment?
			Objective 1 Mitigate increased travel demand enabling planned growth (JSP and non-JSP)	Objective 2 Provide a range of convenient and attractive journey options for south-east Bristol to key	Objective 3 Increase orbital connectivity to improve access around south-east Bristol, reduce delays on	Objective 4 Improve journey time reliability for public transport along the corridor and orbital		Estimated timescales for implementation (opening year)	Deliverability		Economic Growth	Environment	Well being	Capital Costs	Revenue Costs	Affordability and financial risk	
Whitchurch P&R	31	Site 10 at sports ground north of the A4174 to the west of Tesco Extra.	Very small impact	Minor impact	Very small impact	Very small impact	Very small impact	Before 2026	Deliverable but high complexity/risk	No							
Whitchurch P&R	32	Site 11 south of Staunton Lane between Sleep Lane and Newlands.	Moderate impact	Moderate impact	Minor impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Major adverse impact	Minor / Moderate beneficial impact	< £ 10m	Short-term revenue support required (<5 years)	Affordable with relatively low costs + financial risk	No
Hicks Gate P&R	33	Site 1 NW quadrant of Hicks Gate roundabout.	Minor impact	Moderate impact	Very small impact	Minor impact	Minor impact	Before 2026	Deliverable but high complexity/risk	No							
Hicks Gate P&R	34	Site 2 NE quadrant of Hicks Gate roundabout.	Moderate impact	Moderate impact	Very small impact	Minor impact	Minor impact	Before 2026	Deliverable but high complexity/risk	No							
Hicks Gate P&R	35	Site 3 SE quadrant of Hicks Gate roundabout.	Moderate impact	Moderate impact	Minor impact	Moderate impact	Moderate impact	Before 2026	Unlikely to be deliverable	No							
Hicks Gate P&R	36	Site 4 SW quadrant of Hicks Gate roundabout, next to Durley Hill.	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Neutral	Minor / Moderate beneficial impact	< £ 10m	Short-term revenue support required (<5 years)	Affordable with relatively low costs + financial risk	Yes
Hicks Gate P&R	37	Site 5 SW quadrant of Hicks Gate roundabout, further from roundabout towards Bristol south of A4.	Moderate impact	Moderate impact	Minor impact	Minor impact	Moderate impact	Before 2026	Deliverable with low complexity/risk	Yes	Minor / Moderate adverse impact	Minor / Moderate adverse impact	Minor / Moderate adverse impact	< £ 10m	Short-term revenue support required (<5 years)	Affordable with relatively low costs + financial risk	Yes
Hicks Gate P&R	38	Site 6 NW quadrant of Hicks Gate roundabout, further from roundabout towards Bristol north of A4.	Moderate impact	Moderate impact	Very small impact	Minor impact	Minor impact	Before 2026	Deliverable with low complexity/risk	No							
Hicks Gate P&R	39	Site 7 SE quadrant of Hicks Gate roundabout, further from roundabout towards Bath south of A4.	Moderate impact	Moderate impact	Very small impact	Minor impact	Minor impact	Before 2026	Deliverable but high complexity/risk	No							
A37 Public Transport	40	Extension to North Fringe Hengrove MetroBus.	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	Minor / Moderate beneficial impact	< £ 10m	Short-term revenue support required (<5 years)	Affordable with relatively low costs + financial risk	Yes
West of A37 Link	41	Single carriageway road connecting the A37 to Bishop Avenue and Hawkfield Road in the west through an alignment south of Whitchurch village.	Moderate impact	Moderate impact	Significant impact	Moderate impact	Moderate impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Major adverse impact	Minor / Moderate adverse impact	£ 25-50m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	No
Whitchurch P&R	42	Site 1 west of A37, south of Norton Lane, south of the cricket pitch.	Minor impact	Minor impact	Minor impact	Moderate impact	Minor impact	Before 2026	Deliverable but high complexity/risk	No							
Whitchurch P&R	43	Site 2 east of A37, land adjacent to the Cemetery.	Minor impact	Minor impact	Minor impact	Moderate impact	Minor impact	Before 2026	Deliverable but high complexity/risk	No							
Whitchurch P&R	44	Site 3 east of A37, north of Cemetery.	Minor impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	No							
Whitchurch P&R	45	Site 4 west of A37, north of Norton Lane.	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	< £ 10m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes
Whitchurch P&R	46	Site 5 west of A37, south of Church Road.	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	< £ 10m	Short-term revenue support required (<5 years)	Affordable with relatively low costs + financial risk	Yes
A4-A37 Link	47	South Alignment 1 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - takes a direct alignment through the potential SDL. 40mph link providing access to the SDL and significant measures to provide connectivity across the link. Connecting to the A37 south of Staunton Lane. Not compatible with future dualling. (Purple)	Significant impact	Moderate impact	Significant impact	Significant impact	Significant impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	£ 25-50m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes



Themes	No.	Transport Option	Strategic Case				Overall Assessment	Management Case		Taken forward to Phase 2?	Economic Case			Financial Case			Taken forward for detailed assessment?
			Objective 1 Mitigate increased travel demand enabling planned growth (JSP and non-JSP)	Objective 2 Provide a range of convenient and attractive journey options for south-east Bristol to key	Objective 3 Increase orbital connectivity to improve access around south-east Bristol, reduce delays on	Objective 4 Improve journey time reliability for public transport along the corridor and orbital		Estimated timescales for implementation (opening year)	Deliverability		Economic Growth	Environment	Well being	Capital Costs	Revenue Costs	Affordability and financial risk	
A4-A37 Link	48	South Alignment 2 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - takes a direct alignment through the potential SDL. 50mph link with no access to the SDL and limited measures to provide connectivity across the link. Connecting to the A37 south of Staunton Lane. Potentially compatible with future dualling. (Purple)	Significant impact	Moderate impact	Significant impact	Significant impact	Significant impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	£ 25-50m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes
A4-A37 Link	49	South Alignment 3 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - takes an alignment around the southern eastern extent of the potential SDL. 50mph link with no access to the SDL and limited measures to provide connectivity across the link. Connecting to the A37 north of Gibbet Lane. Potentially compatible with future dualling. (Dotted green)	Significant impact	Moderate impact	Significant impact	Significant impact	Significant impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Major adverse impact	Minor / Moderate adverse impact	£ 25-50m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes
A4-A37 Link	50	Dual carriageway – all alignments	Significant impact	Moderate impact	Significant impact	Significant impact	Significant impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Major adverse impact	Major adverse impact	£ 50-100m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	No

Summary Shortlist

				Strategic Case				Management Case		Taken forward to Phase 2?	Economic Case			Financial Case			Taken forward for detailed assessment?	
				Objective 1	Objective 2	Objective 3	Objective 4	Overall Assessment	Estimated timescales for implementation (opening year)		Deliverability	Economic Growth	Environment	Well being	Capital Costs	Revenue Costs		Affordability and financial risk
Yes	Orbital MetroBus	2	MetroBus route from Emersons Green to Whitchurch and beyond, connecting to existing MetroBus infrastructure (via new transport link around South East Bristol) - Silver standard.	Moderate impact	Significant impact	Moderate impact	Moderate impact			Moderate impact		2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	£ 25-50m
Yes	Orbital MetroBus	6	Enhanced bus service on new orbital transport link.	Moderate impact	Minor impact	Minor impact	Minor impact	Minor impact	2026-2036	Deliverable with low complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	< £ 10m	Ongoing revenue support required (> 5 years)	Affordable with relatively low costs + financial risk	Yes
Yes	A4-A37 Link	13	North Alignment 3 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 – south westerly route from Hicks Gate following topography – parallel route to Stockwood avoiding Stockwood Vale valley. (Blue)	Significant impact	Moderate impact	Significant impact	Significant impact	Significant impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	Minor / Moderate adverse impact	£ 25-50m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes
Yes	West of A37 Link	14	Connect from the A37 (at the roundabout with the routes to the east) to Washing Pound Lane, north of the junction with Church Road. Washing Pound Lane would be widened with an improved junction created at the junction with Ridgeway Lane and Whitchurch Lane. (Grey)	Significant impact	Minor impact	Significant impact	Minor impact	Moderate impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	Minor / Moderate adverse impact	£ 10-25m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes
Yes	West of A37 Link	15	Connect from the A37 (at the roundabout with the routes to the east) to Stoneberry Road, which would connect via Half Acre Lane to Whitchurch Lane. It is assumed that Stoneberry Road and Half Acre Lane would be widened, with an improved junction at Whitchurch Lane. (Orange)	Significant impact	Minor impact	Significant impact	Minor impact	Moderate impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	Minor / Moderate adverse impact	£ 10-25m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes
Yes	Hicks Gate Roundabout	17	At-grade junction improvement - link between A4 Keynsham and A4174.	Moderate impact	Moderate impact	Moderate impact	Minor impact	Moderate impact	Before 2026	Deliverable with low complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	Neutral	< £ 10m	No revenue support required / maintenance only	Affordable with relatively low costs + financial risk	Yes
Yes	A37 Public Transport	24	Enhanced bus service on the A37 corridor or via Callington Road Link.	Moderate impact	Moderate impact	Minor impact	Minor impact	Moderate impact	Before 2026	Deliverable with low complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	< £ 10m	No revenue support required / maintenance only	Affordable with relatively low costs + financial risk	Yes
Yes	Railway Path MetroBus and Cycle Route	26	Strategic cycle route from Whitchurch to the city centre via the old Railway Path.	Moderate impact	Moderate impact	Very small impact	Significant impact	Moderate impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	£ 10-25m	Ongoing revenue support required (> 5 years)	Affordable, but potentially high costs + financial risk	Yes
Yes	Hicks Gate P&R	36	Site 4 SW quadrant of Hicks Gate roundabout, next to Durley Hill.	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Neutral	Minor / Moderate beneficial impact	< £ 10m	Short-term revenue support required (<5 years)	Affordable with relatively low costs + financial risk	Yes
Yes	Hicks Gate P&R	37	Site 5 SW quadrant of Hicks Gate roundabout, further from roundabout towards Bristol south of A4.	Moderate impact	Moderate impact	Minor impact	Minor impact	Moderate impact	Before 2026	Deliverable with low complexity/risk	Yes	Minor / Moderate adverse impact	Minor / Moderate adverse impact	Minor / Moderate adverse impact	< £ 10m	Short-term revenue support required (<5 years)	Affordable with relatively low costs + financial risk	Yes
Yes	A37 Public Transport	40	Extension to North Fringe Hengrove MetroBus.	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate adverse impact	Minor / Moderate beneficial impact	< £ 10m	Short-term revenue support required (<5 years)	Affordable with relatively low costs + financial risk	Yes
Yes	Whitchurch P&R	45	Site 4 west of A37, north of Norton Lane.	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	< £ 10m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes

				Strategic Case				Management Case		Taken forward to Phase 2?	Economic Case			Financial Case			Taken forward for detailed assessment?	
				Objective 1	Objective 2	Objective 3	Objective 4	Overall Assessment	Estimated timescales for implementation (opening year)		Deliverability	Economic Growth	Environment	Well being	Capital Costs	Revenue Costs		Affordability and financial risk
				Mitigate increased travel demand enabling planned growth (JSP and non-JSP)	Provide a range of convenient and attractive journey options for south-east	Increase orbital connectivity to improve access around south-east Bristol, reduce delays on	Improve journey time reliability for public transport along the corridor and orbital							Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	< £ 10m	Short-term revenue support required (<5 years)
Yes	Whitchurch P&R	46	Site 5 west of A37, south of Church Road.	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Moderate impact	Before 2026	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	Minor / Moderate beneficial impact	< £ 10m	Short-term revenue support required (<5 years)	Affordable with relatively low costs + financial risk	Yes
Yes	A4-A37 Link	49	South Alignment 3 - Single carriageway orbital corridor between Hicks Gate Roundabout and A37 - takes an alignment around the southern eastern extent of the potential SDL. 50mph link with no access to the SDL and limited measures to provide connectivity across the link. Connecting to the A37 north of Gibbet Lane. Potentially compatible with future dualling. (Dotted green)	Significant impact	Moderate impact	Significant impact	Significant impact	Significant impact	2026-2036	Deliverable but high complexity/risk	Yes	Minor / Moderate beneficial impact	Major adverse impact	Minor / Moderate adverse impact	£ 25-50m	No revenue support required / maintenance only	Affordable, but potentially high costs + financial risk	Yes

## **Appendix 6.1 Orbital highway schemes concept designs**



A37 to Whitchurch Lane - Opt. C - Single Carriageway

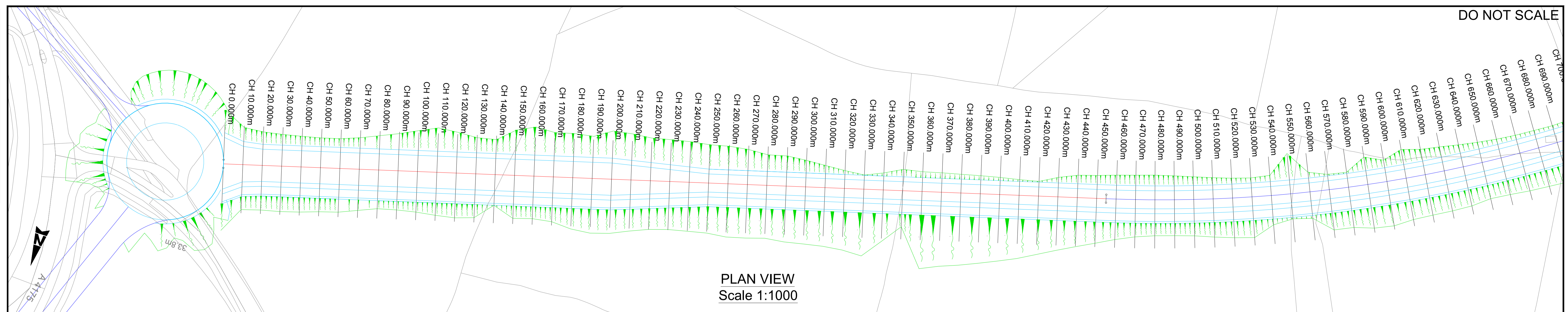
A37 to Whitchurch Lane - Opt. D - Single Carriageway

A4 - A37 S Side - Single Carriageway Opt. A/B

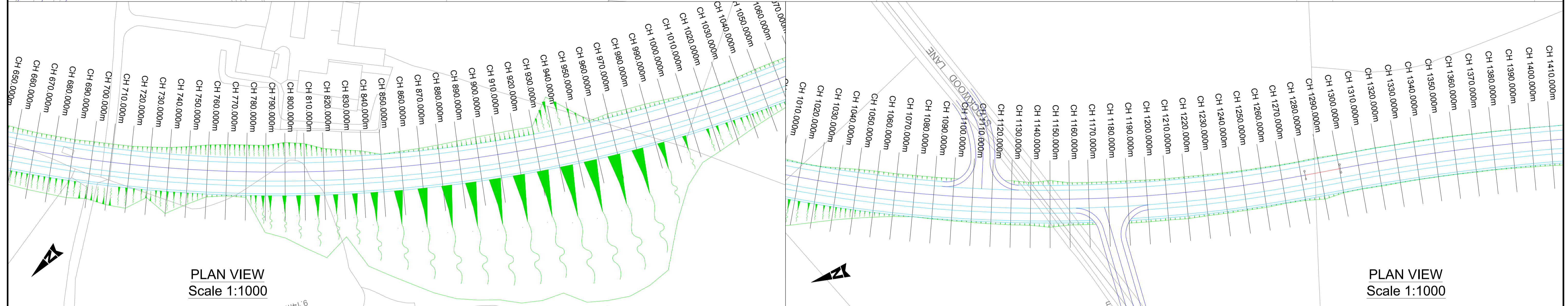
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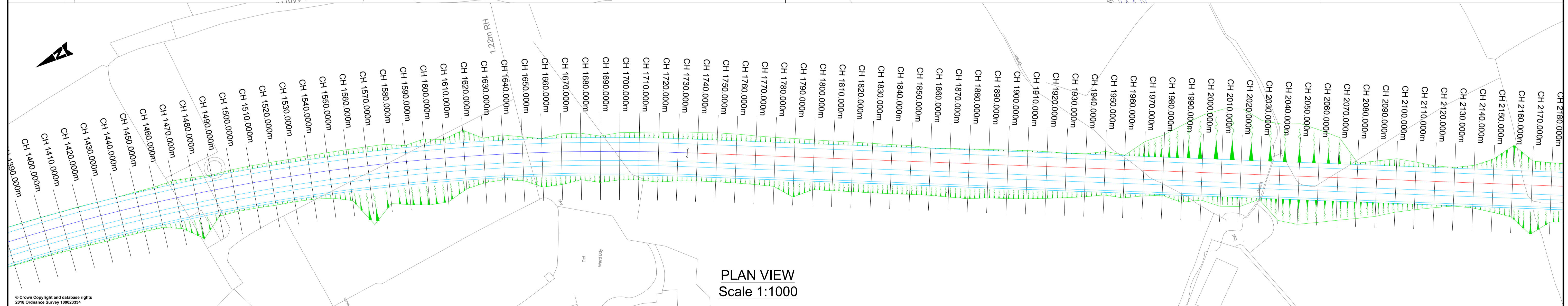


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PLAN VIEW  
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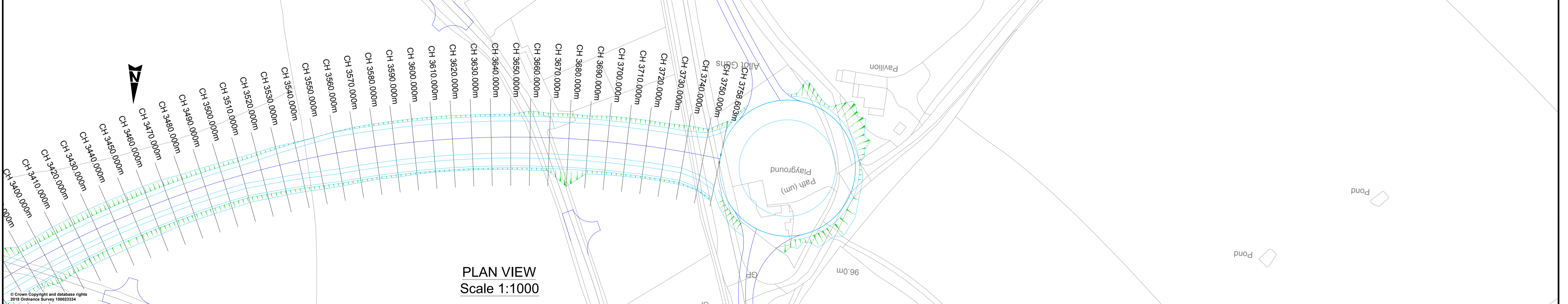
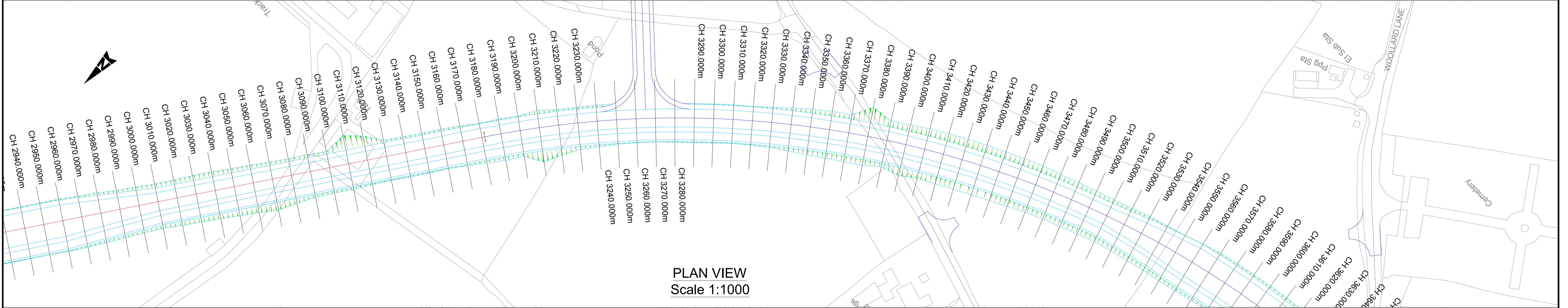
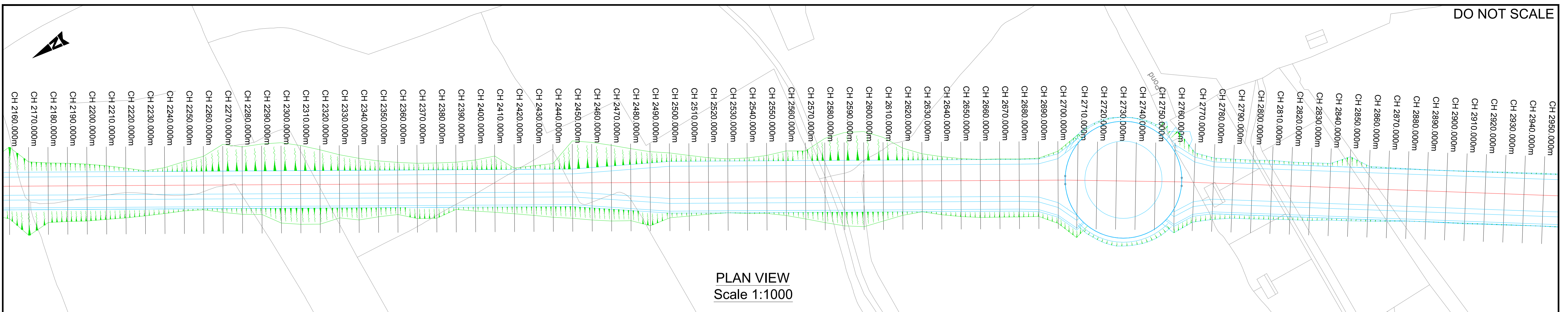
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DECOMMISSIONING/DEMOLITION	NONE
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Rev.	Date	Description	By	Chkd	App'd
P1	05.02.18	DRAWING CREATED		AF	

Drawing Status <b>FOR INFORMATION</b>	Subsidiary <b>S2</b>	Project Title <b>WEST OF ENGLAND WP1</b>
<b>ATKINS</b> The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com	Drawing Title <b>A4 - A37 LINK OPTION 2 PROPOSED CONCEPT LAYOUT SHEET 12</b>	
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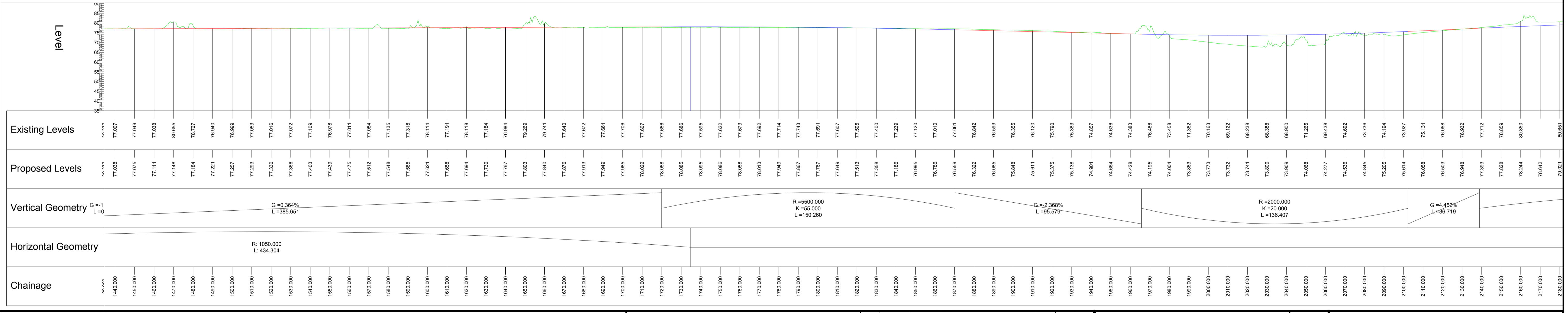
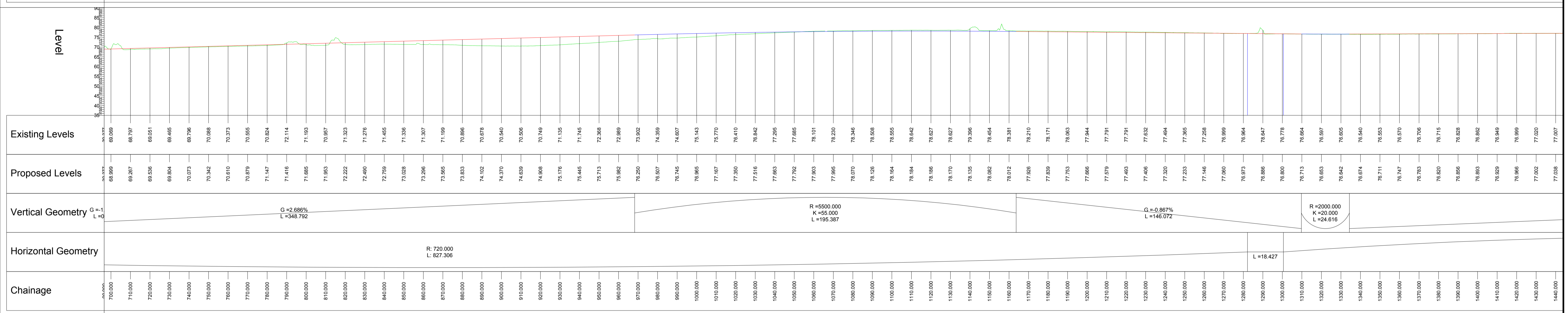
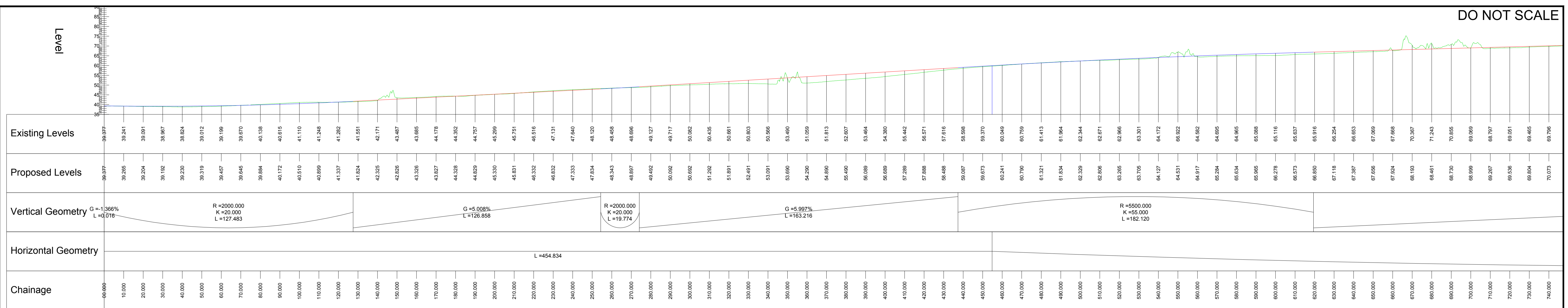
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<b>DECOMMISSIONING/DEMOLITION</b>			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			

Rev.	Date	Description	By	Chk'd	App'd
P1	05.02.18	DRAWING CREATED	AF		

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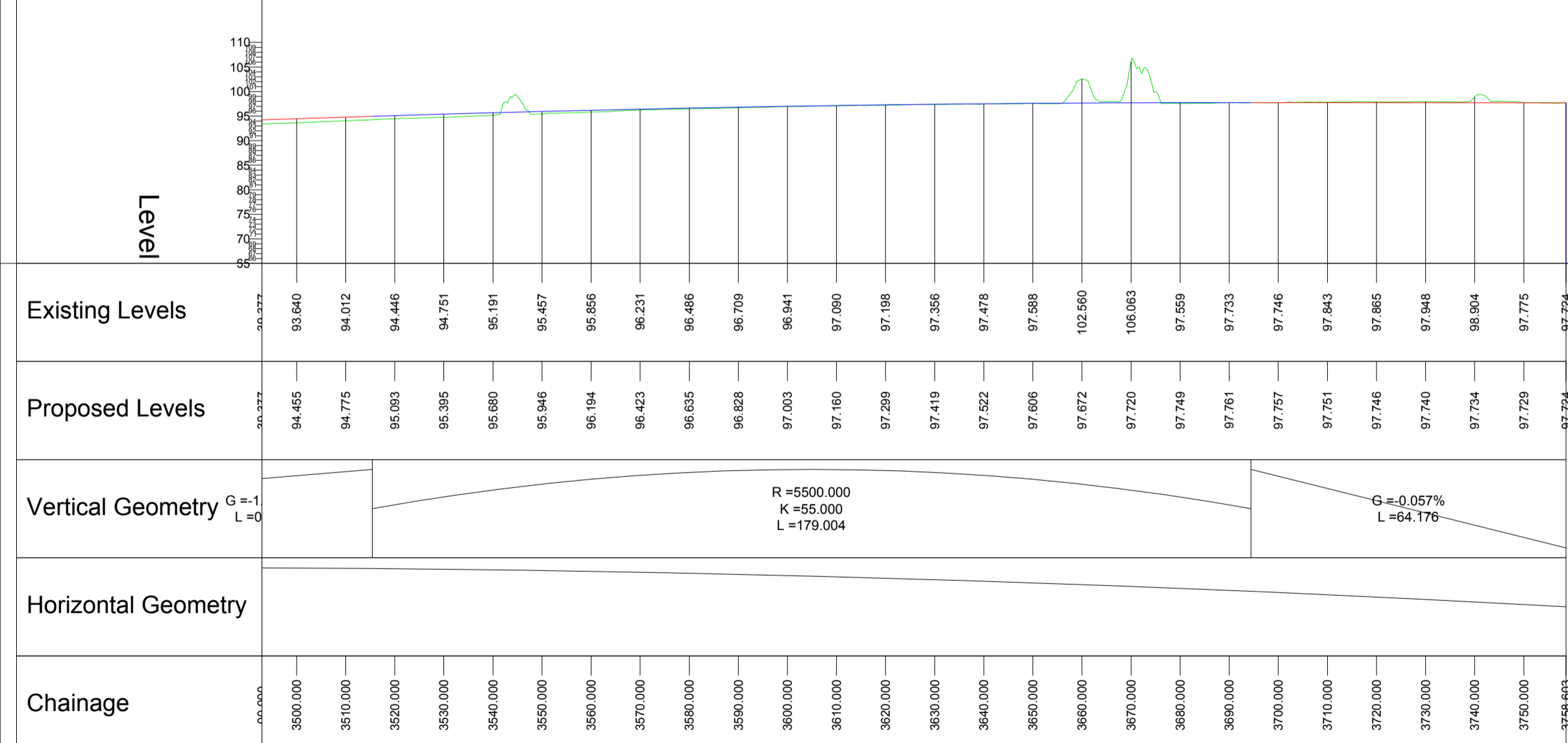
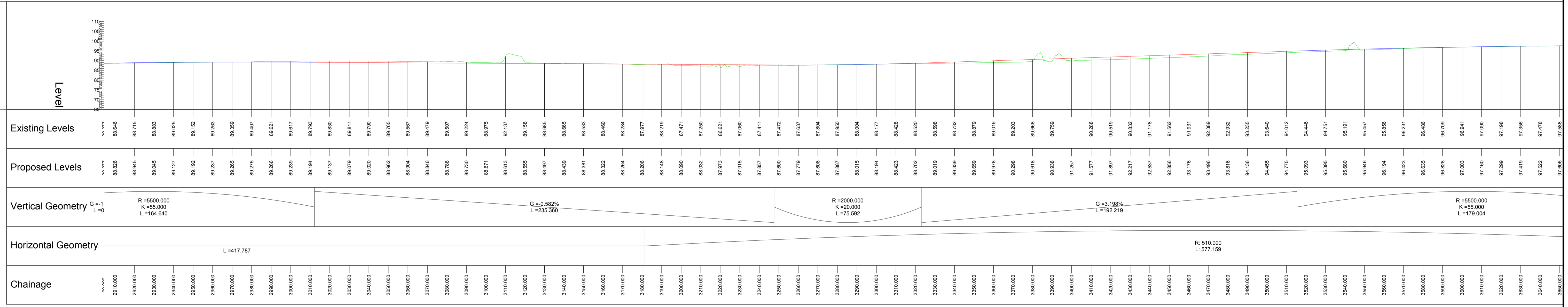
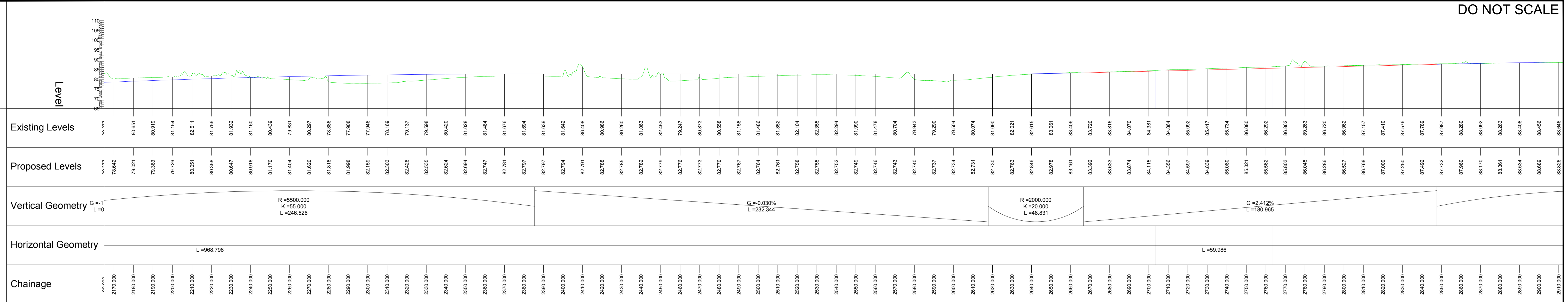


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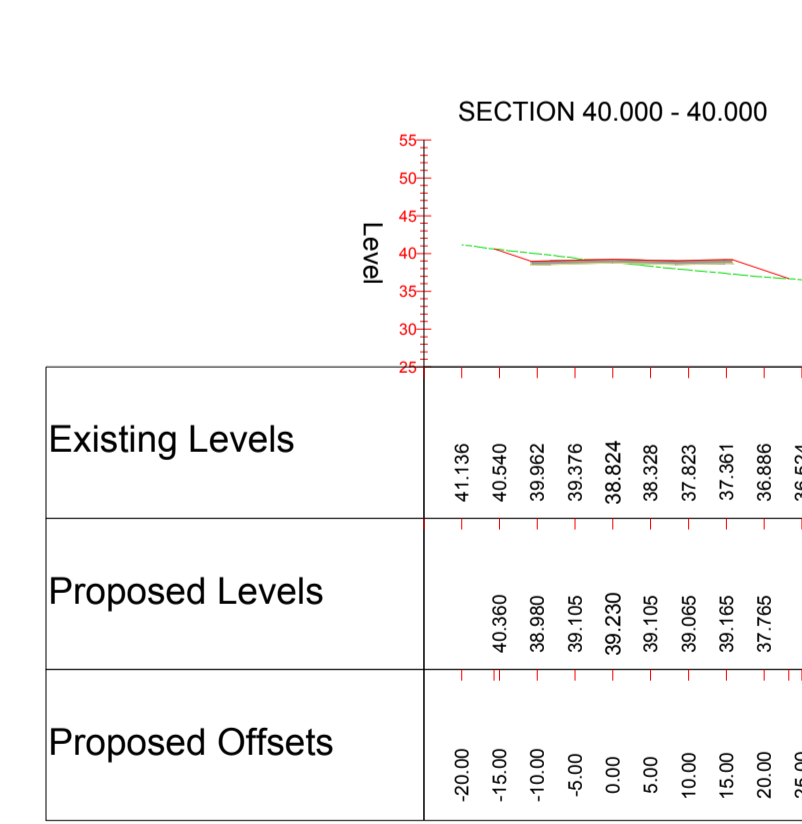
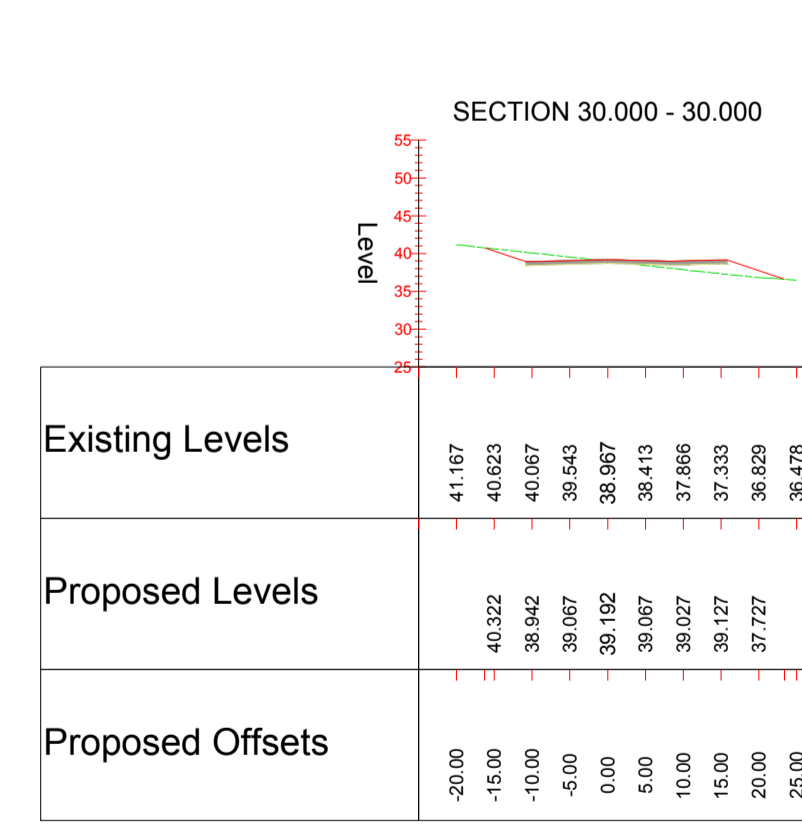
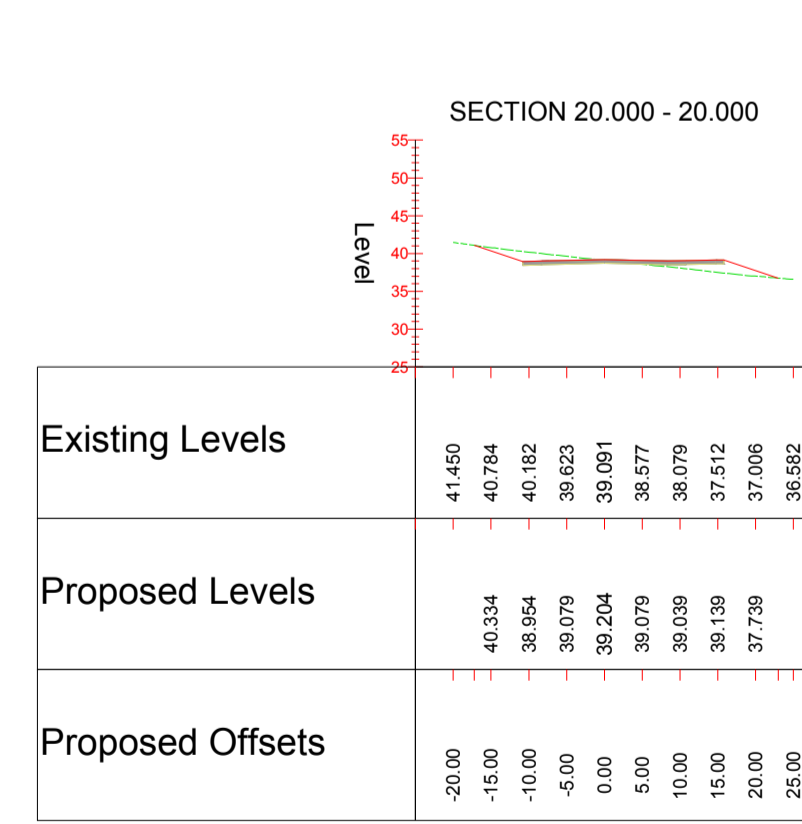
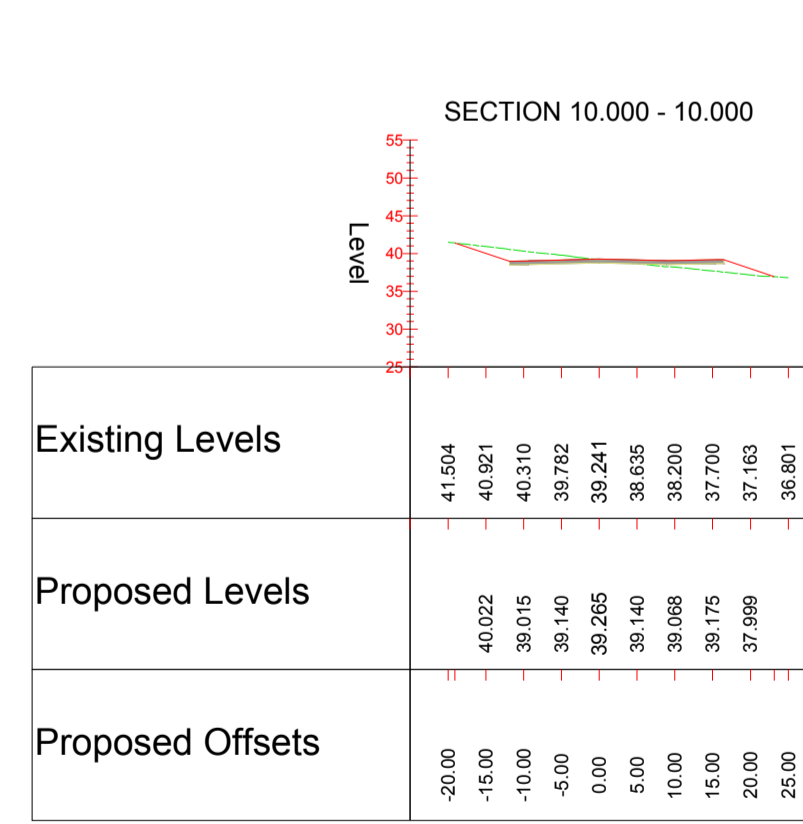
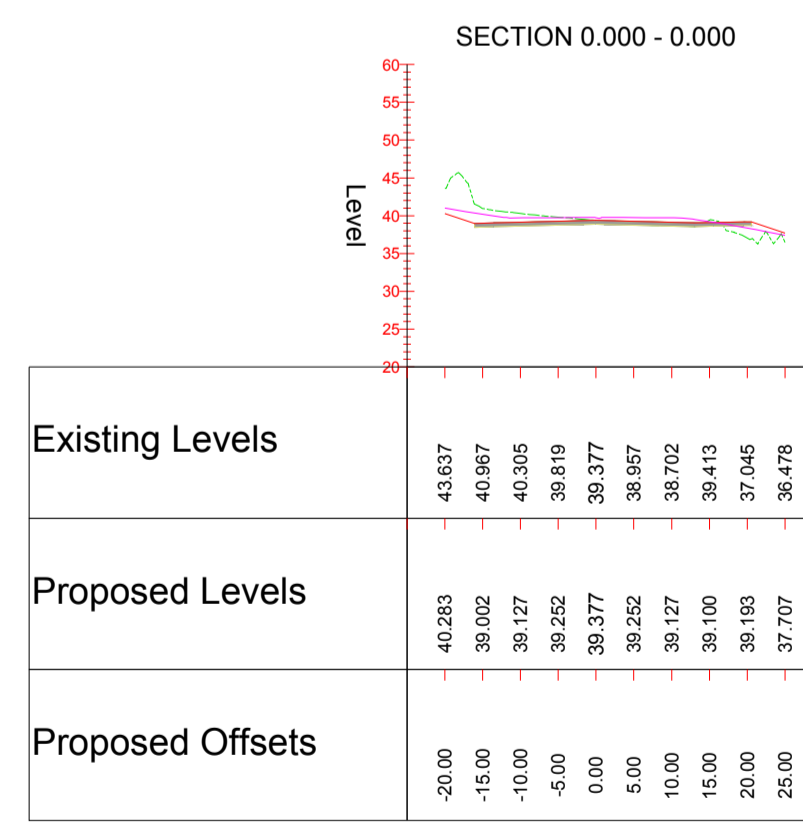
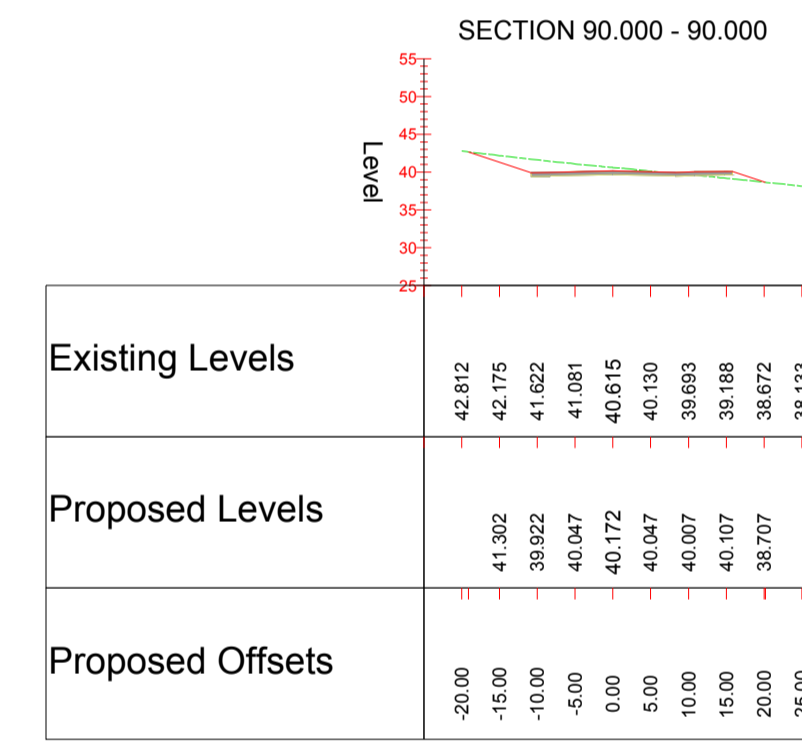
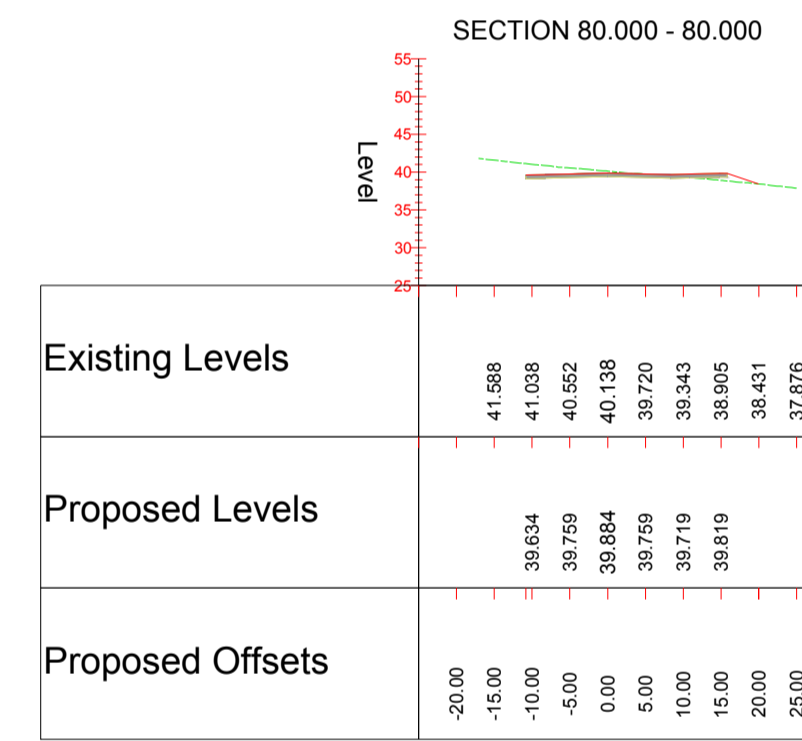
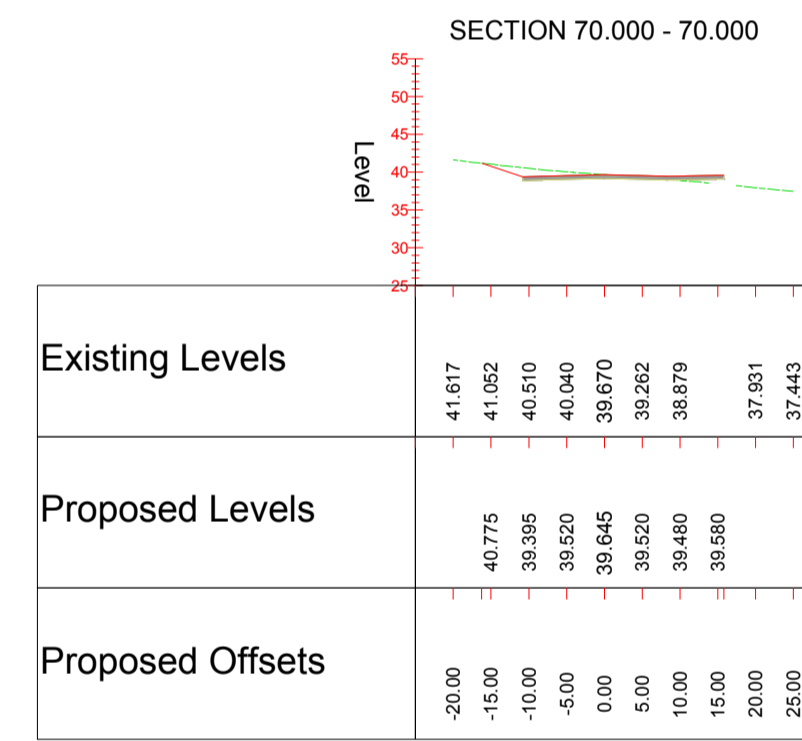
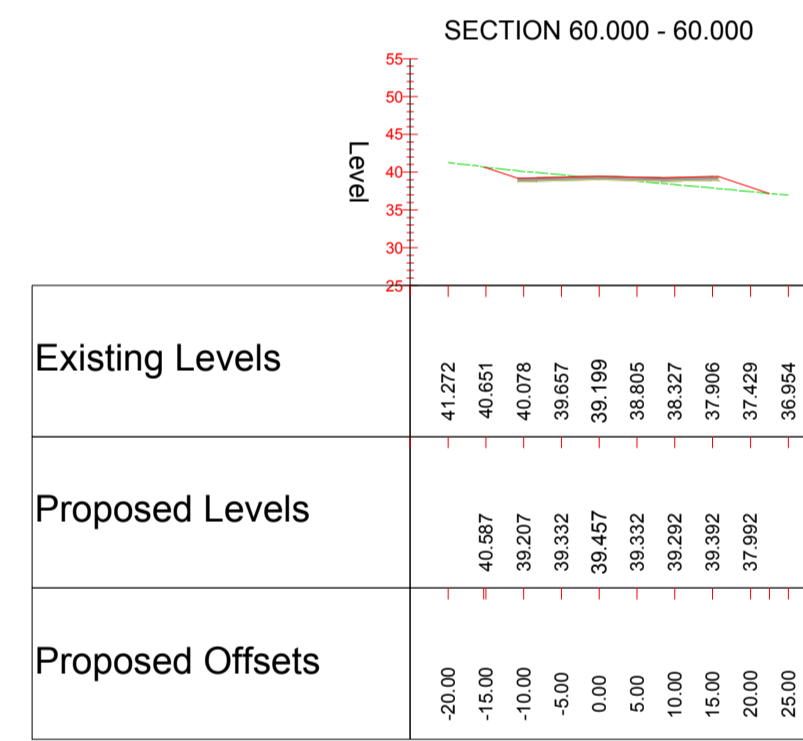
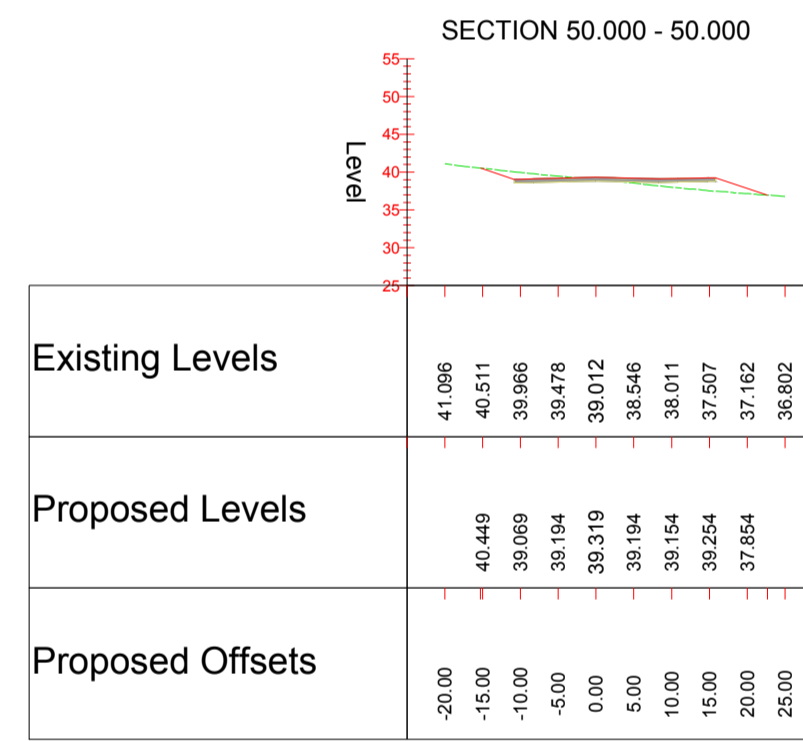
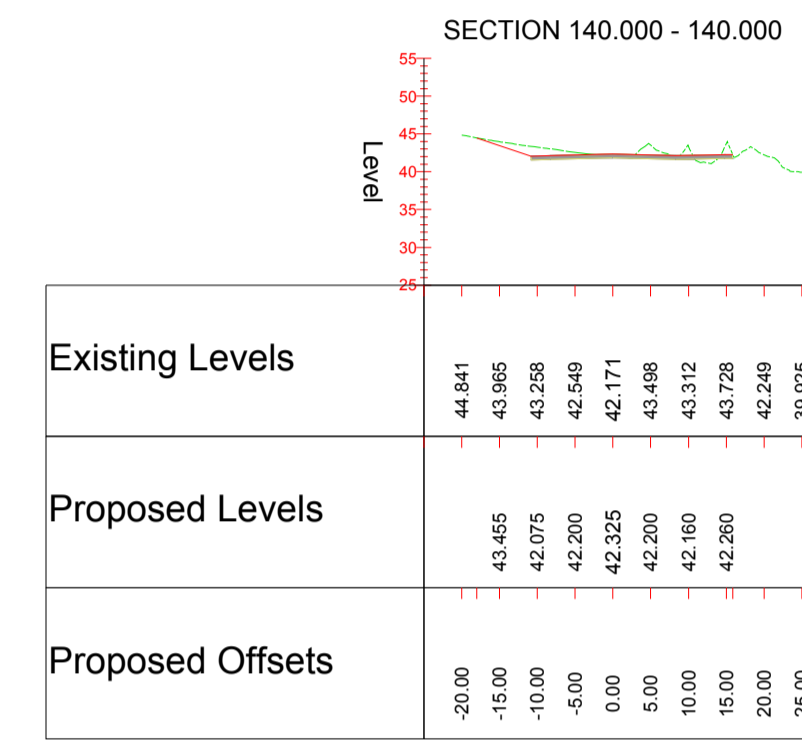
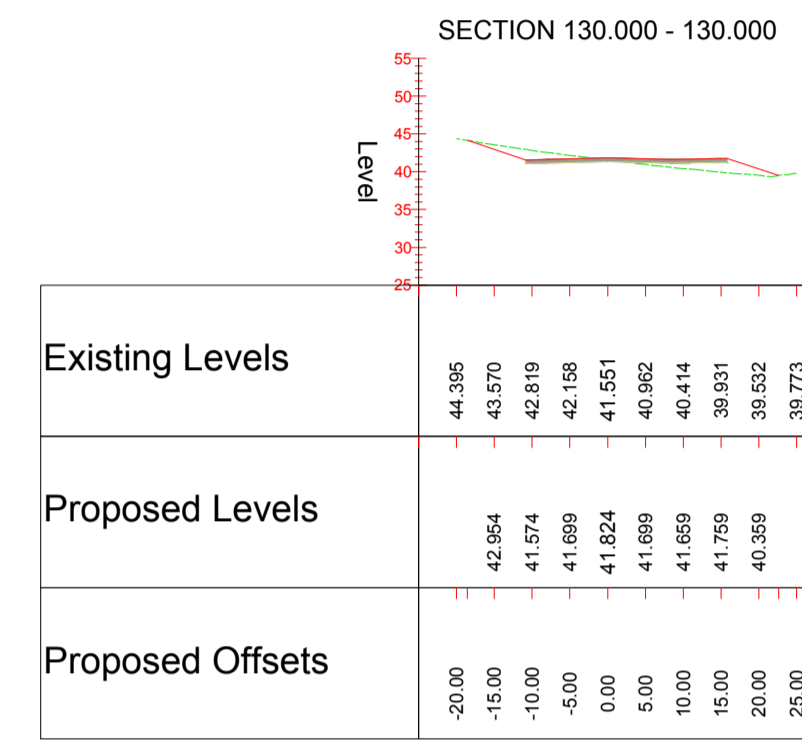
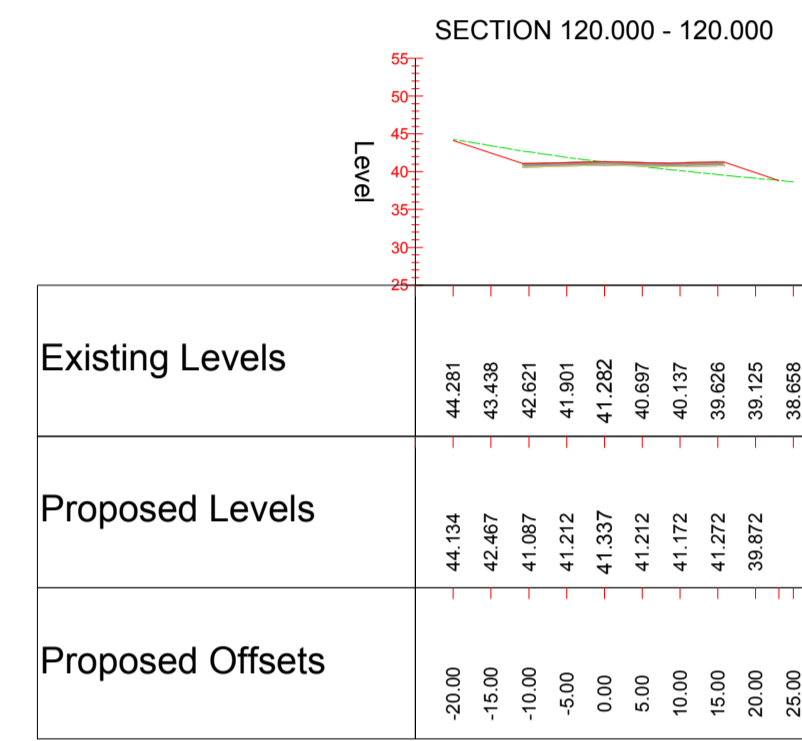
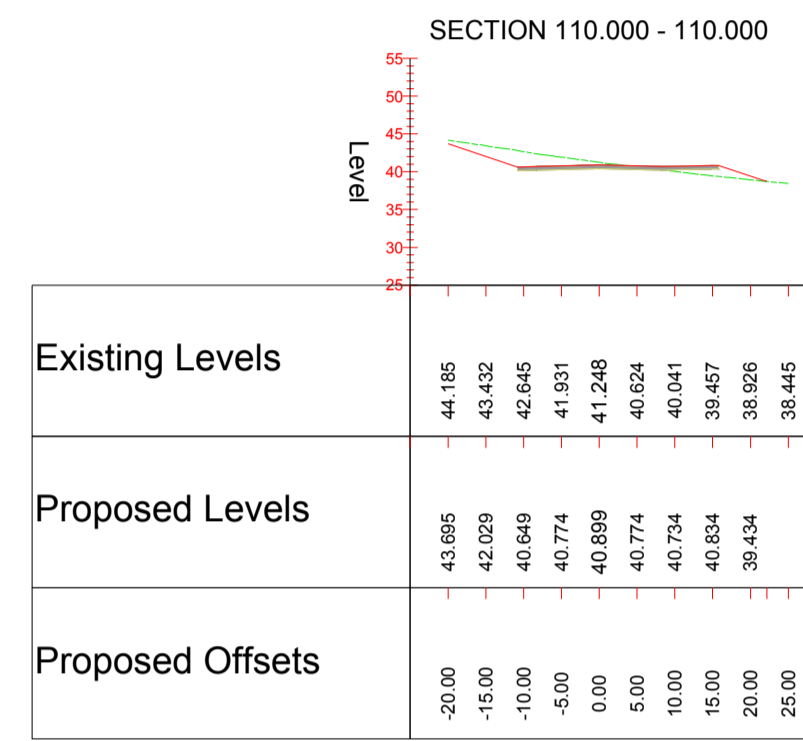
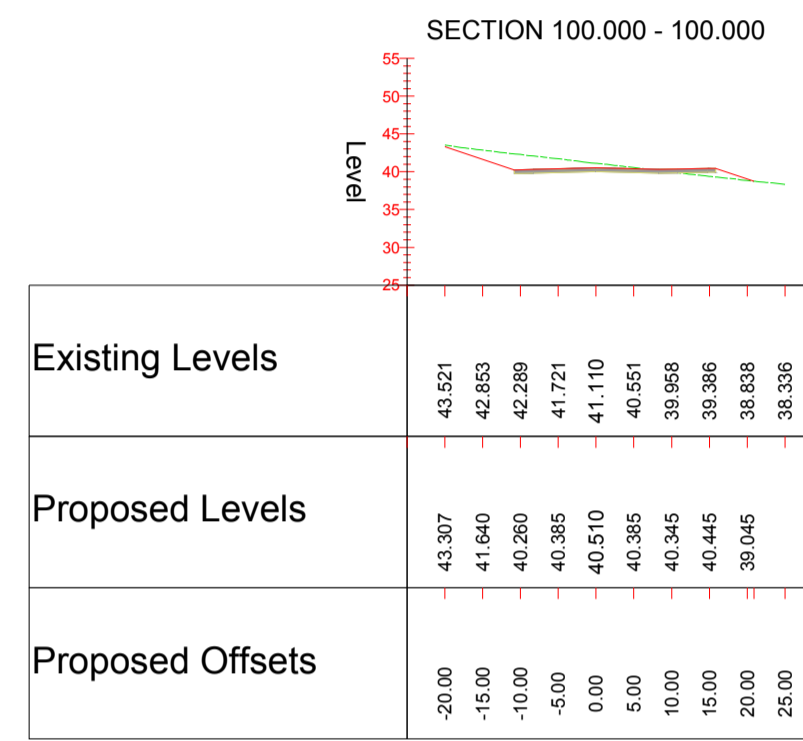
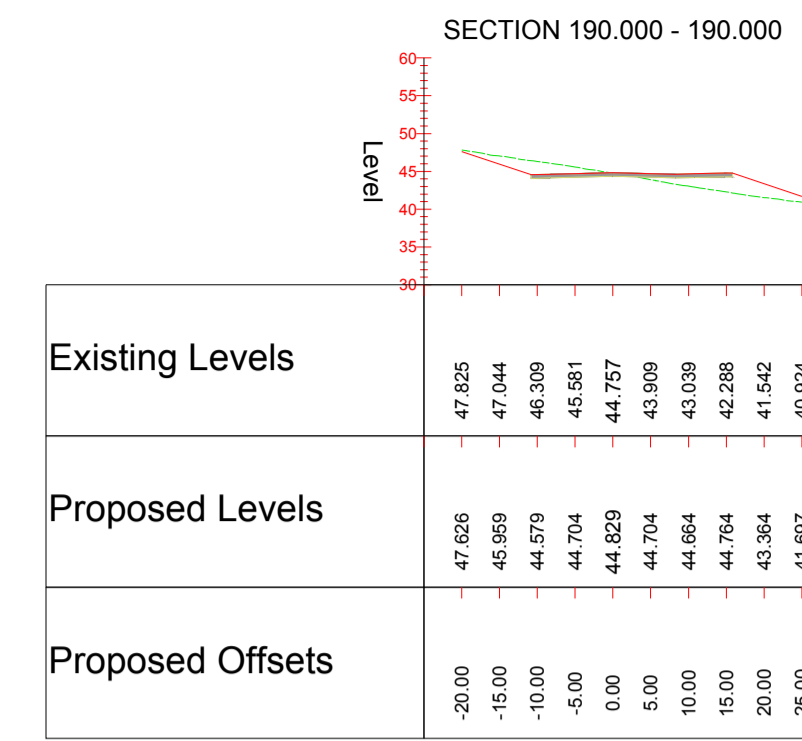
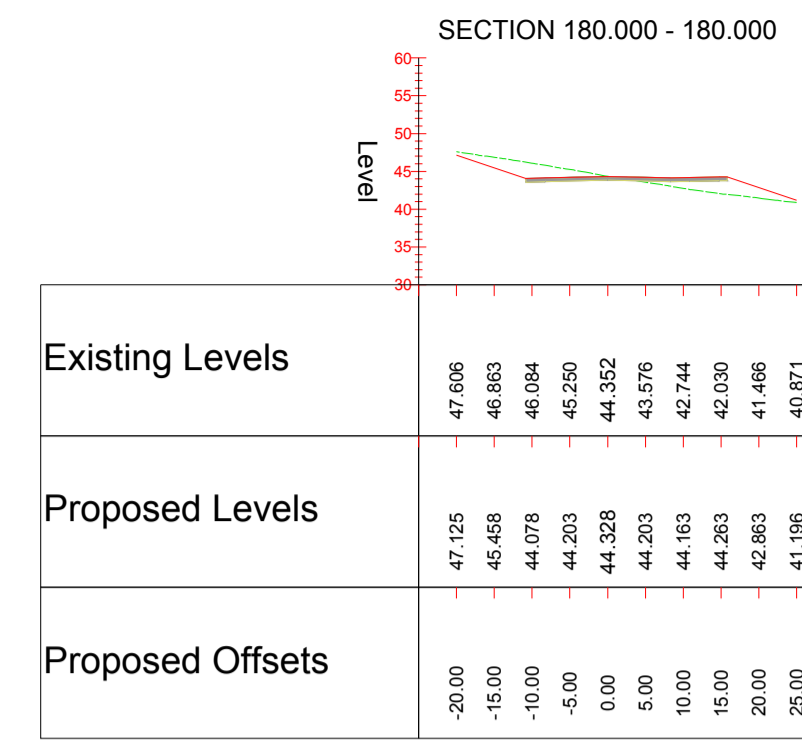
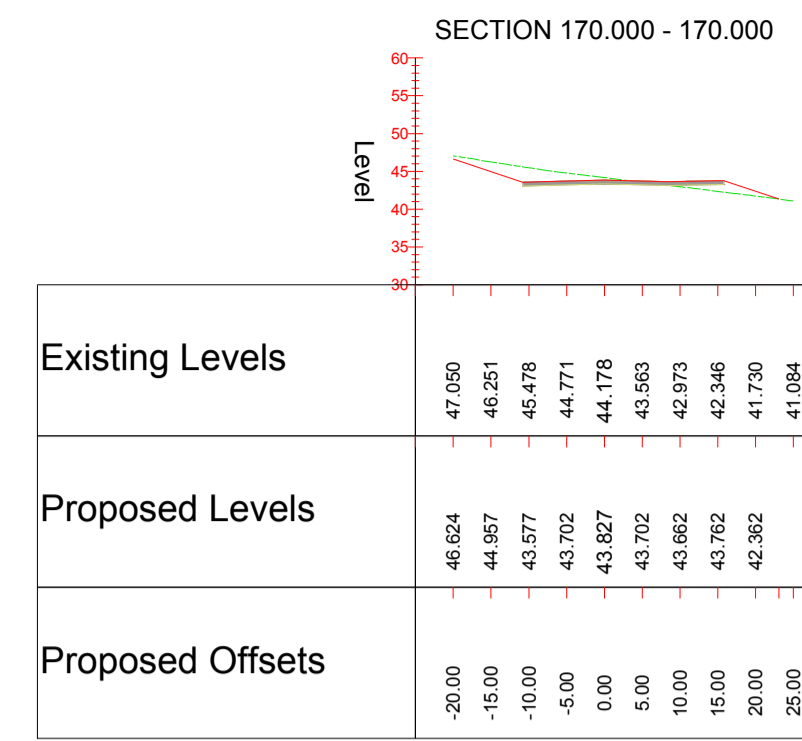
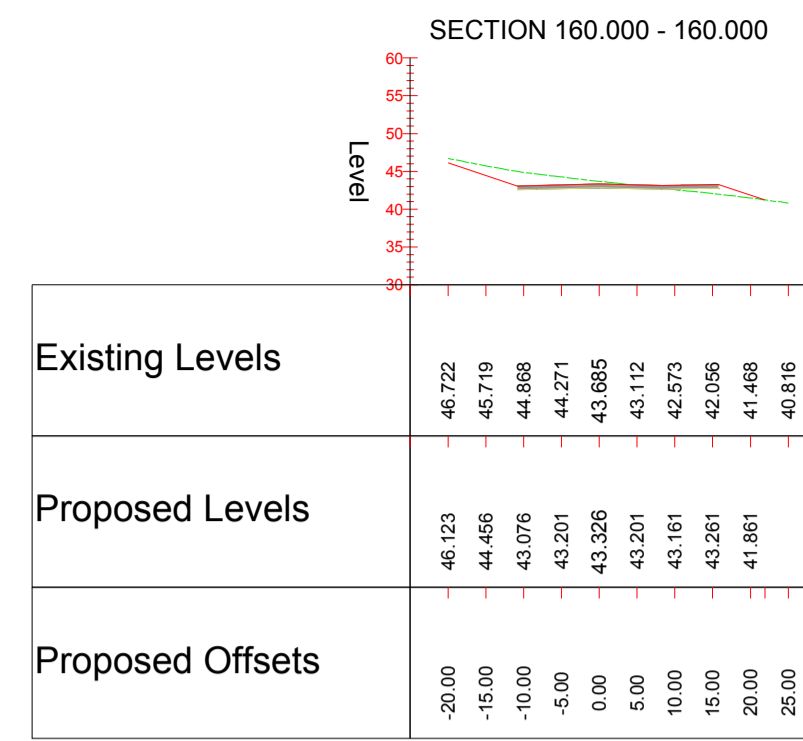
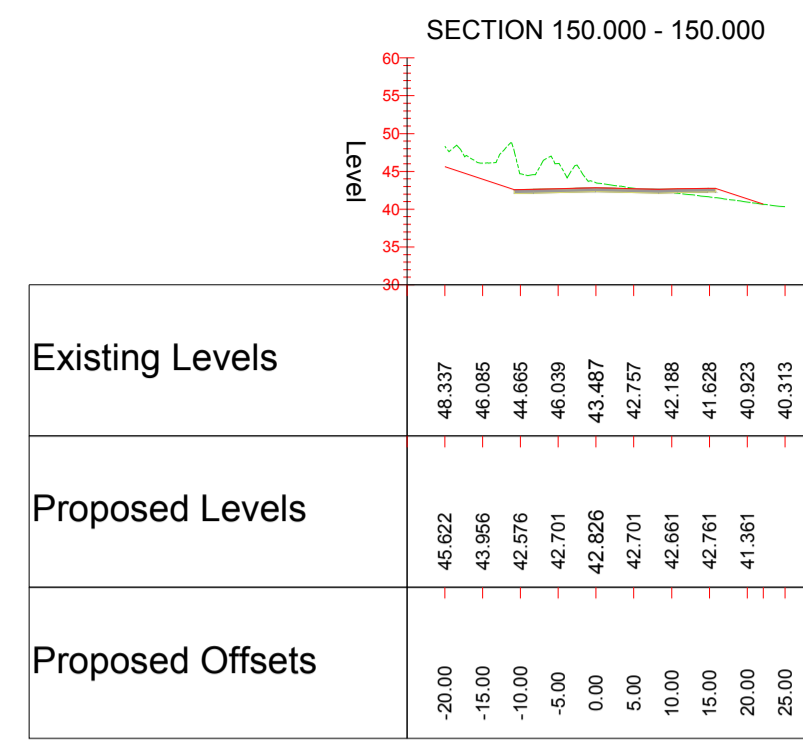
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<b>DECOMMISSIONING/DEMOLITION</b>				
NONE				
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement				
Rev.	Date	Description	By	App'd
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<p>The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com</p>				Drawing Title	<b>A4 - A37 LINK OPTION 2 PROPOSED CONCEPT LONGSECTION SHEET 2 2</b>						
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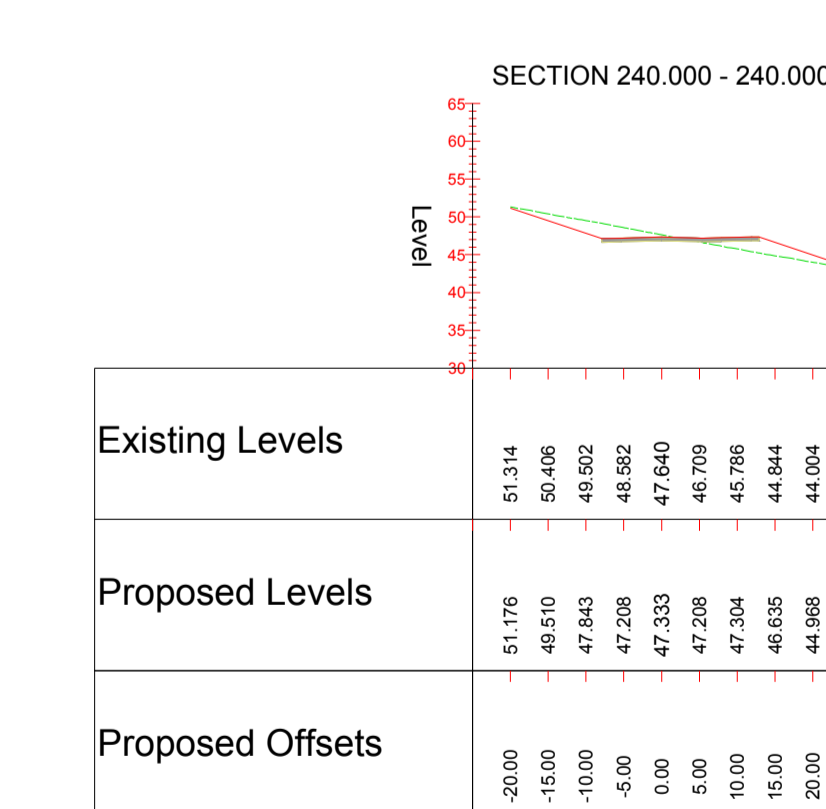
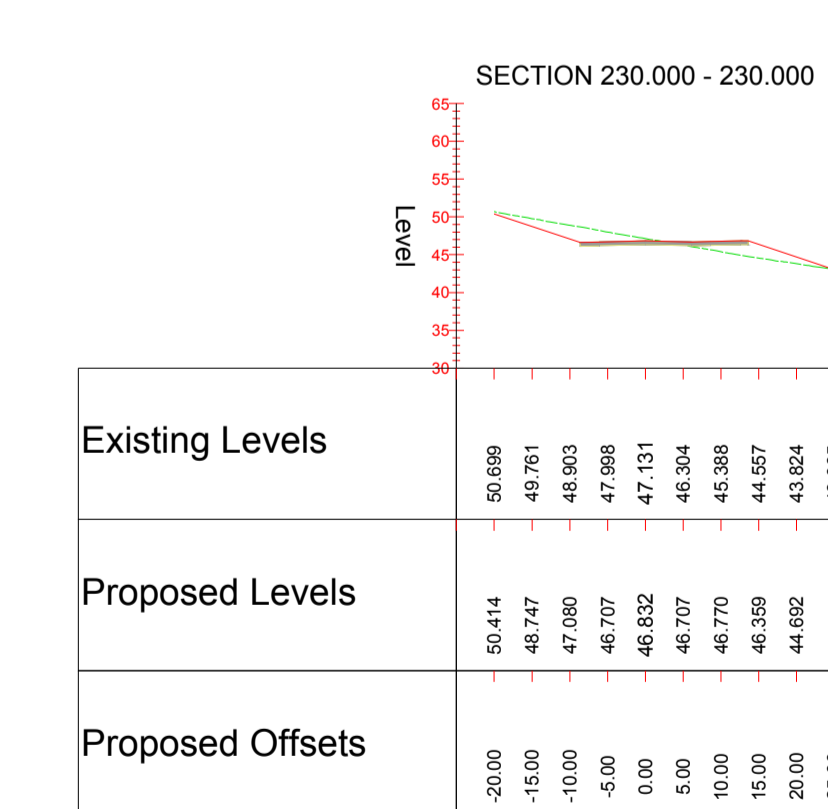
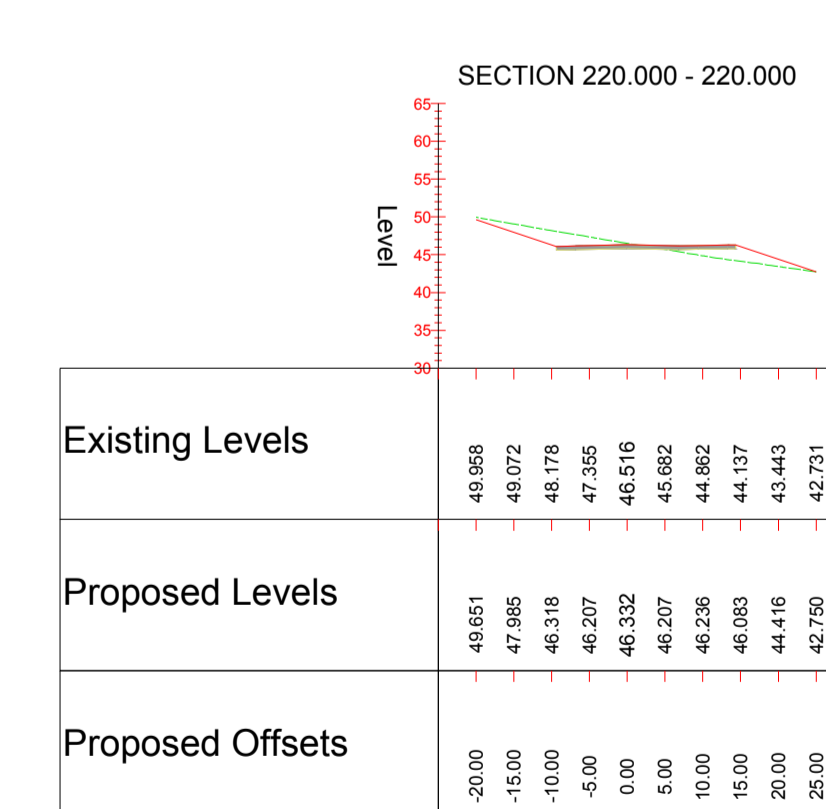
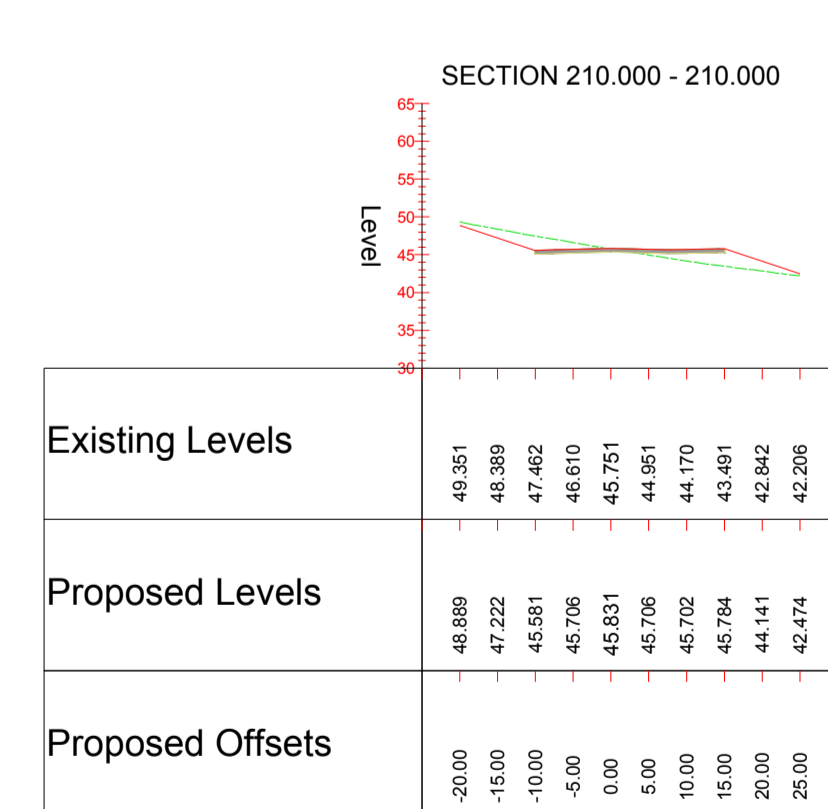
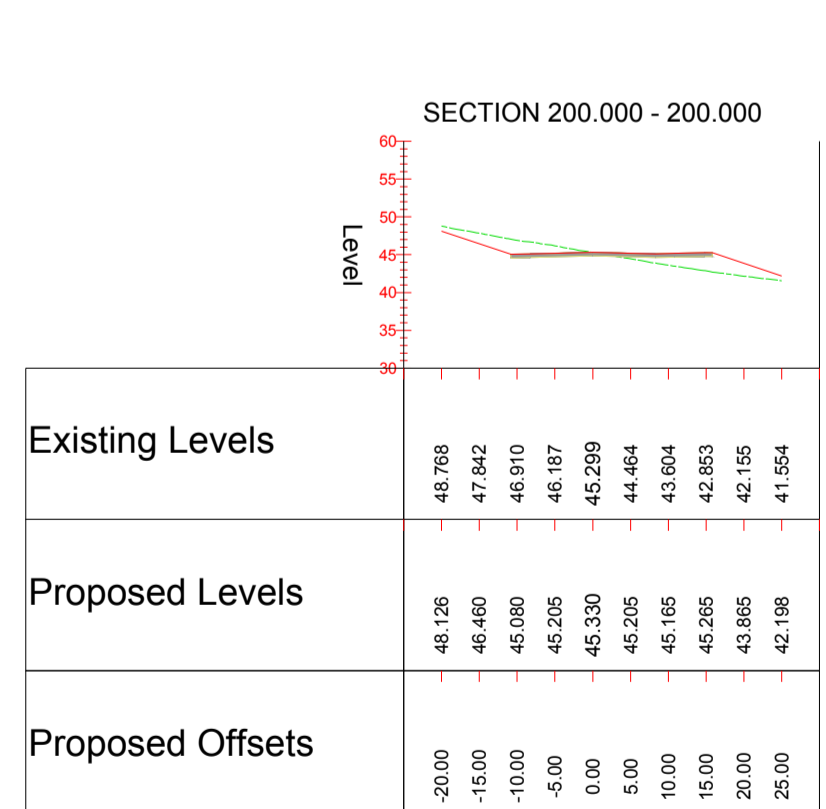
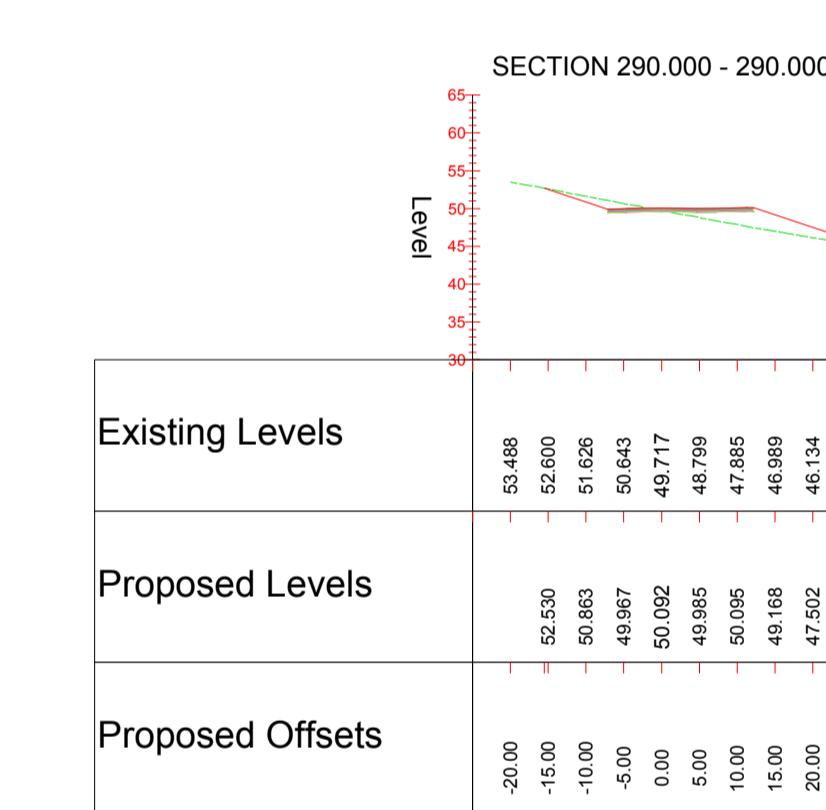
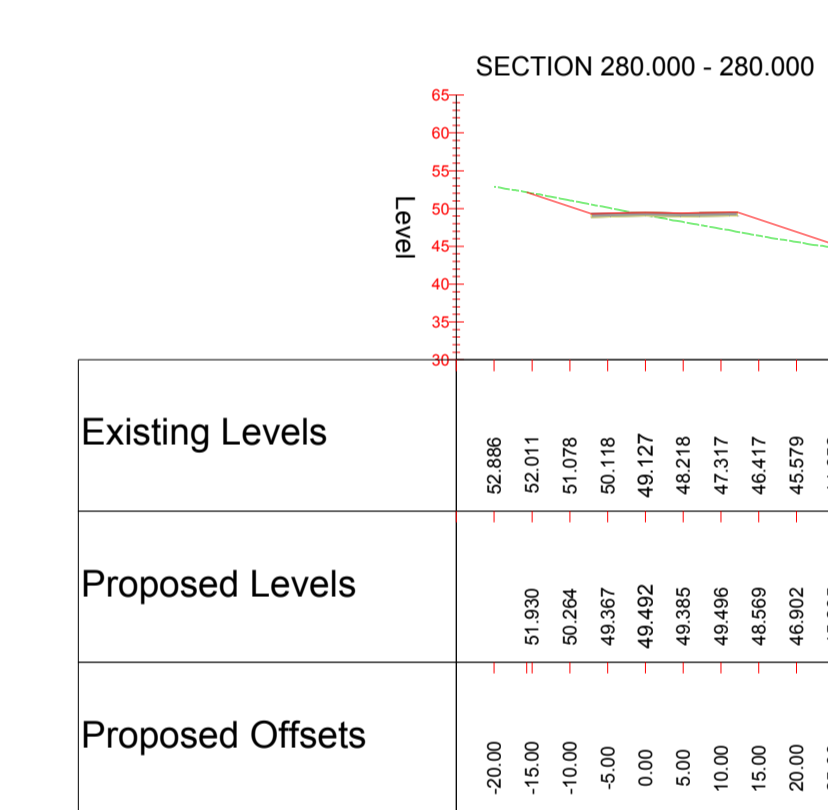
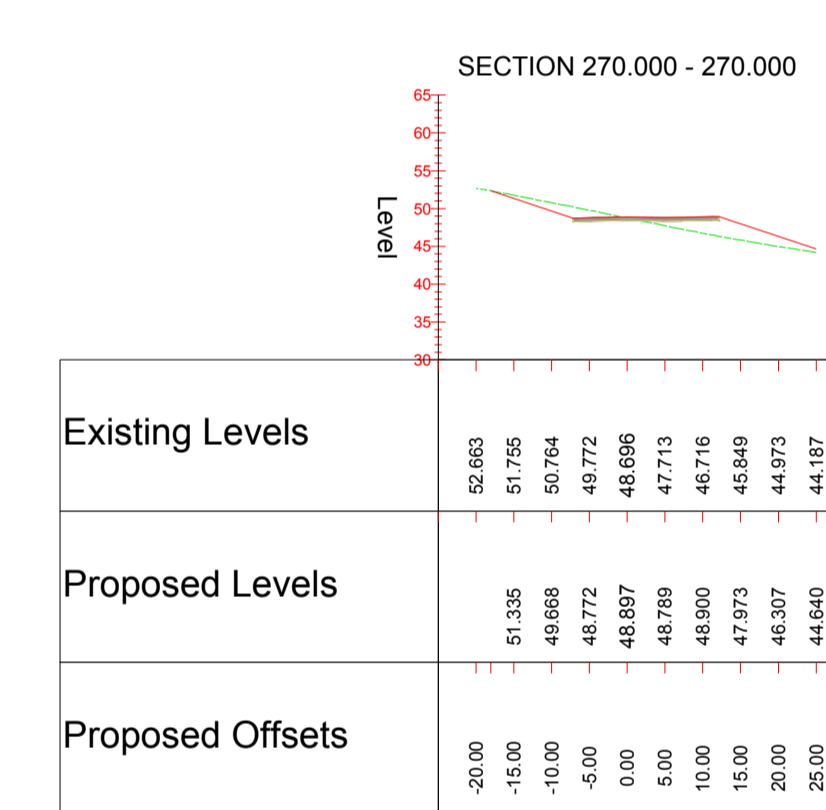
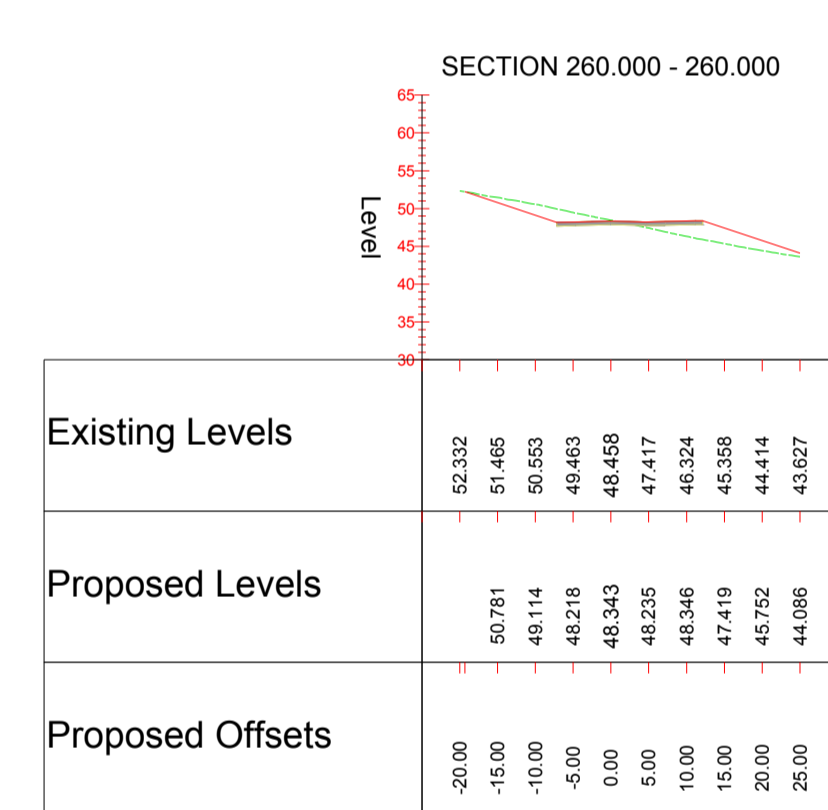
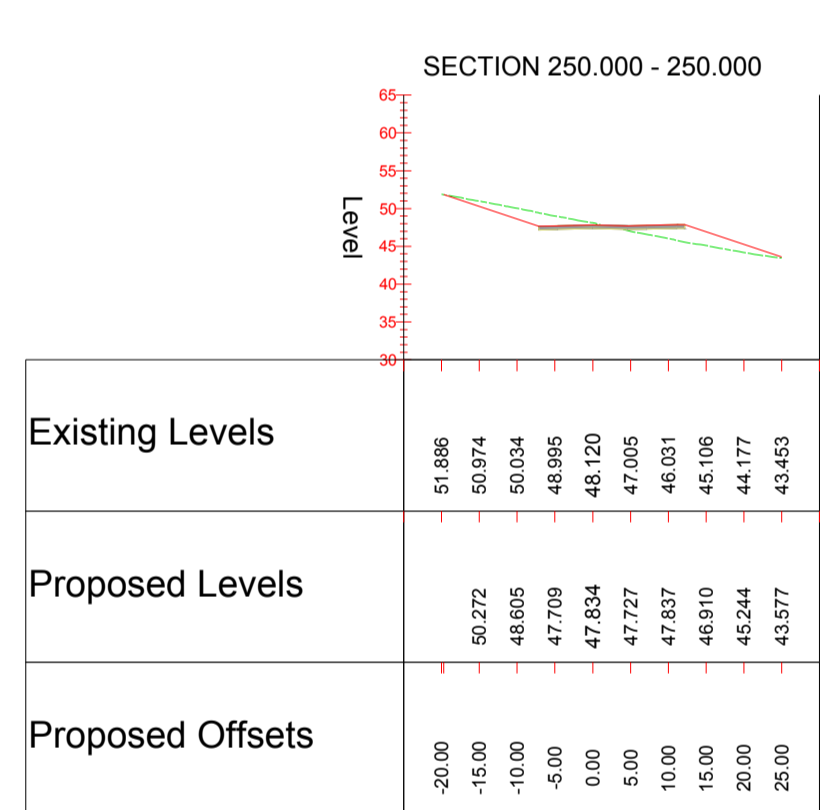
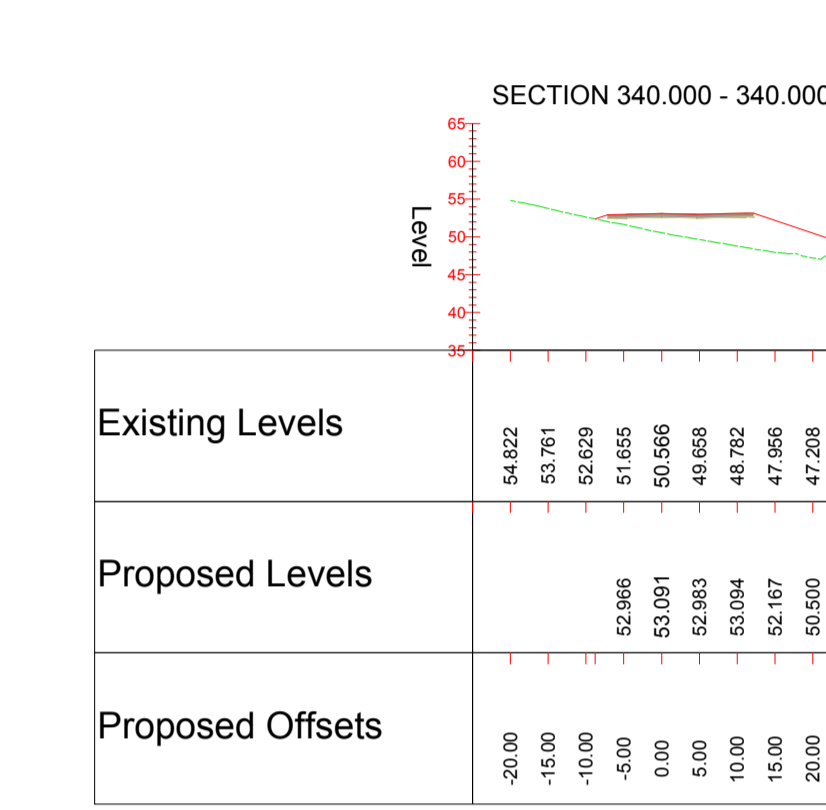
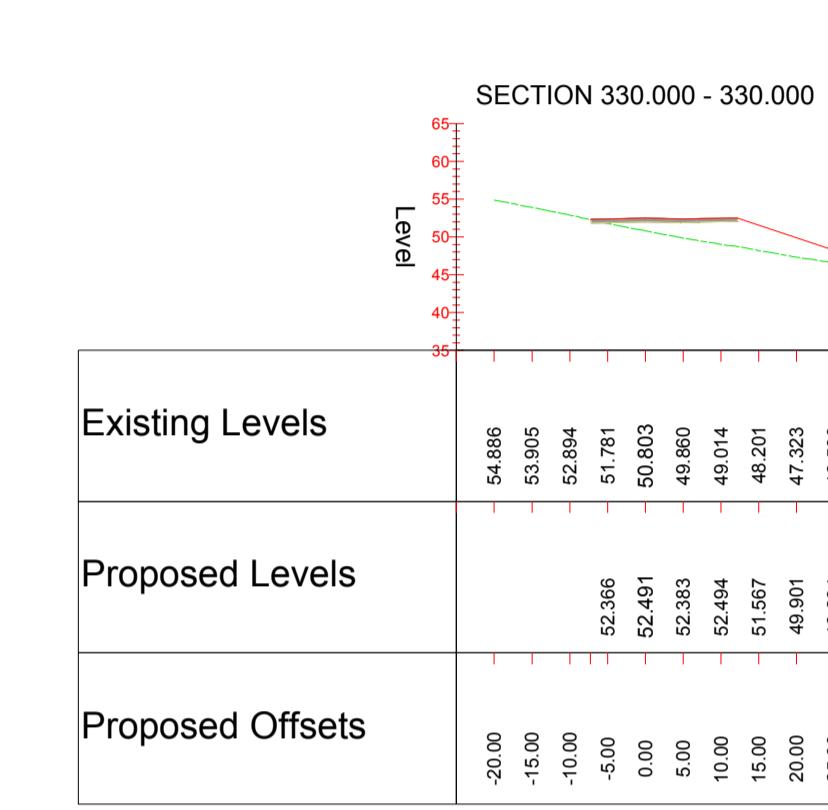
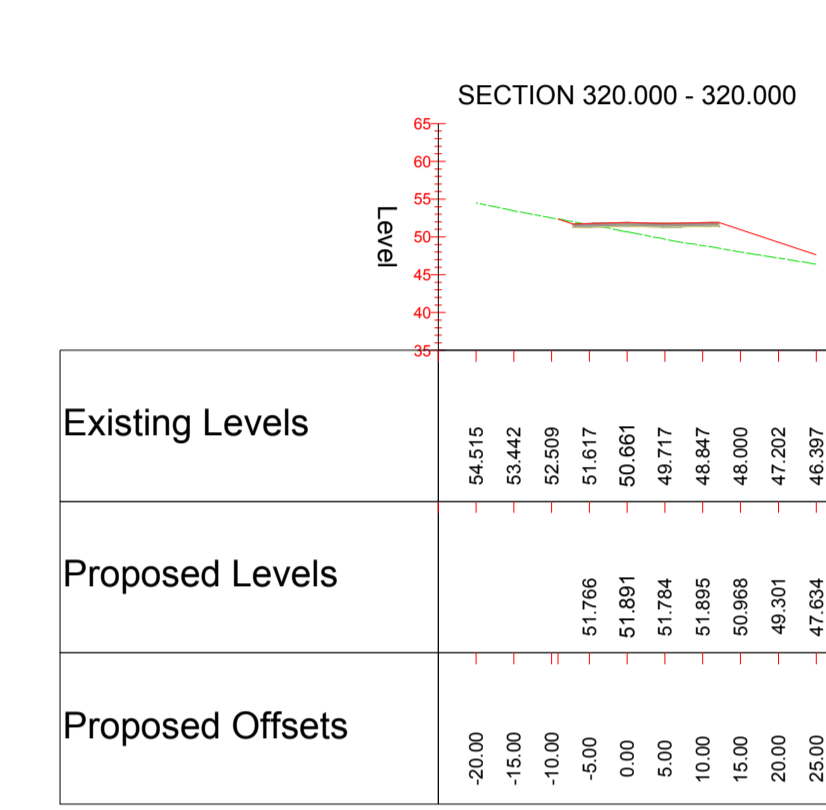
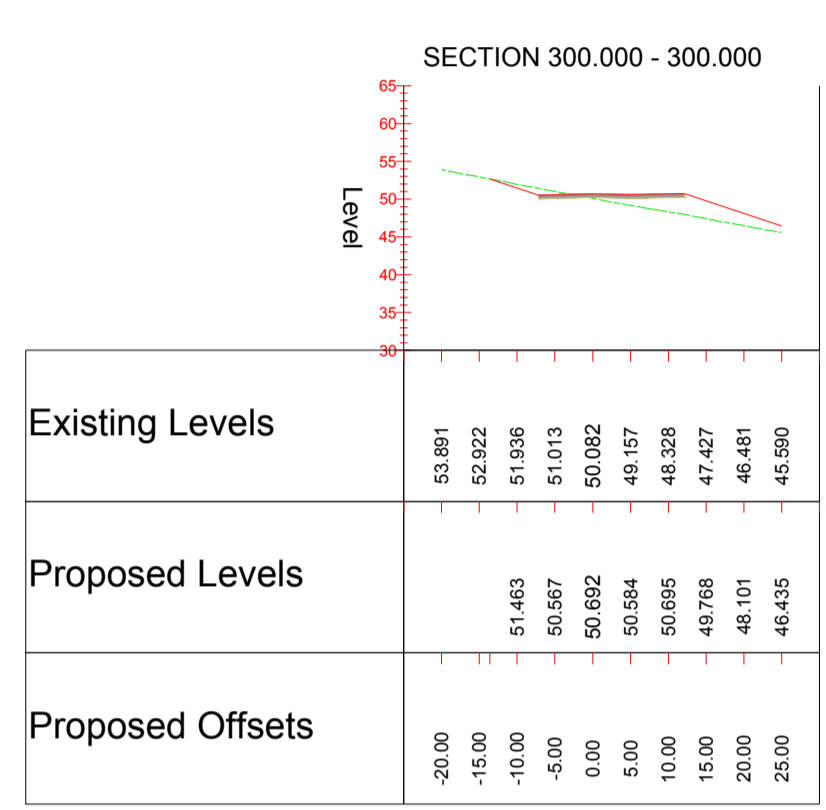
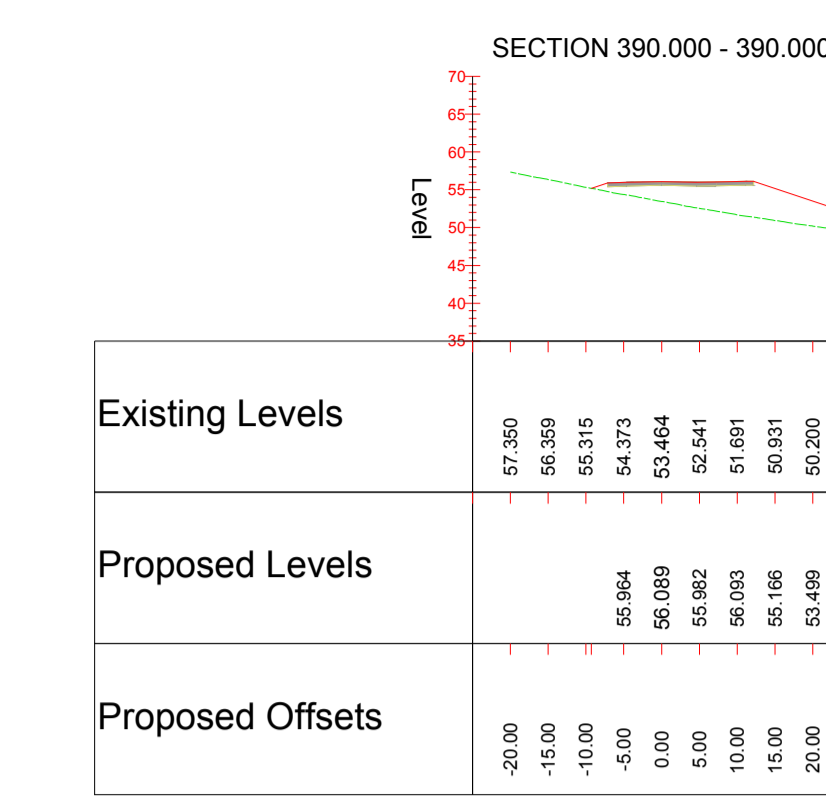
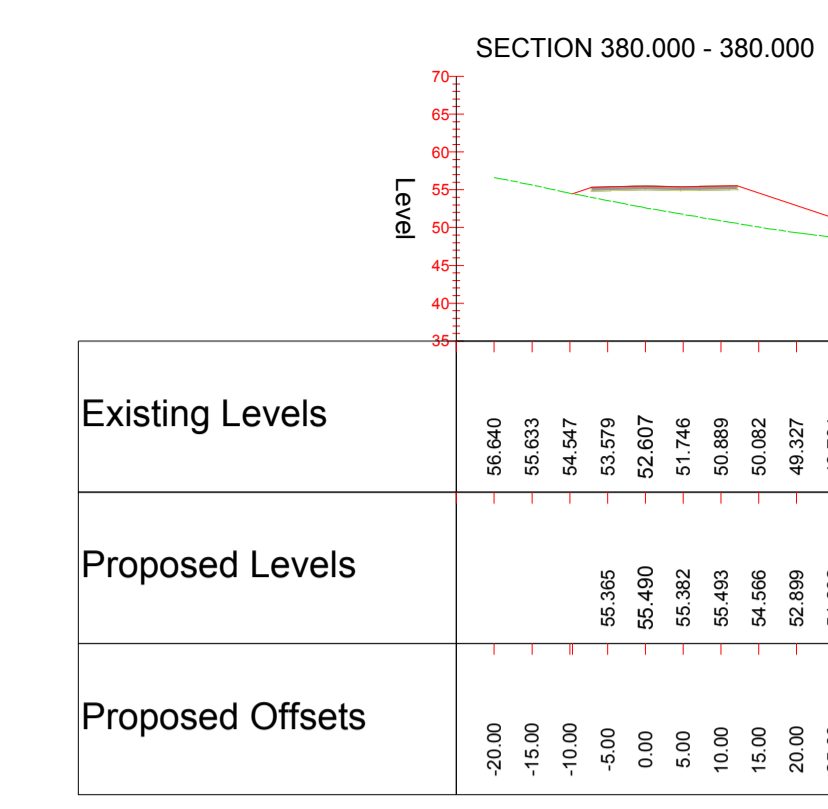
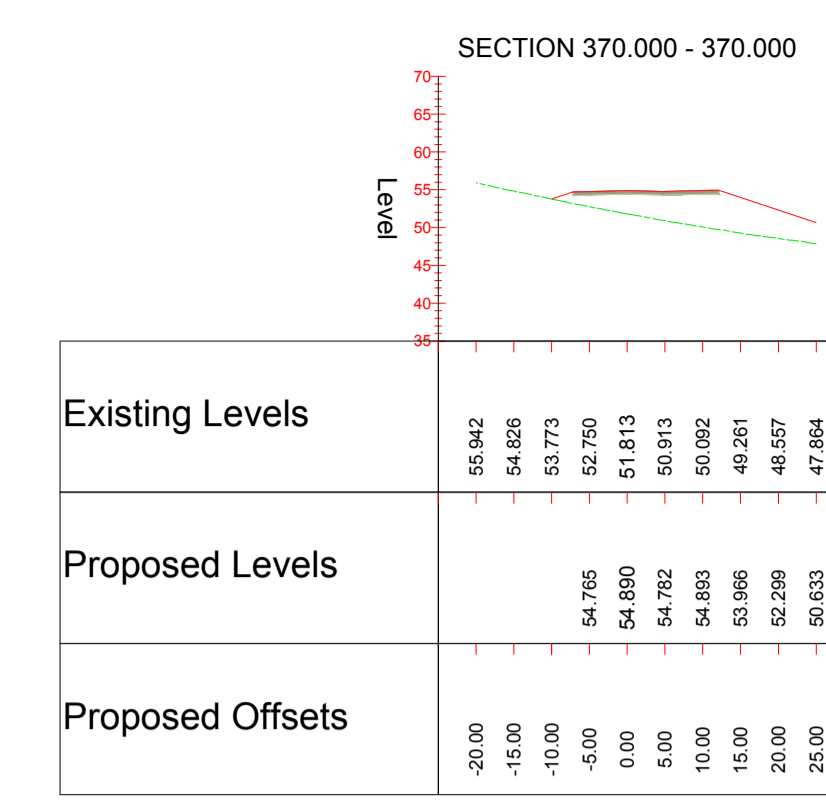
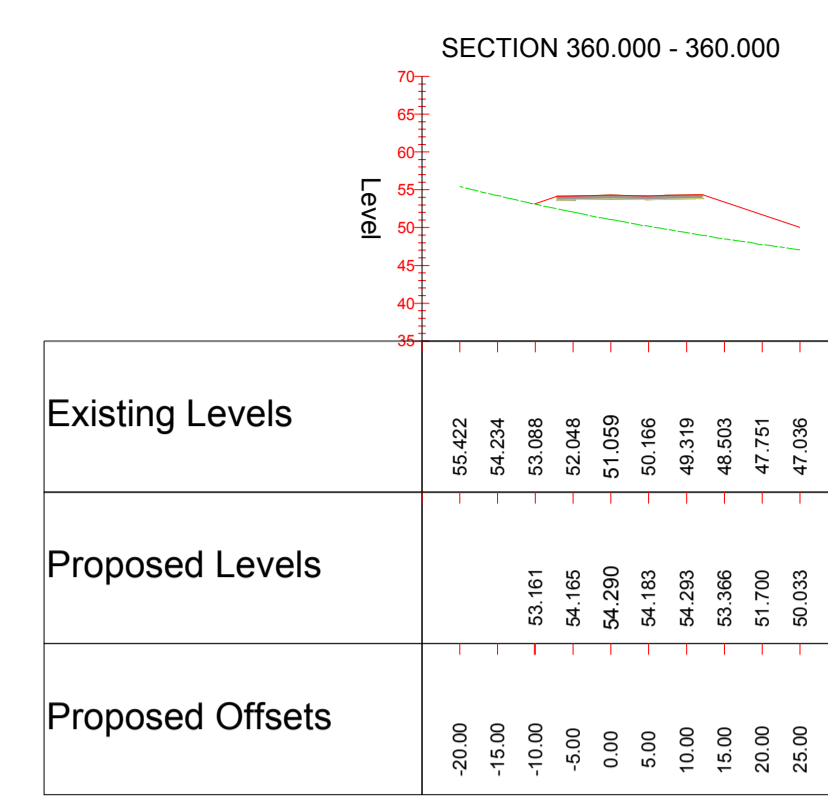
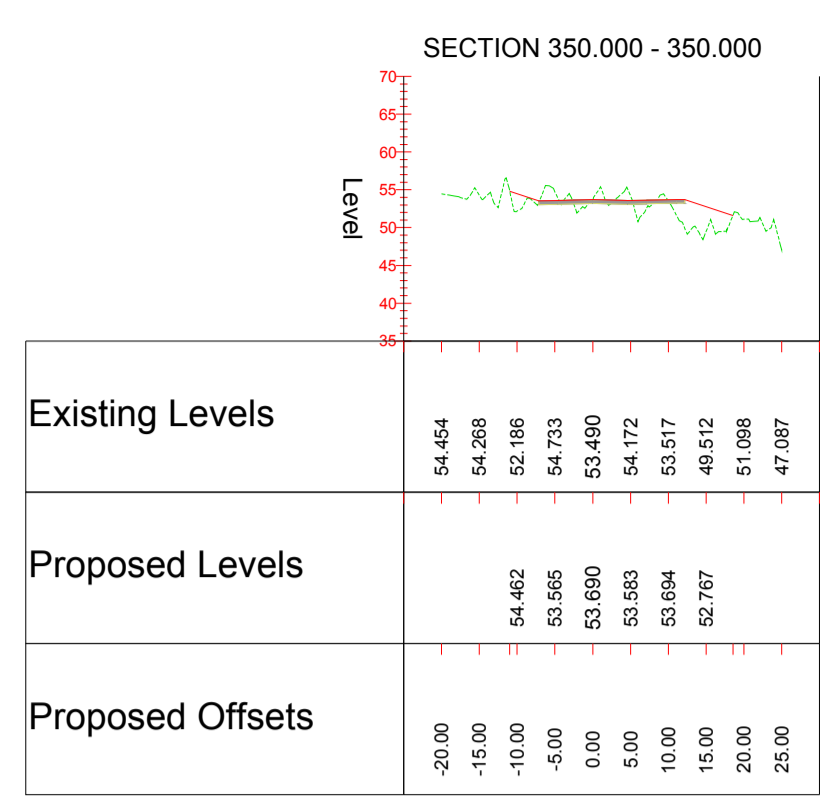


Key:	SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION		
	In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:		
Notes:	CONSTRUCTION NONE		
	MAINTENANCE/CLEANING NONE		
	DECOMMISSIONING/DEMOLITION NONE		
	It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement		
	Rev.	Date	Description
P1	05.02.18	DRAWING CREATED	AF

Drawing Status		FOR INFORMATION	
Sustainability		S2	
Project Title		WEST OF ENGLAND WP1	
Drawing Title		A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 1/19	
Scale	1:1000	Designed	EC
Original Size	A1	Date	05/02/18
Drawn	ATK	Checked	AH
Authorised		Date	05/02/18
Project Ref. No.	0000000	Revision	P1
Client	WEST OF ENGLAND		

Copyright © Atkins Limited (2014)		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com	
Originator	Woe	Volume	HGN
HA PIN	WP1	Revision	- DR - D - 6504
Location		Type	

CROSS SECTIONS  
Scale 1:1000



Key:  
Notes:

**SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION**  
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

**CONSTRUCTION**  
NONE

**MAINTENANCE/CLEANING**  
NONE

**DECOMMISSIONING/DEMOLITION**  
NONE

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

Rev.	Date	Description	By	Chkd	App'd
P1	05.02.18	DRAWING CREATED		AF	

Drawing Status		FOR INFORMATION		S2		Project Title		WEST OF ENGLAND WP1	
Client		WEST OF ENGLAND		Originator		Date		Project Ref. No.	
Originator		Woe		Date		05/02/18		0000000	
Designer		ATK		Date		05/02/18		Revision	
Checked		D		Date		05/02/18		P1	
Authorised		HGN		Date		05/02/18			

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**WEST OF ENGLAND**

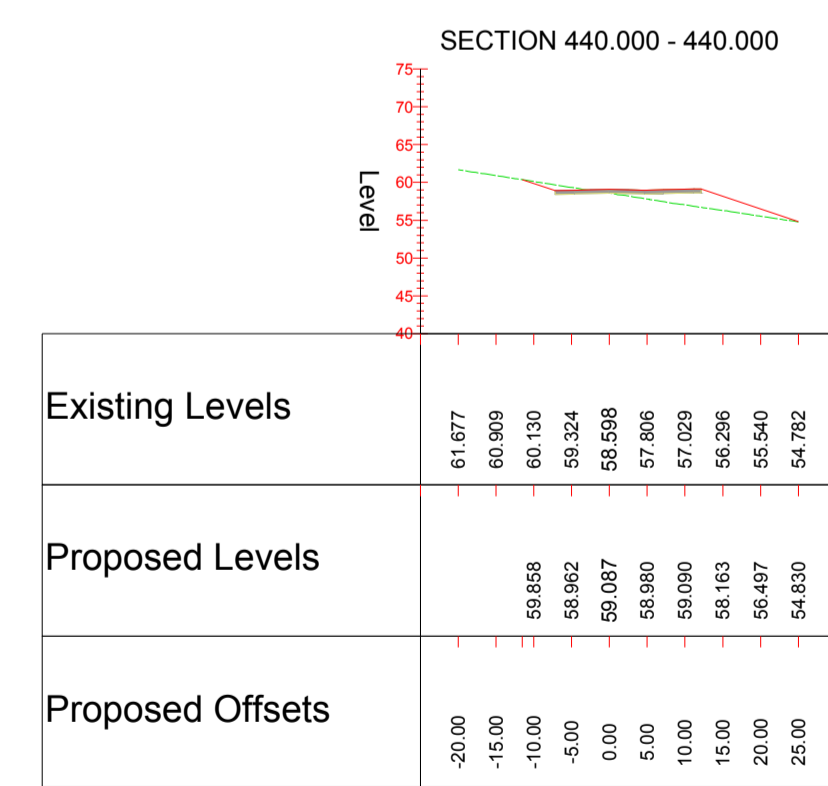
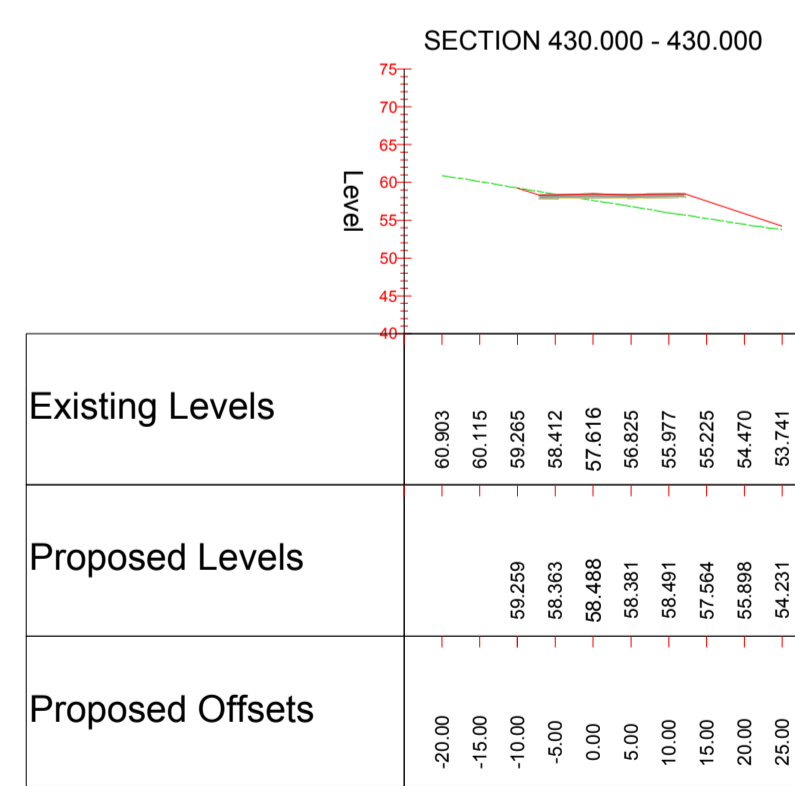
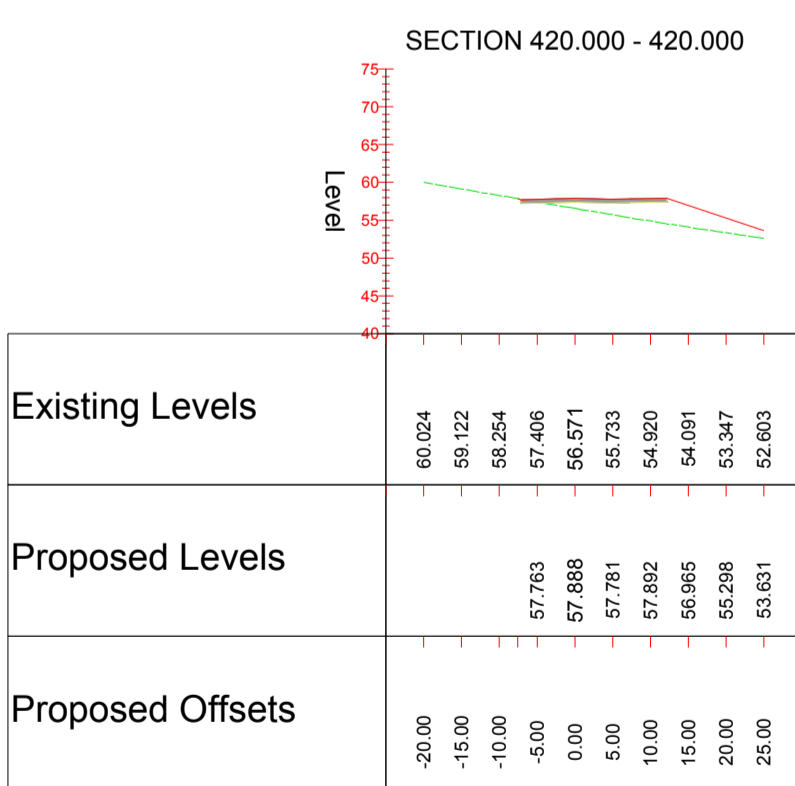
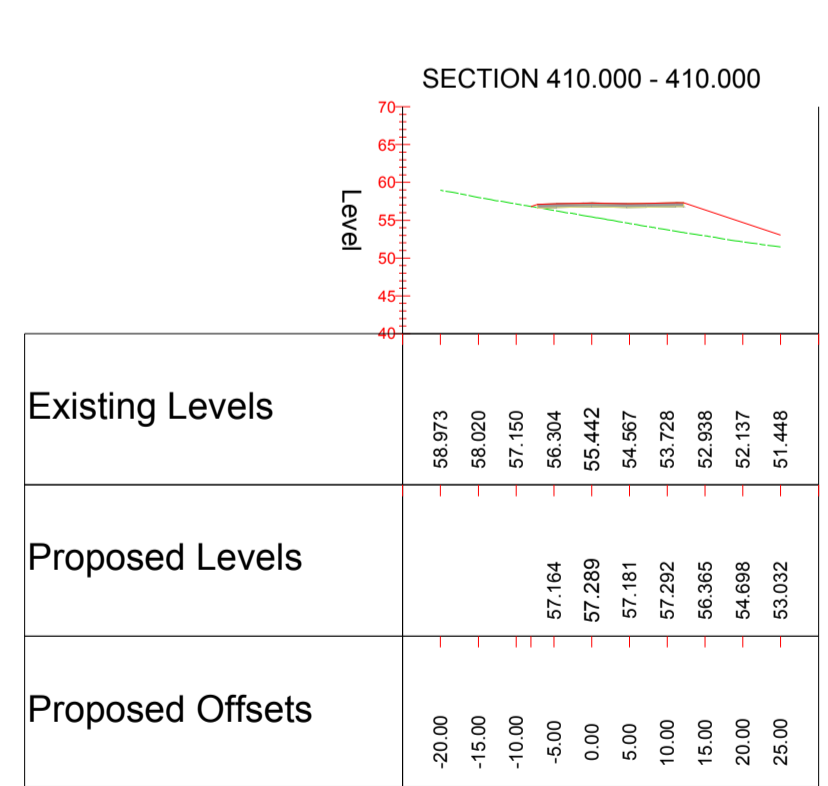
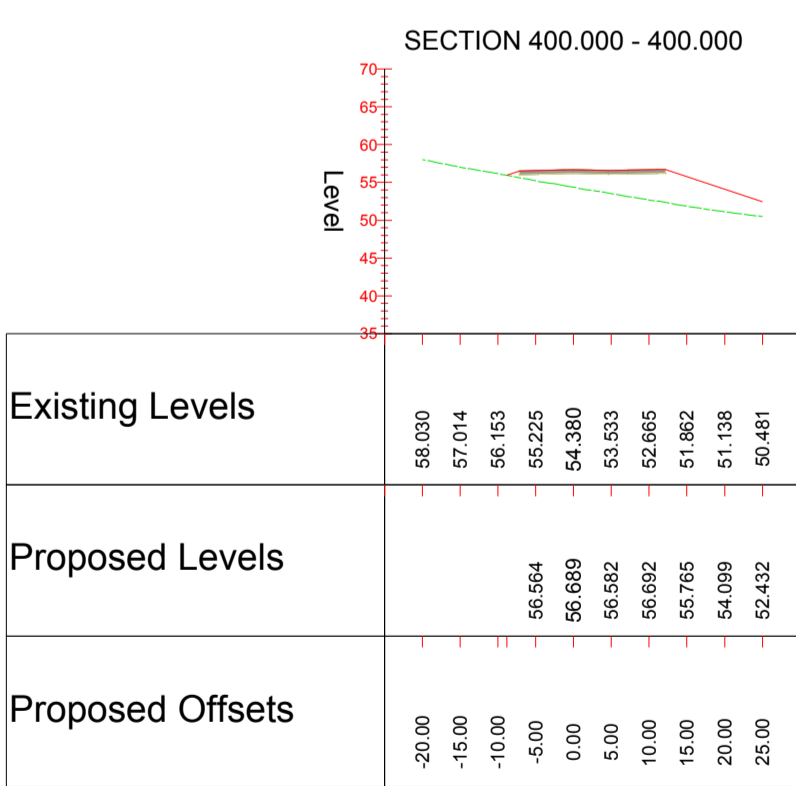
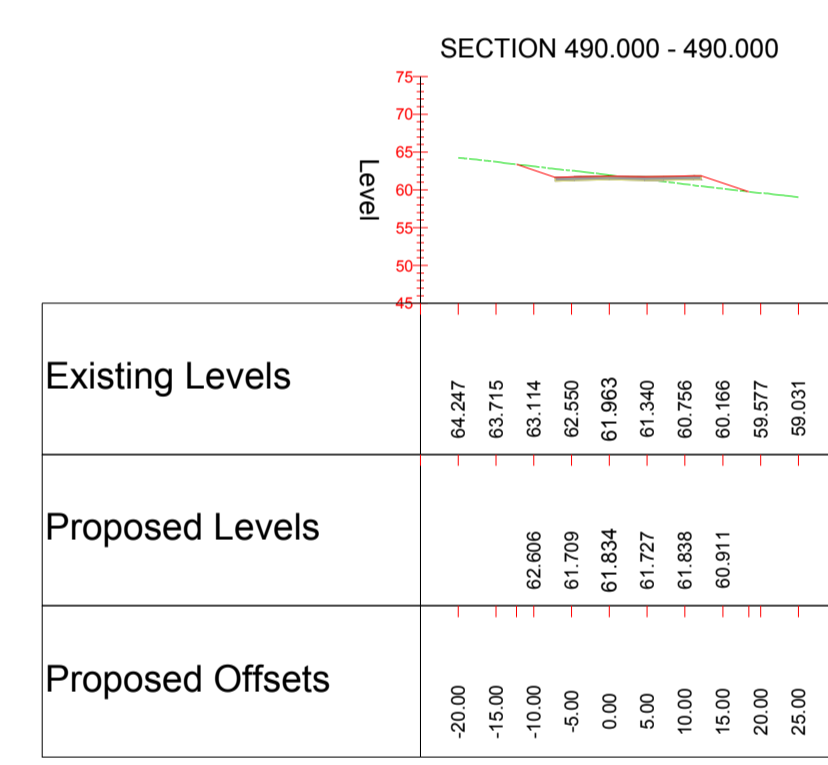
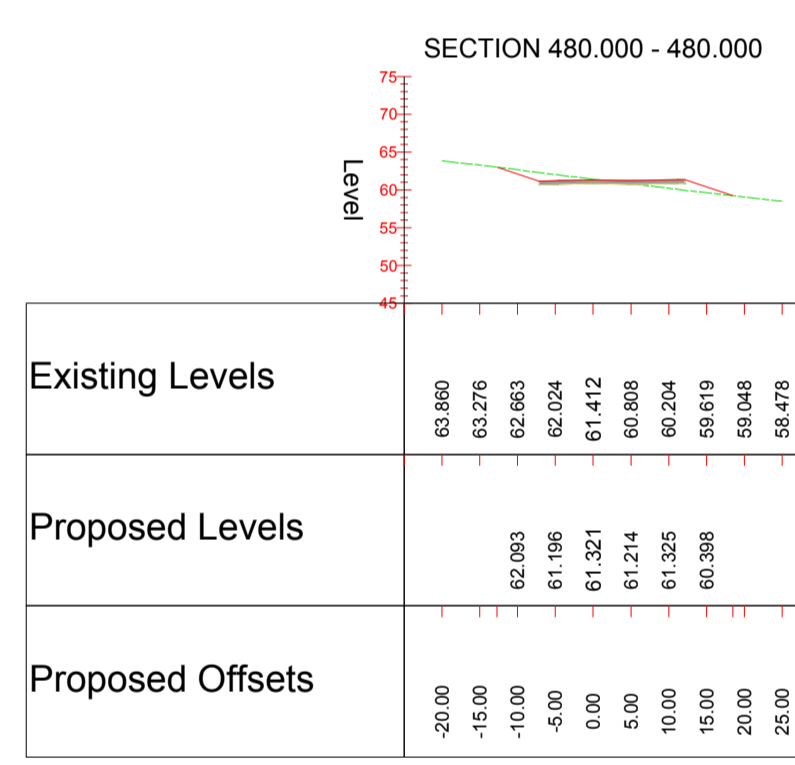
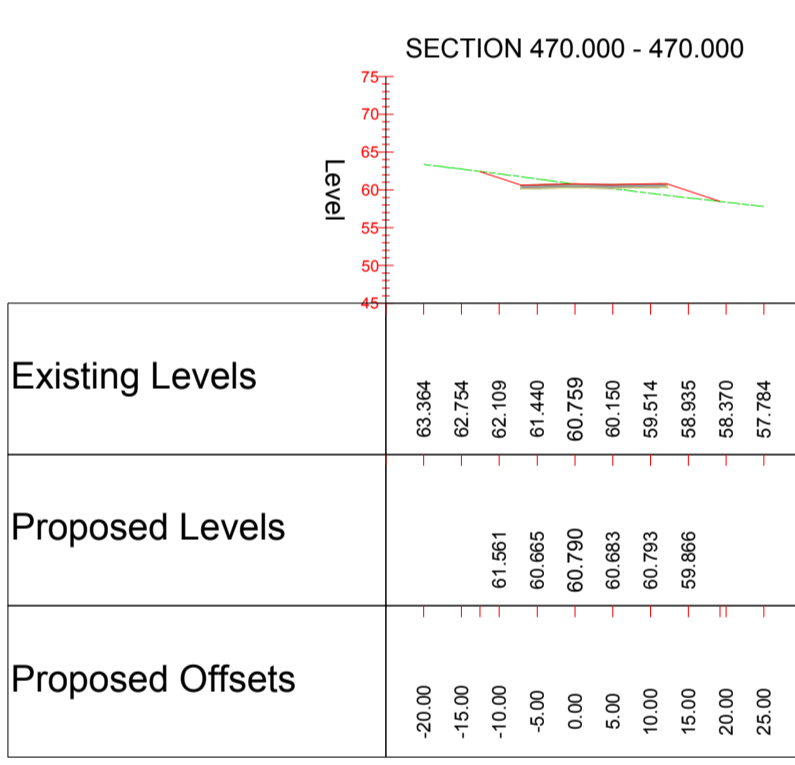
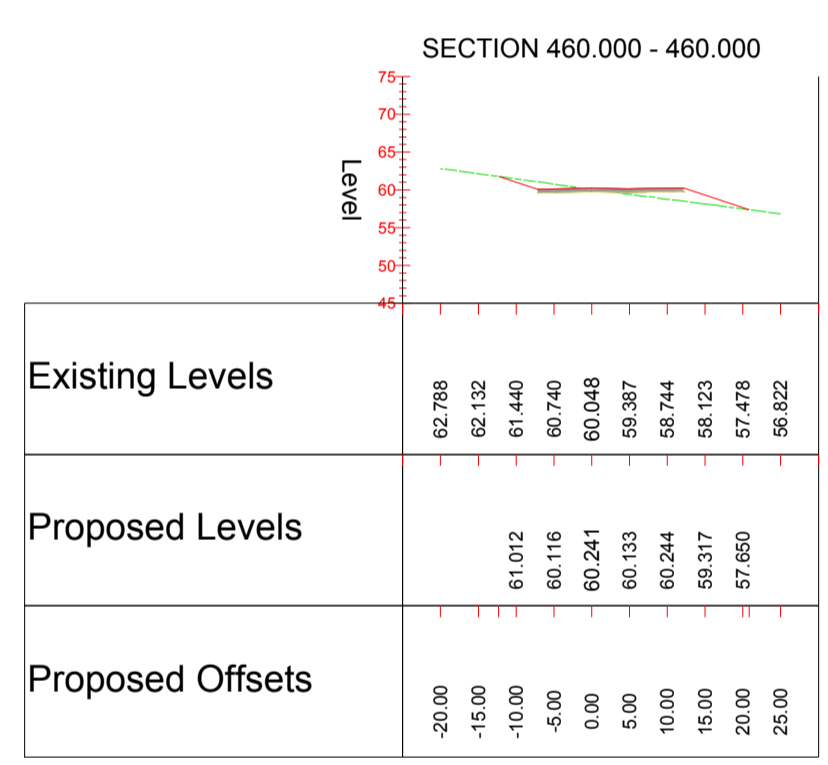
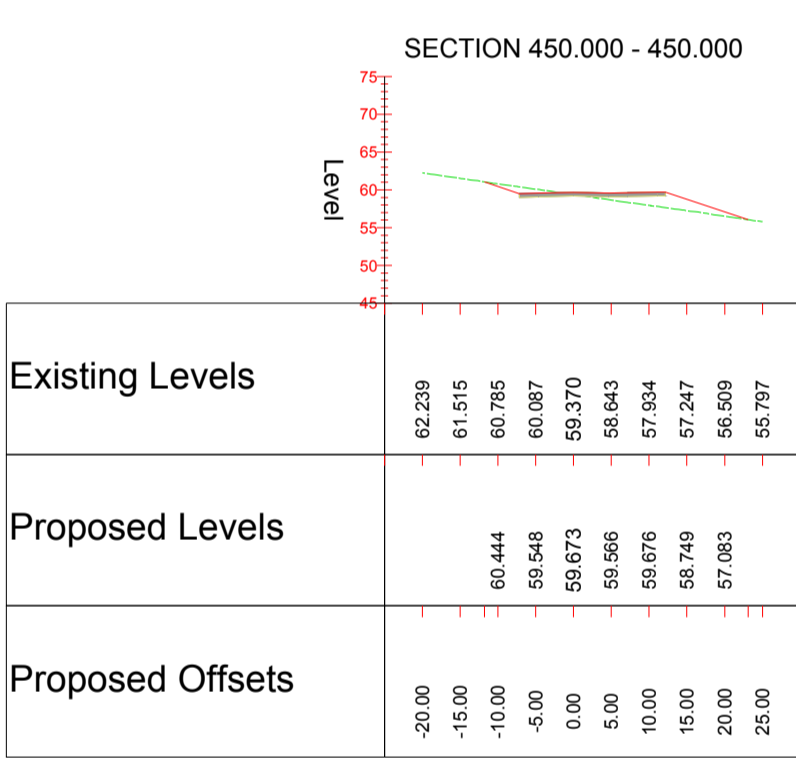
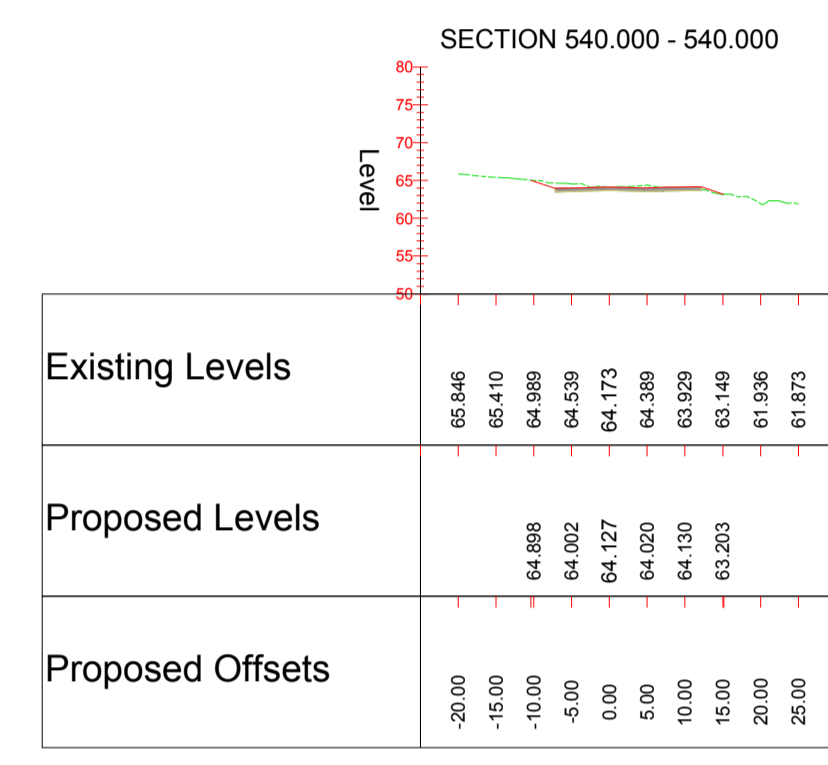
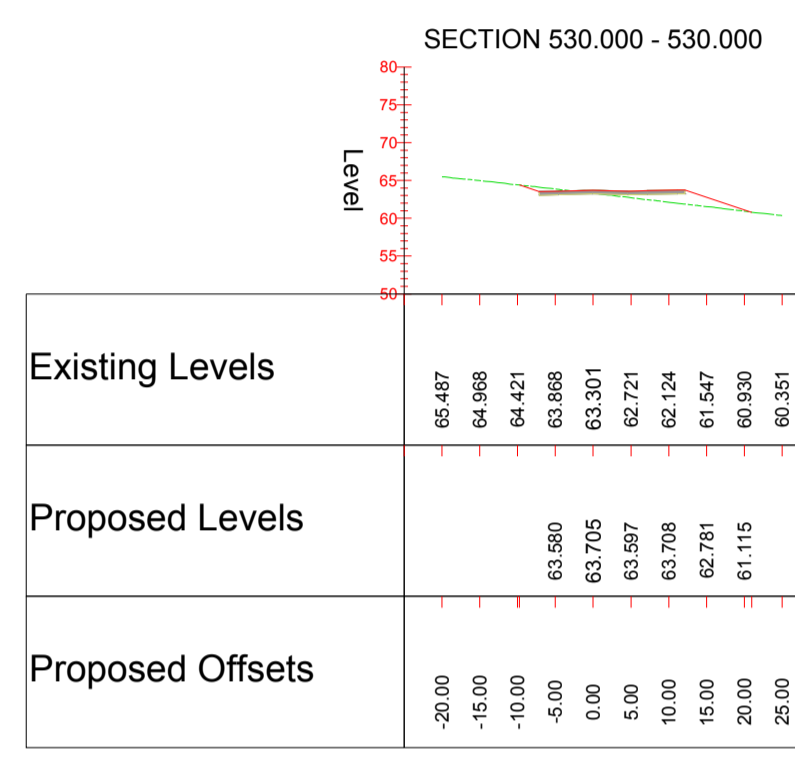
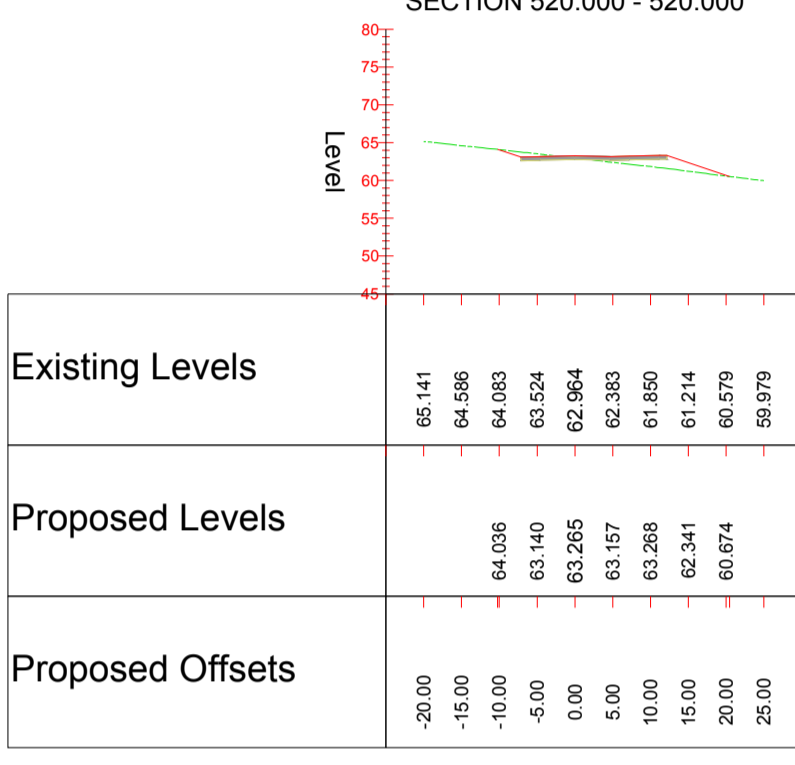
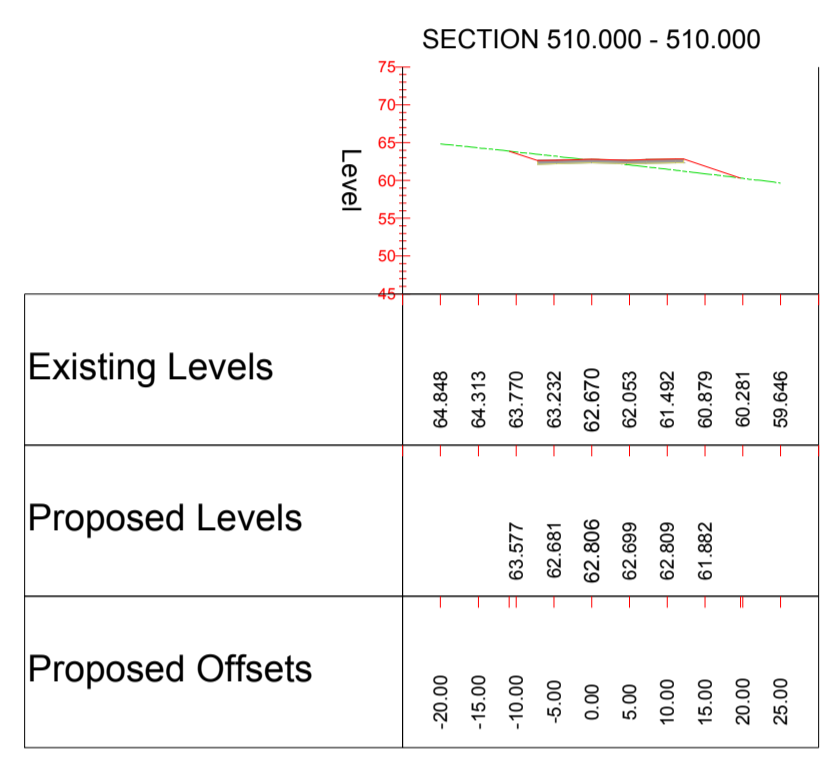
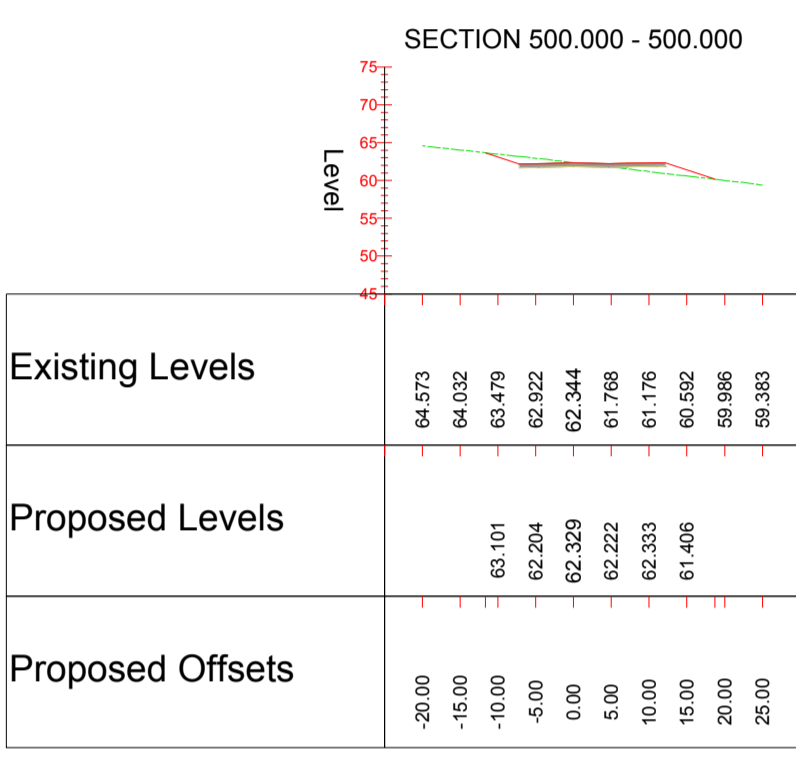
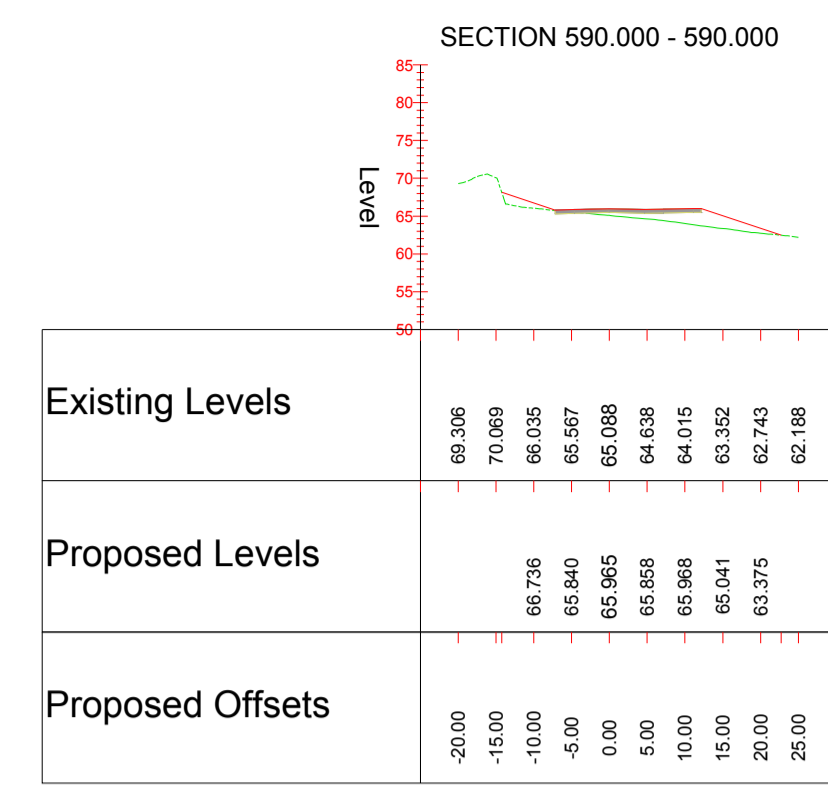
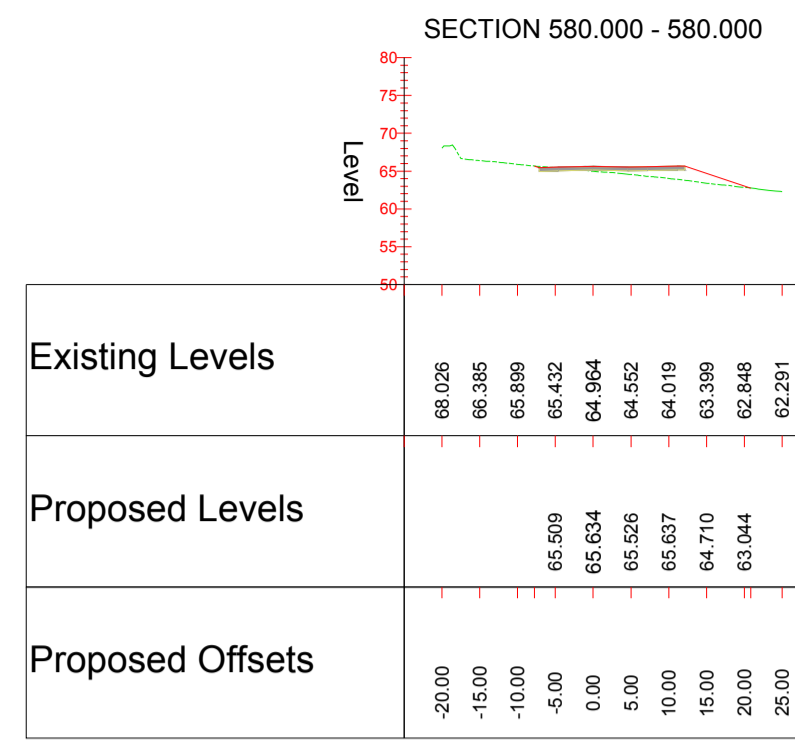
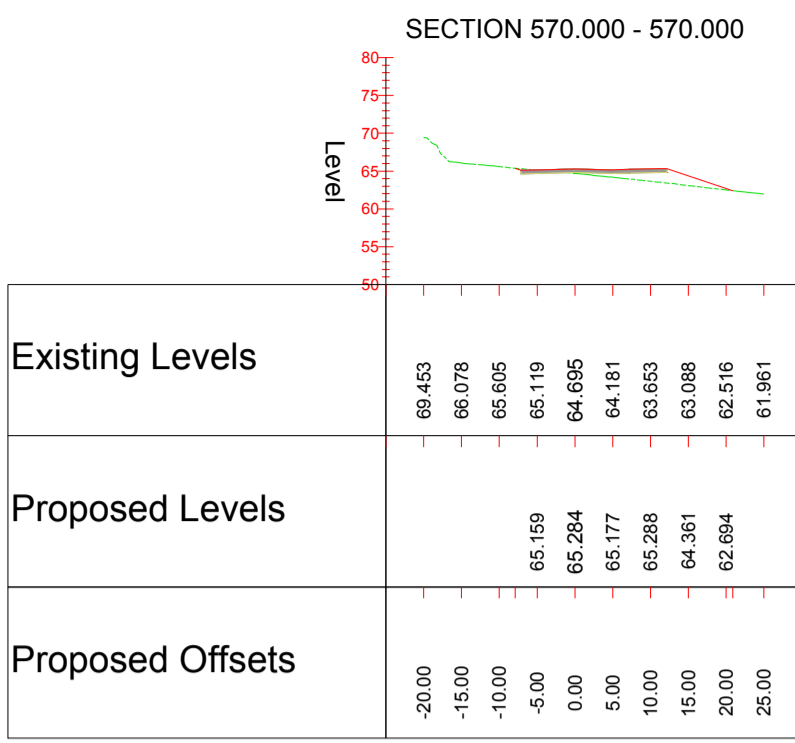
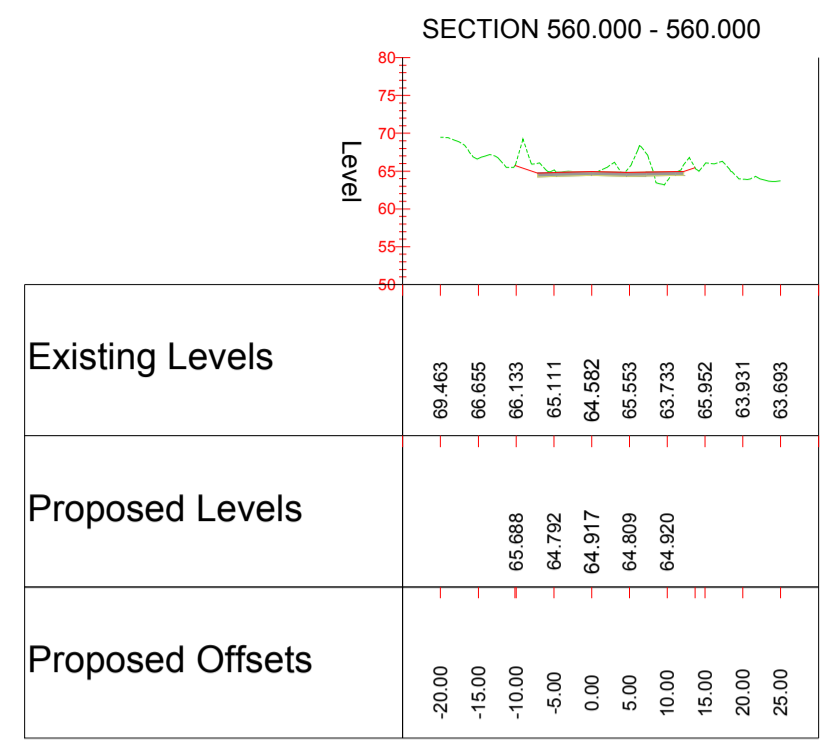
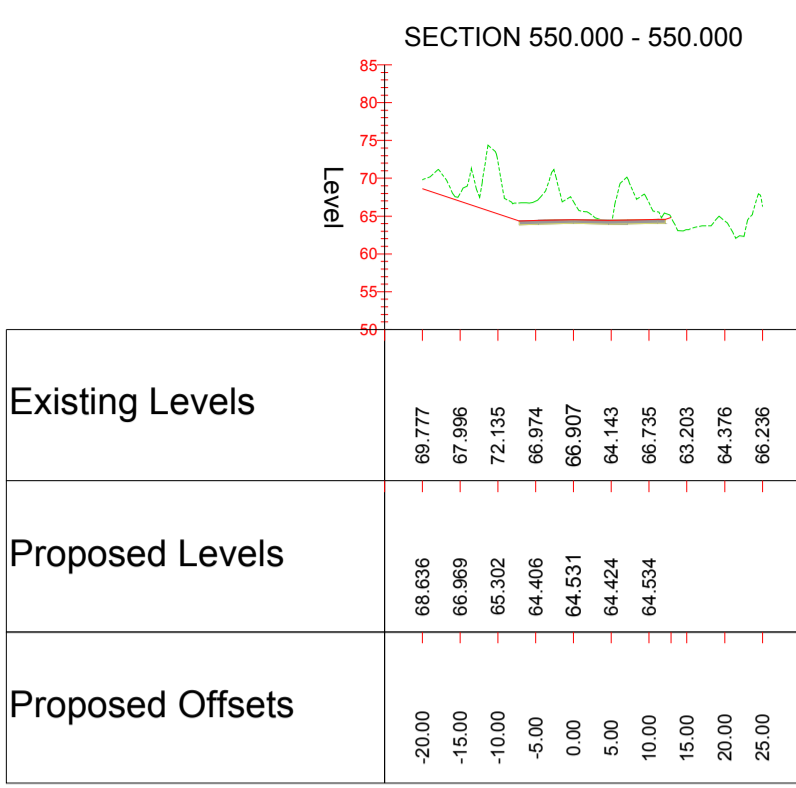
**PROPOSED CONCEPT CROSS SECTIONS SHEET 2/19**

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Original Size	A1	Date	05/02/18	Date	05/02/18	Date	05/02/18	Date	
Drawing Number	Woe	Originator	ATK	Volume	HGN	Project Ref. No.	0000000		
HA PIN	WP1	Designer	DR	Checked	D	Authorised	6505		
Location		Type		Role		Number	P1		

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0 10  
Millimetres

**CROSS SECTIONS**  
Scale 1:1000

DO NOT SCALE

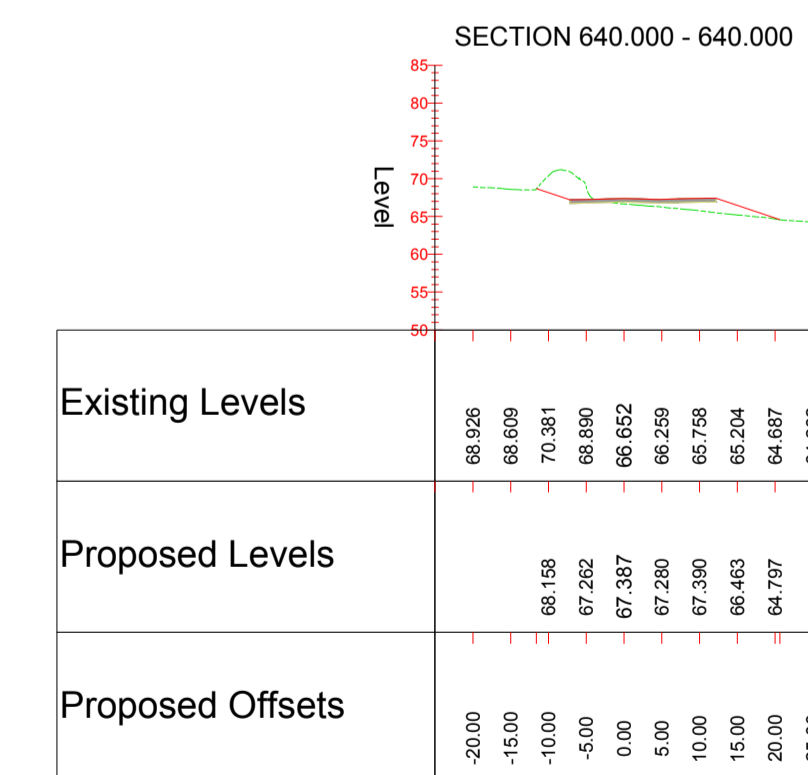
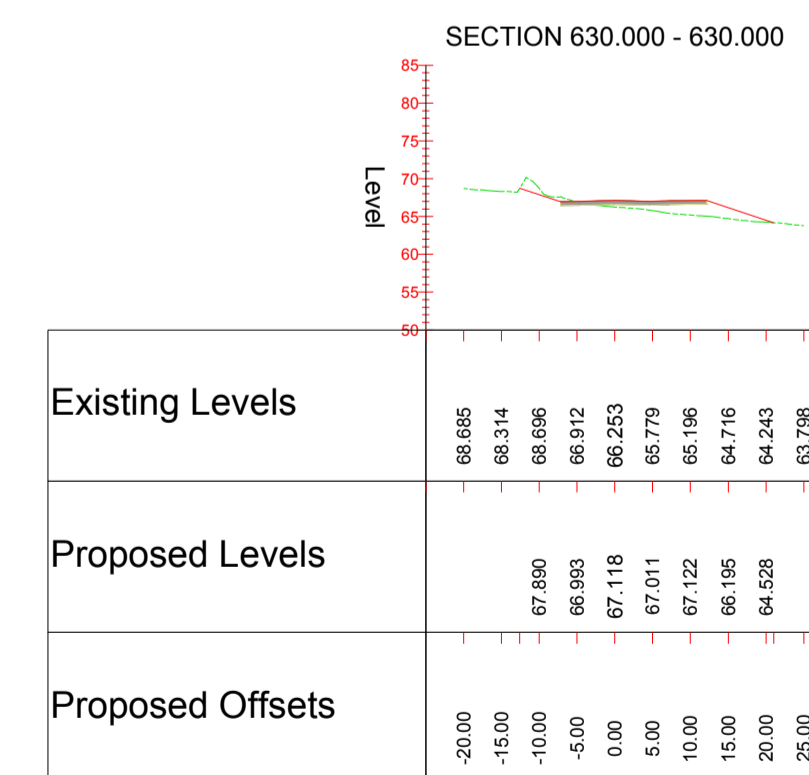
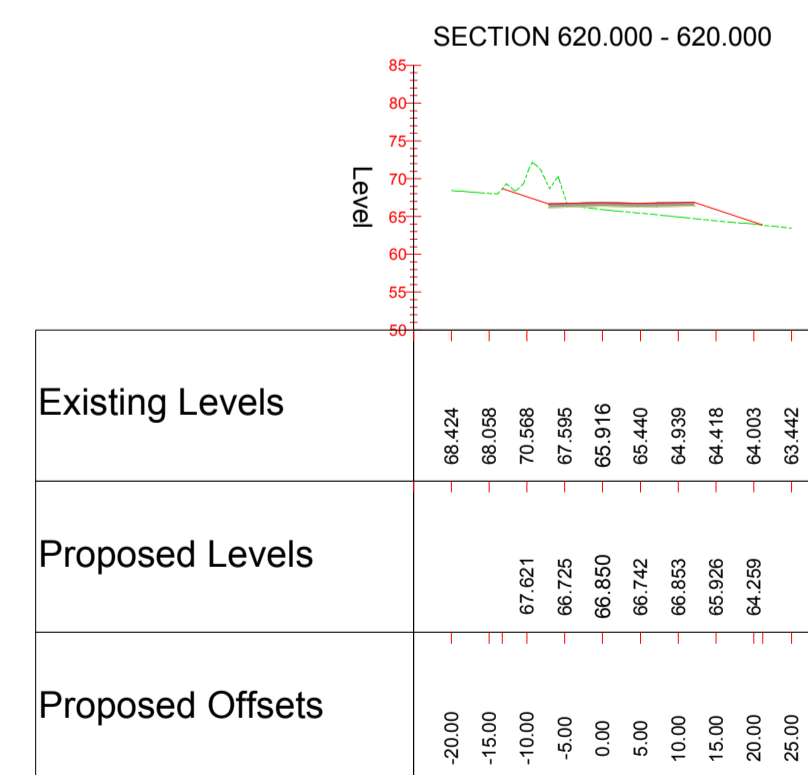
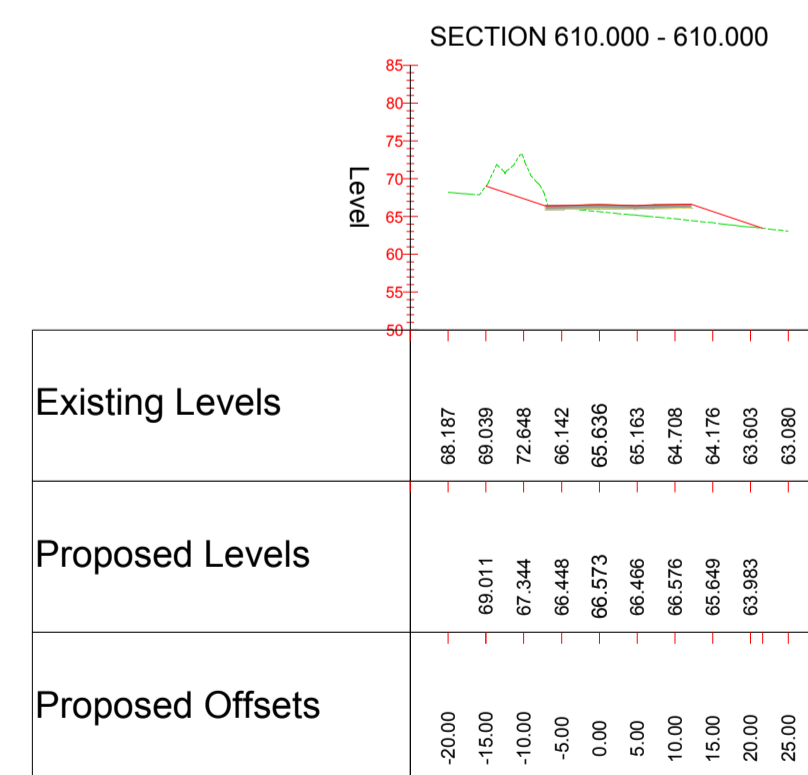
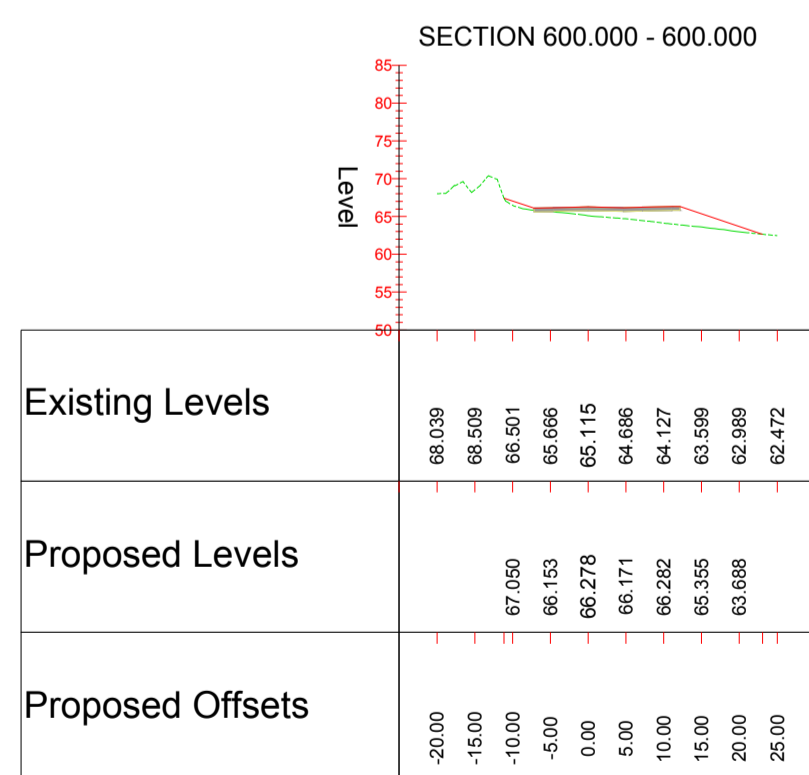
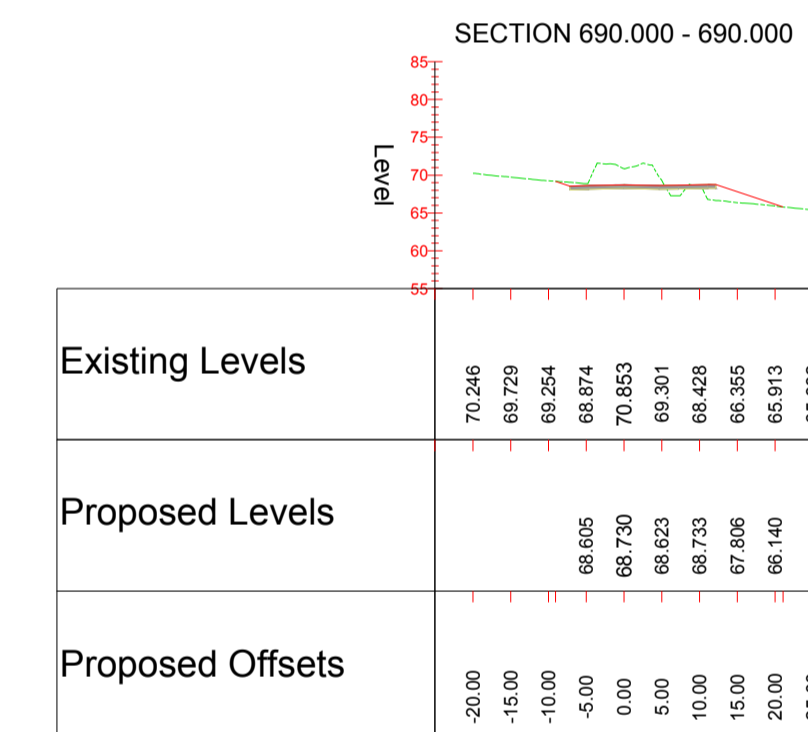
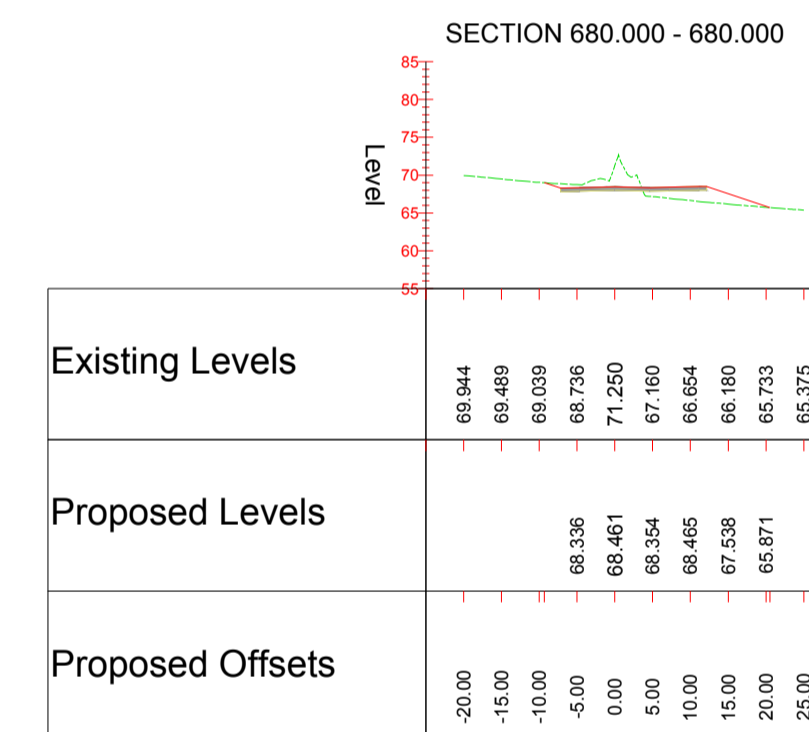
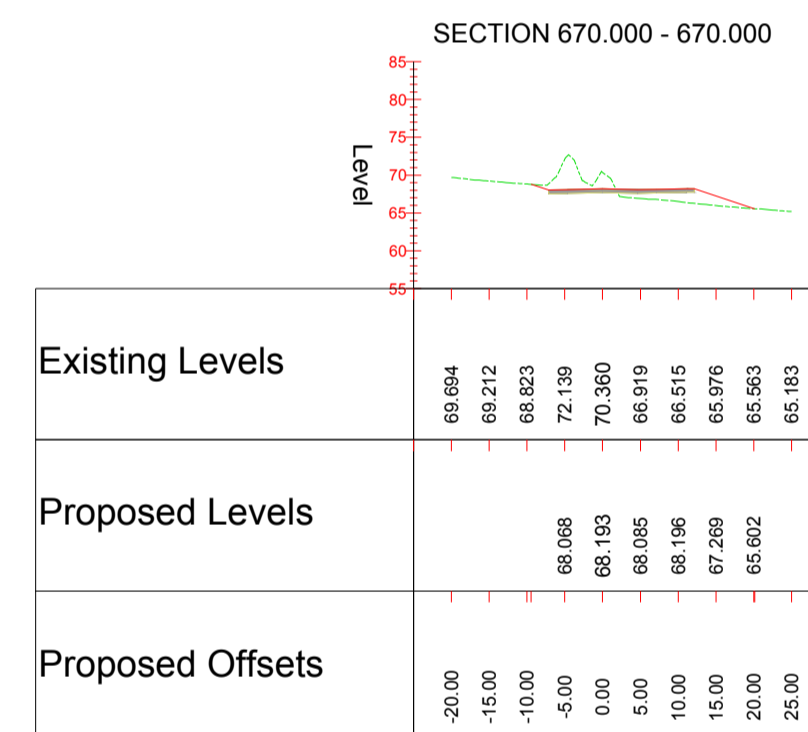
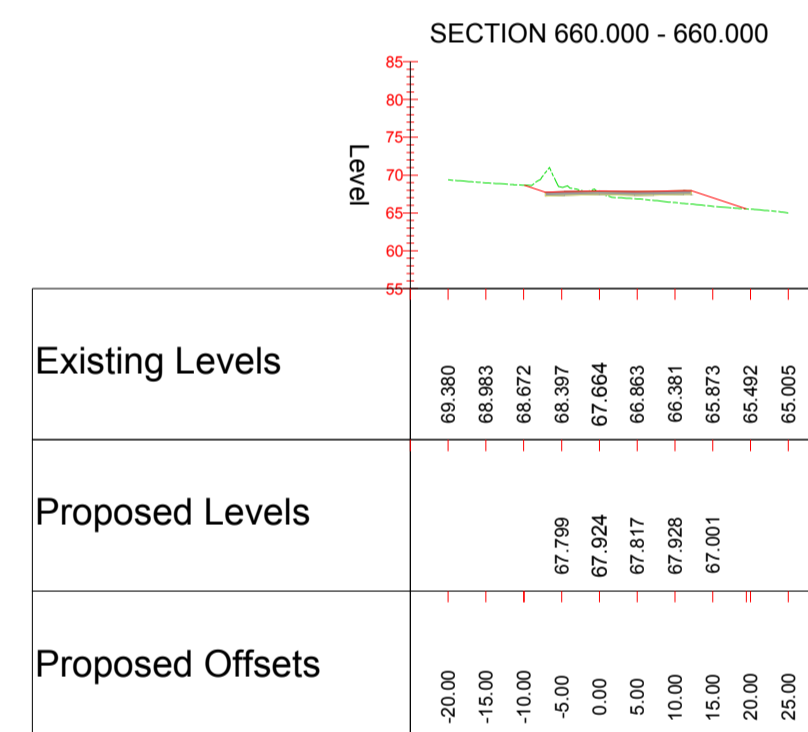
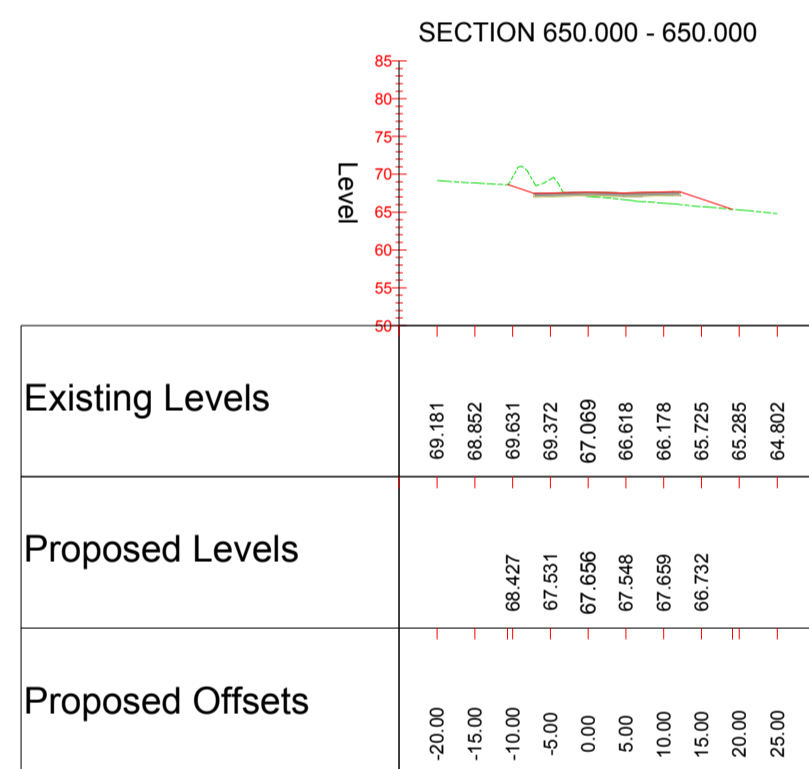
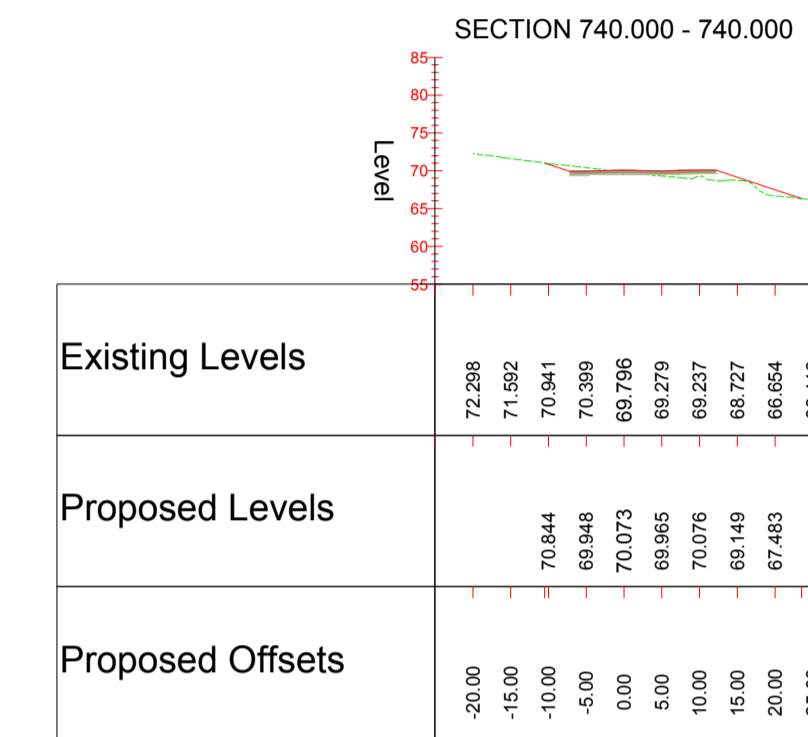
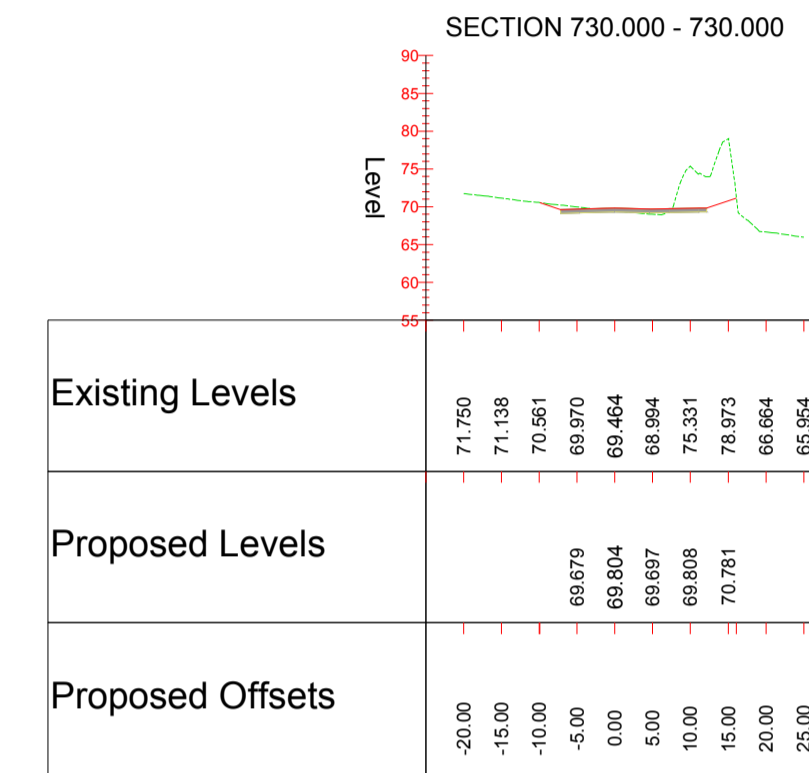
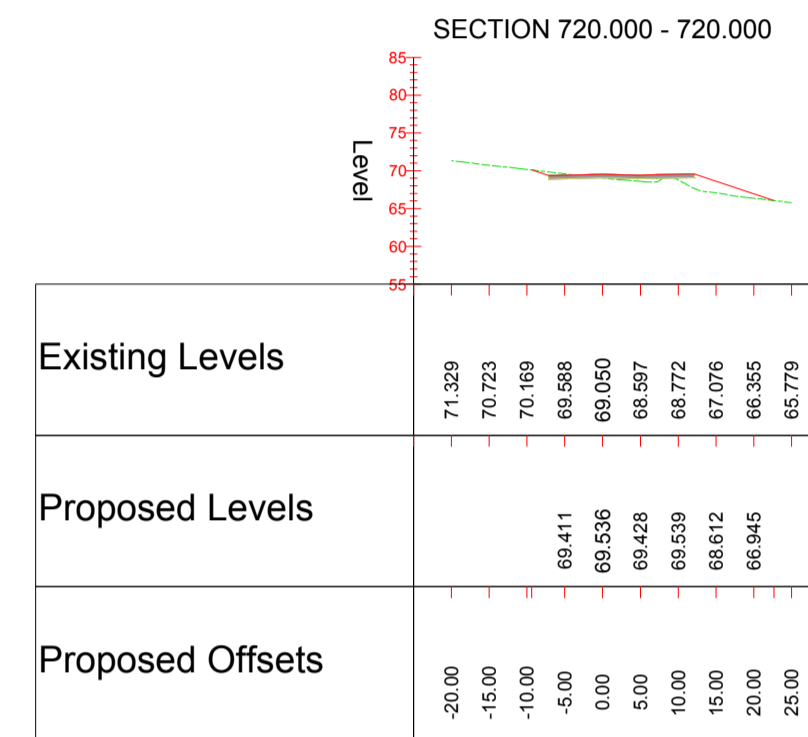
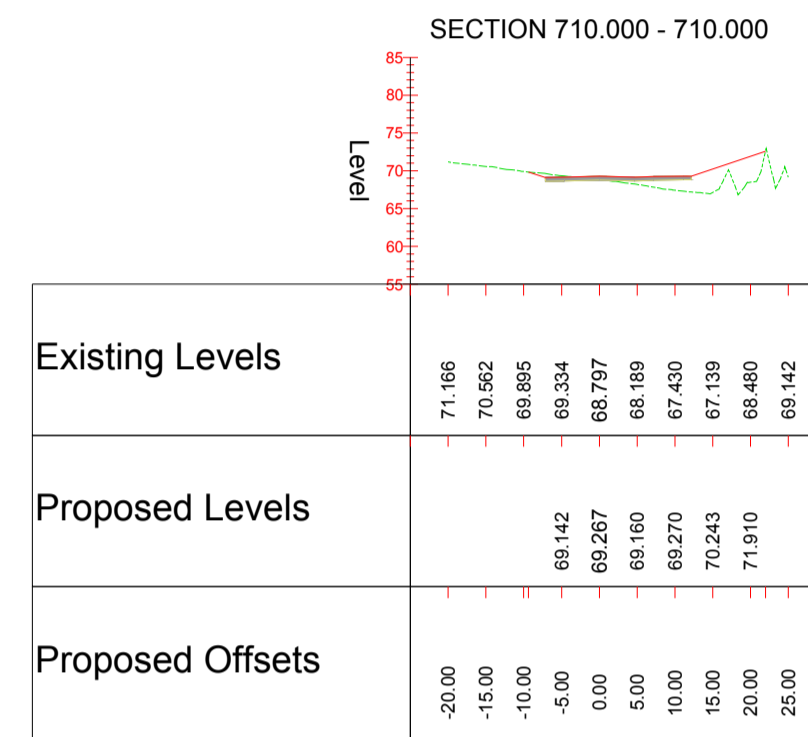
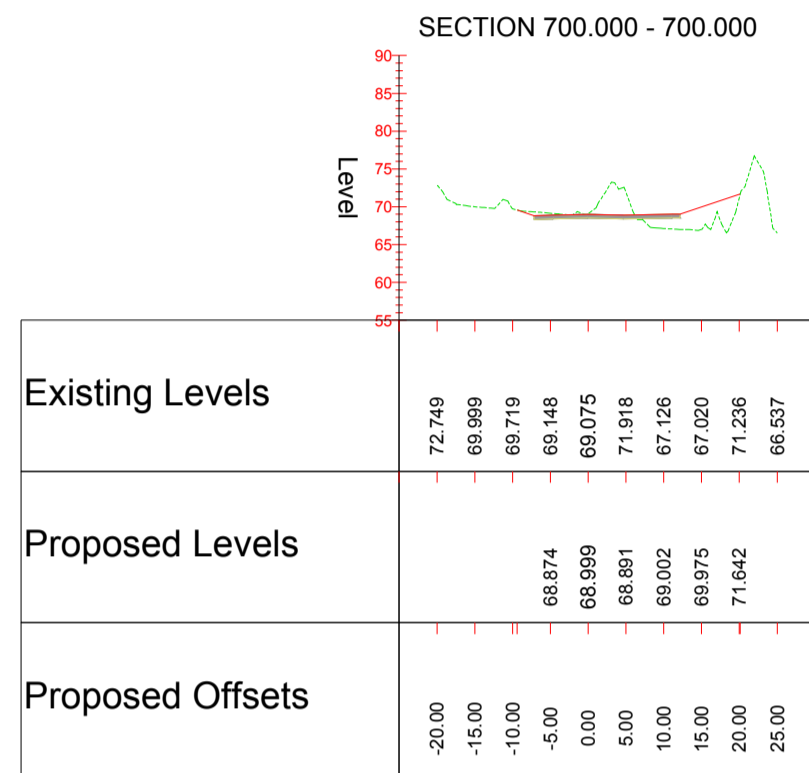
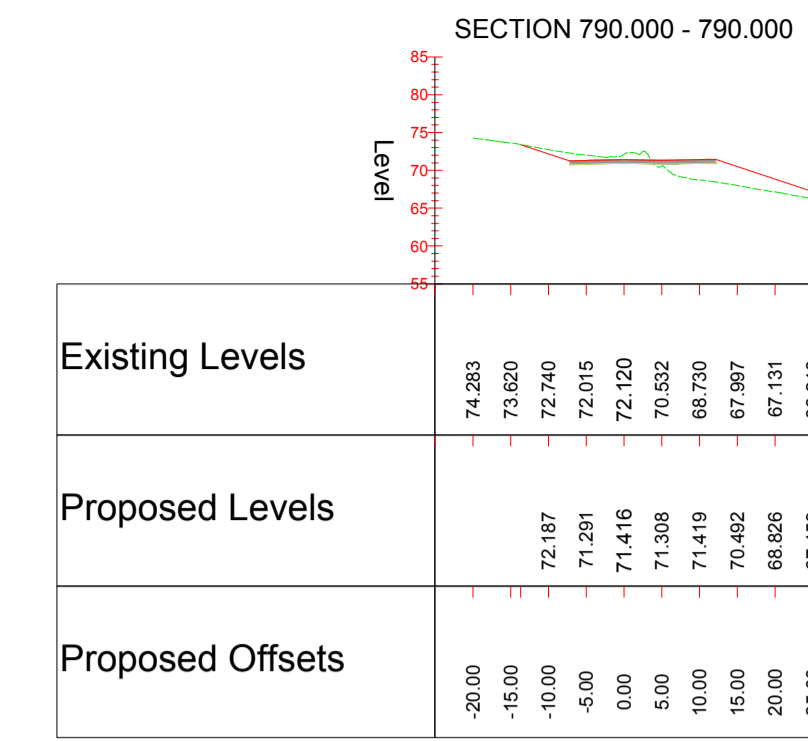
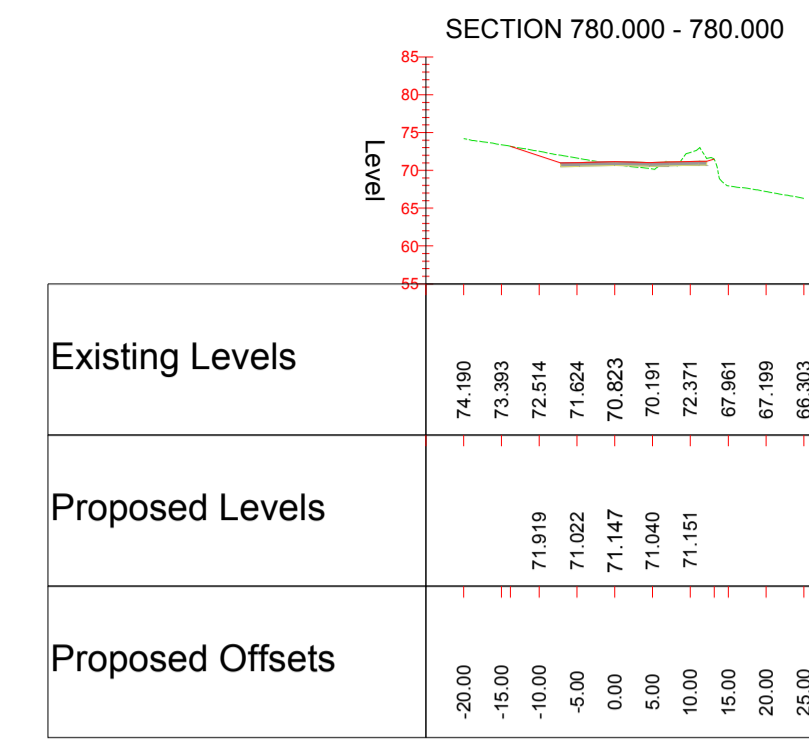
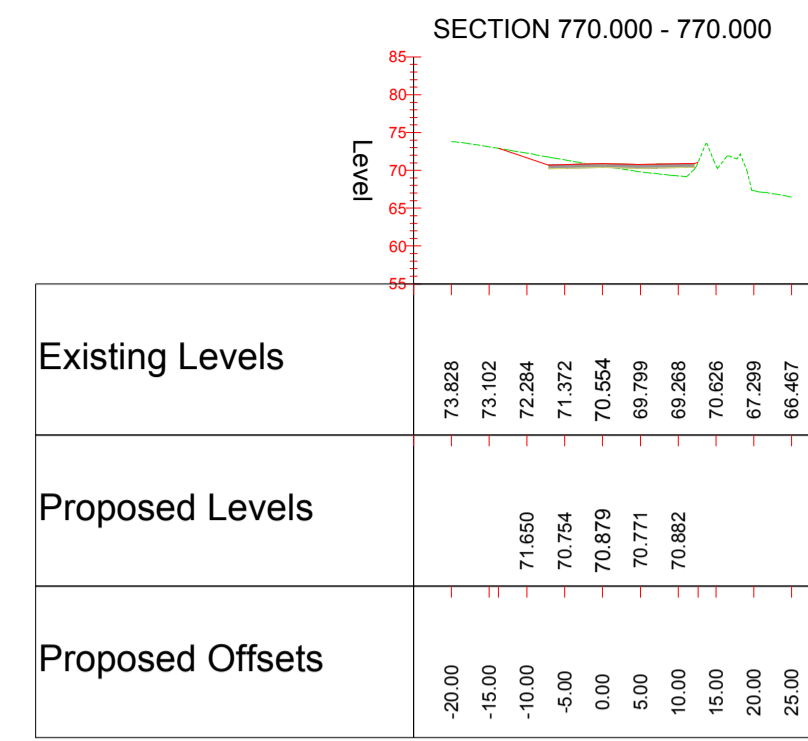
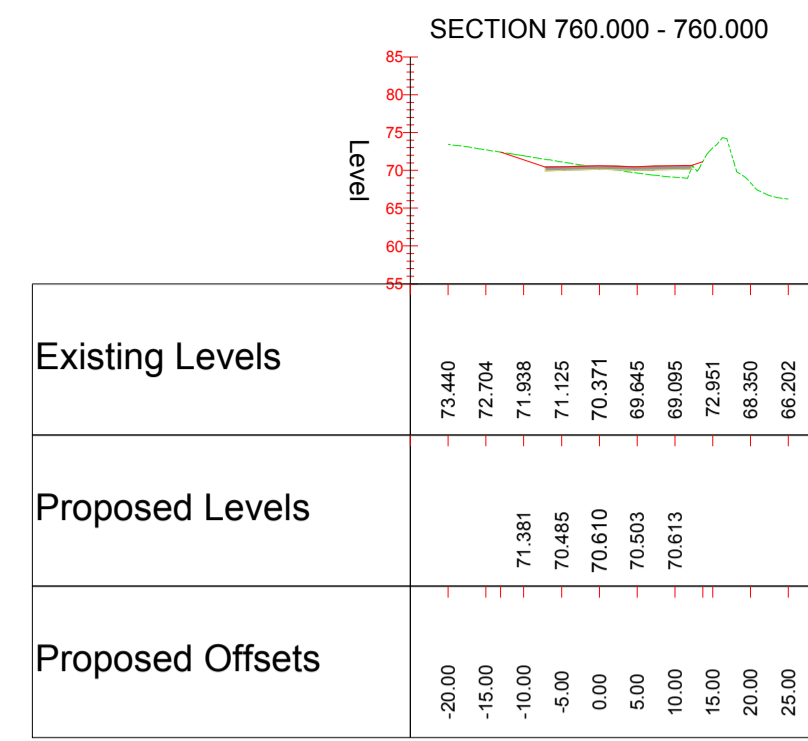
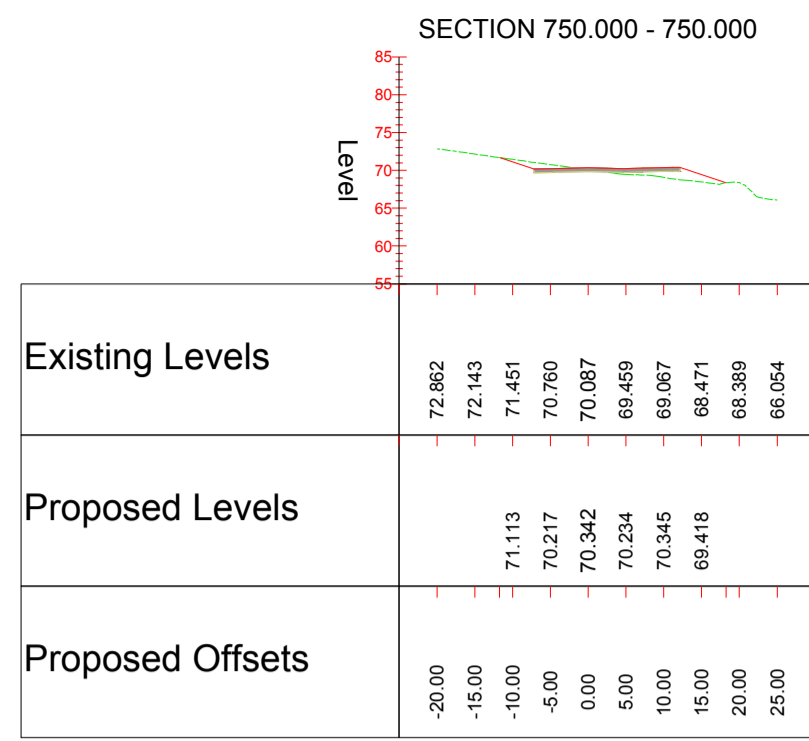


Key:  
Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION			
NONE			
MAINTENANCE/CLEANING			
NONE			
DECOMMISSIONING/DEMOLITION			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF

Drawing Status	FOR INFORMATION	Suitability	S2	Project Title	WEST OF ENGLAND WP1								
ATKINS		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Drawing Title	A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 3/19								
Copyright	© Atkins Limited (2014)	Client	WEST OF ENGLAND	Scale	1:1000	Designed	EC	Drawn	AF	Checked	AH	Authorised	
Original Size	A1	Date	05/02/18	Date	05/02/18	Date	05/02/18	Date		Date		Date	
Drawing Number	Woe	HA PIN	WP1	Originator	ATK	Volume	HGN	Project Ref. No.	0000000	Revision		Date	
	- DR - D - 6506												P1
Location		Type		Role		Number							

CROSS SECTIONS  
Scale 1:1000



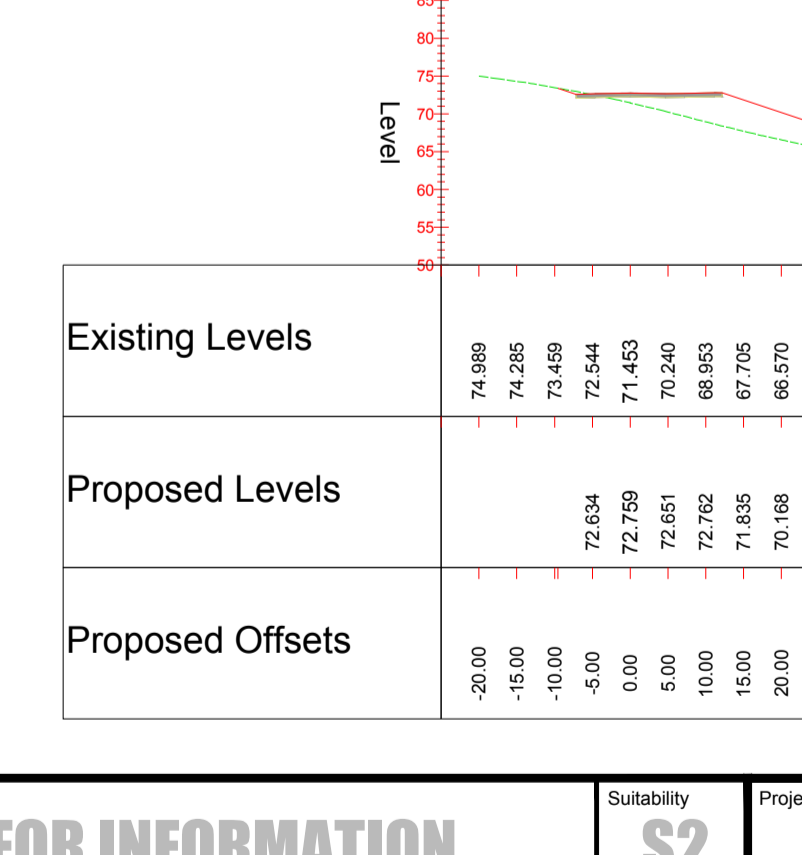
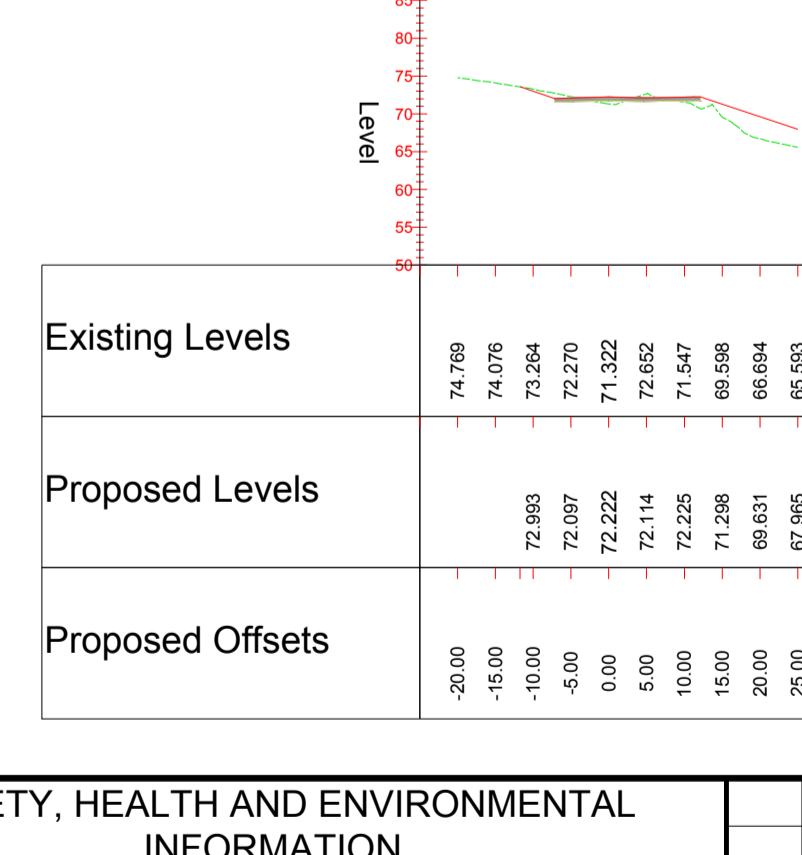
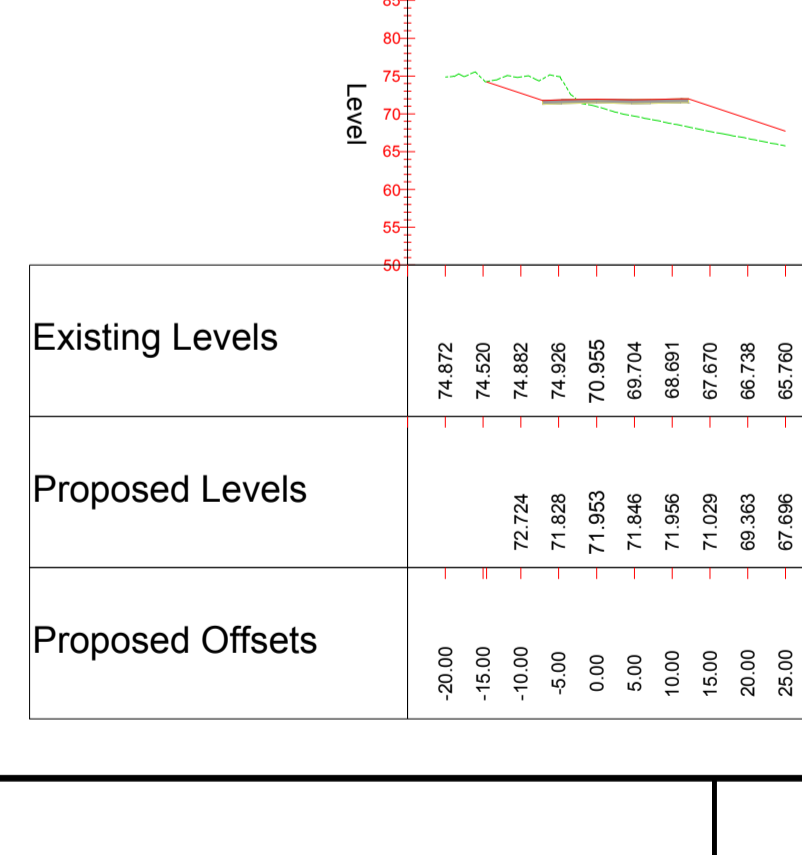
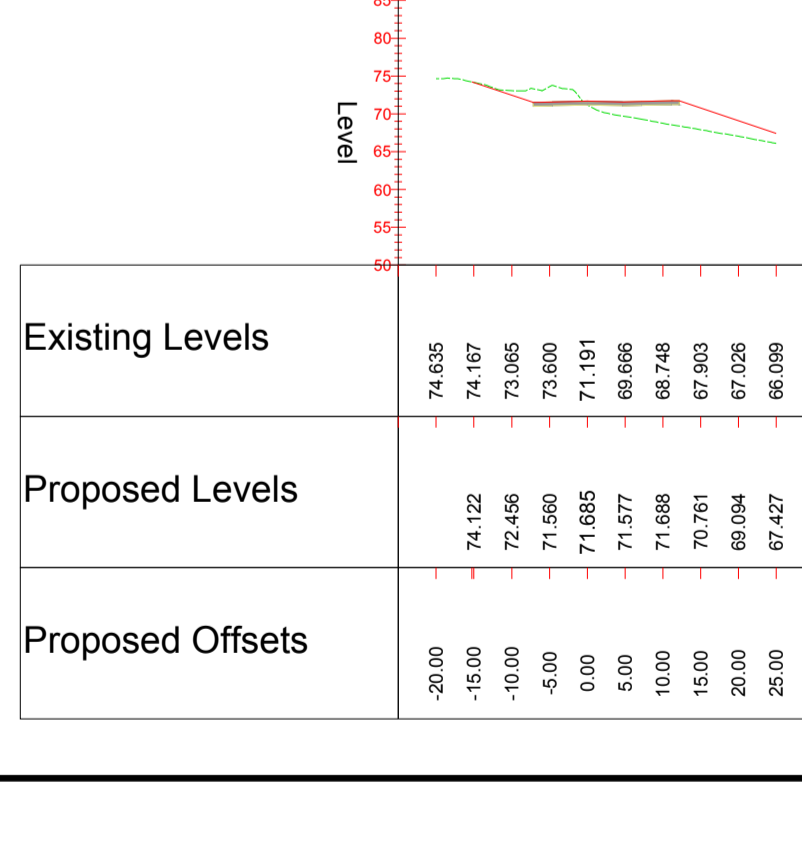
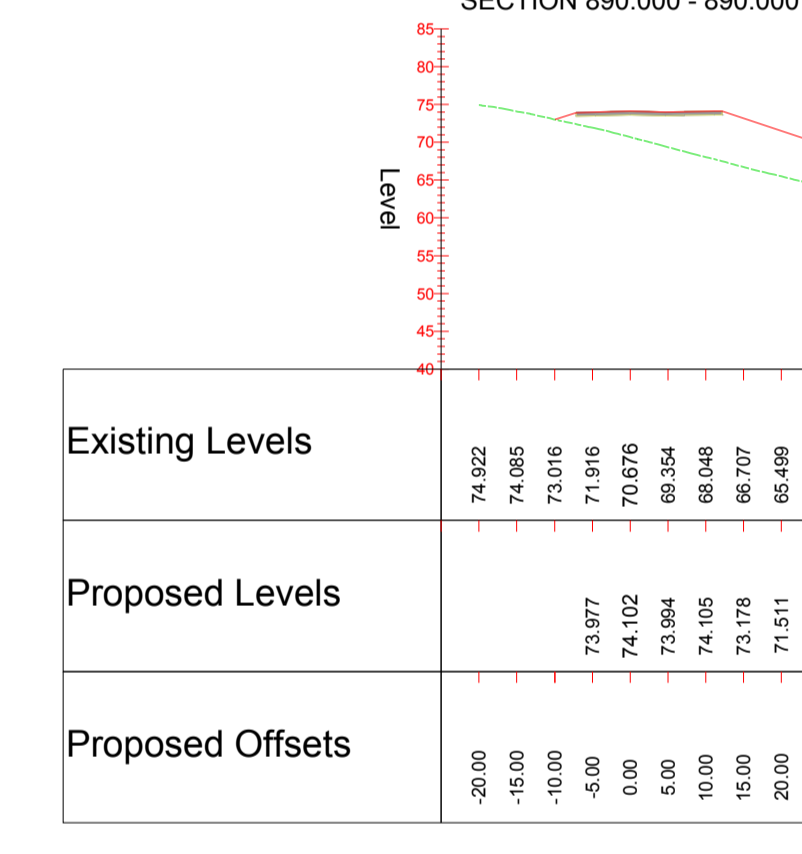
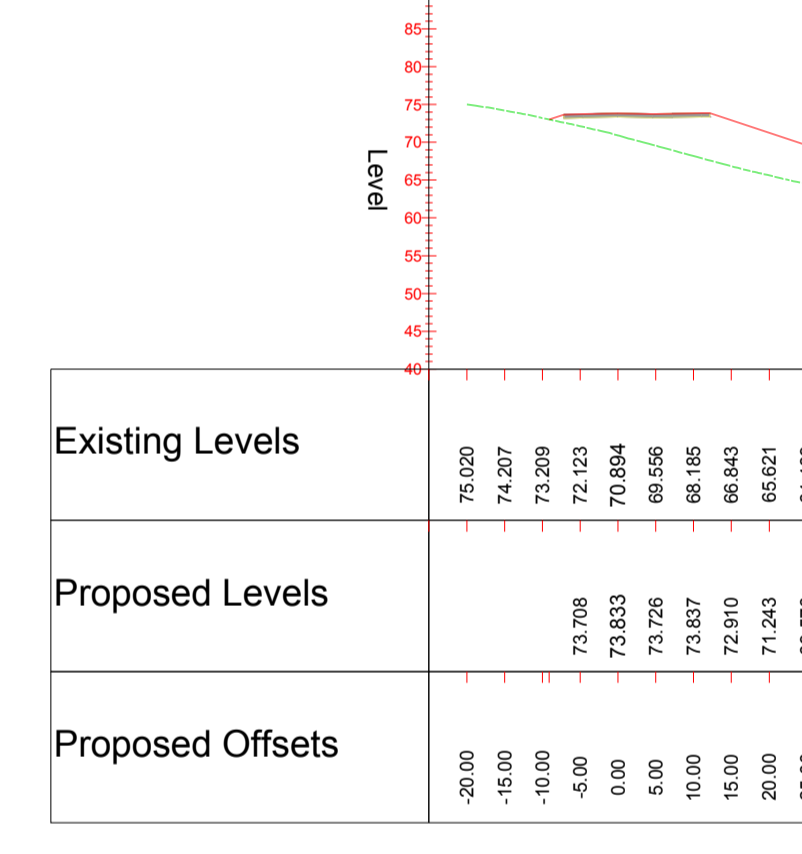
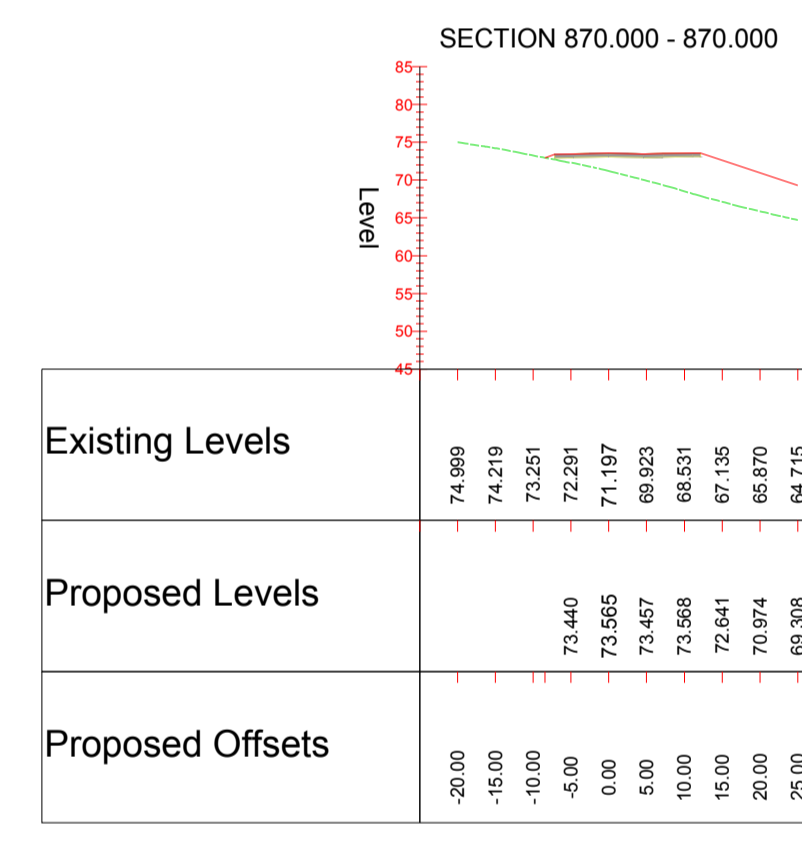
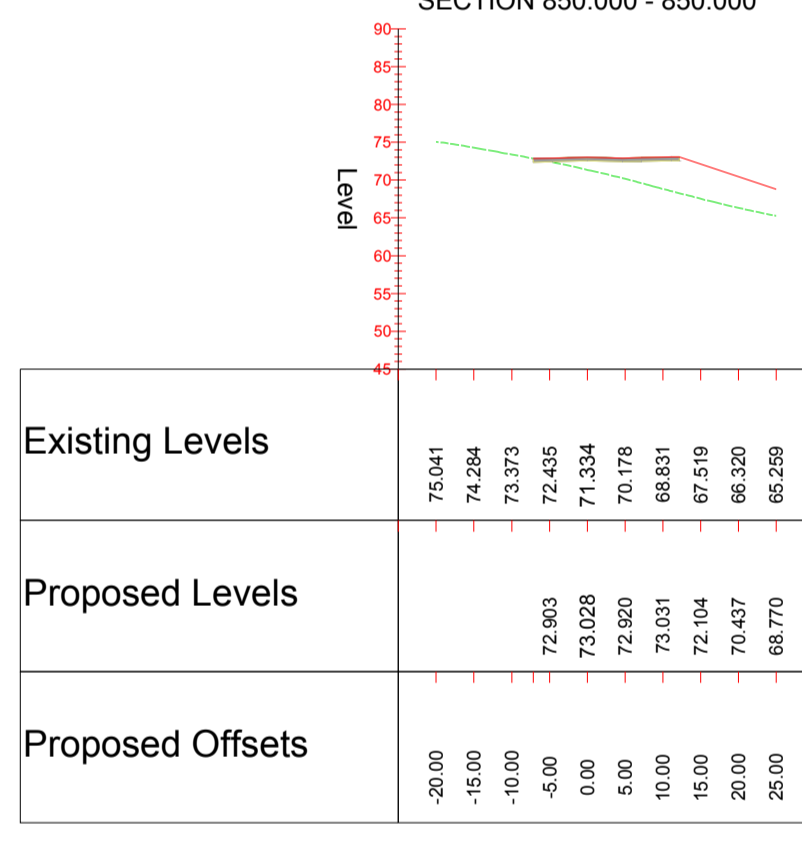
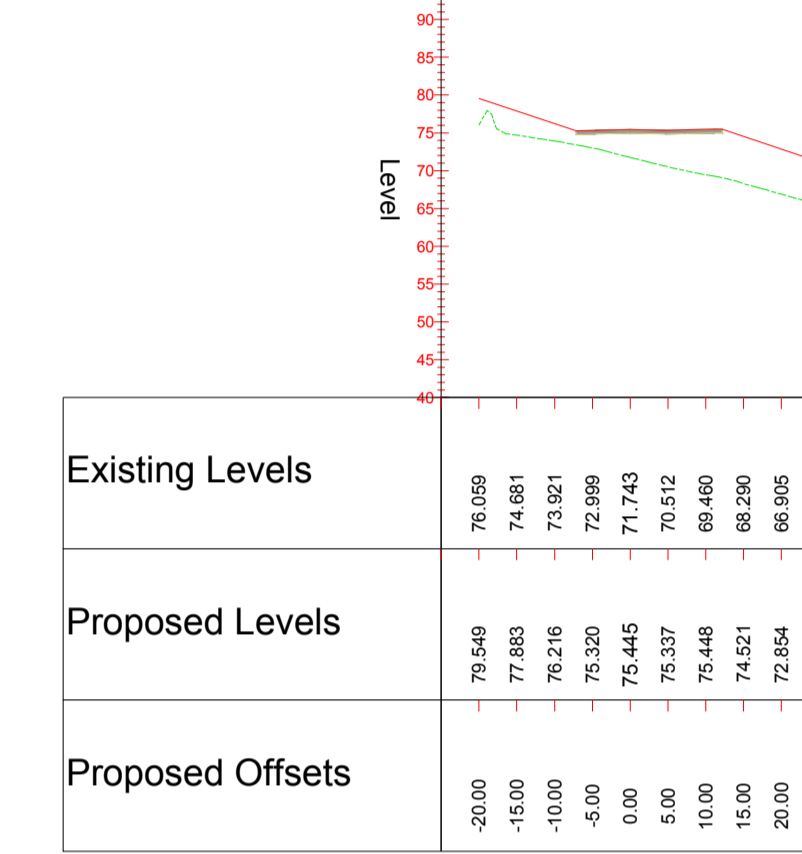
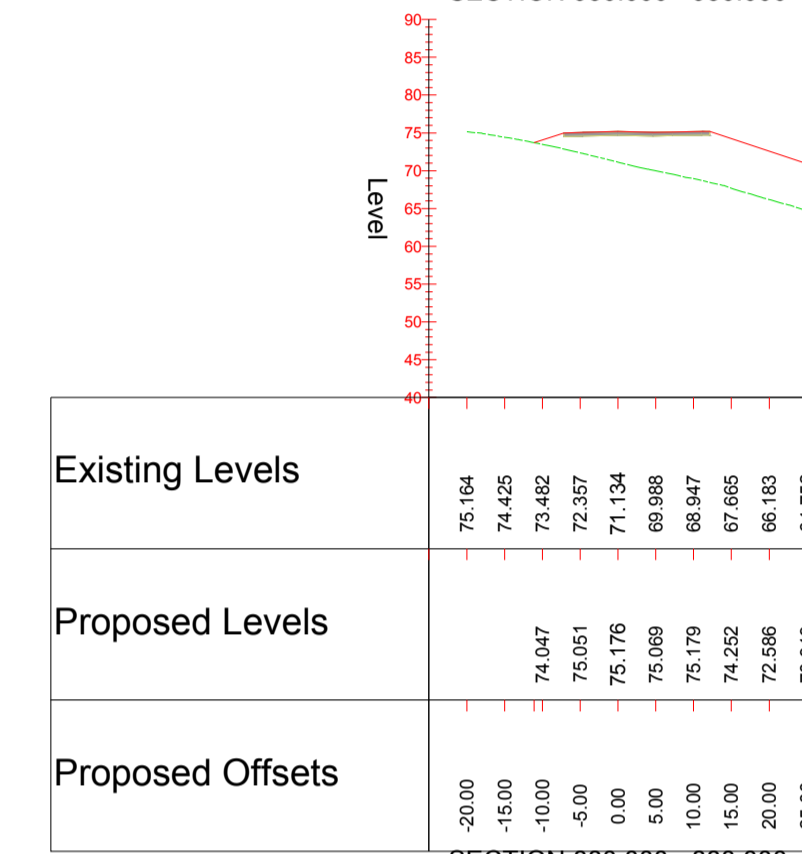
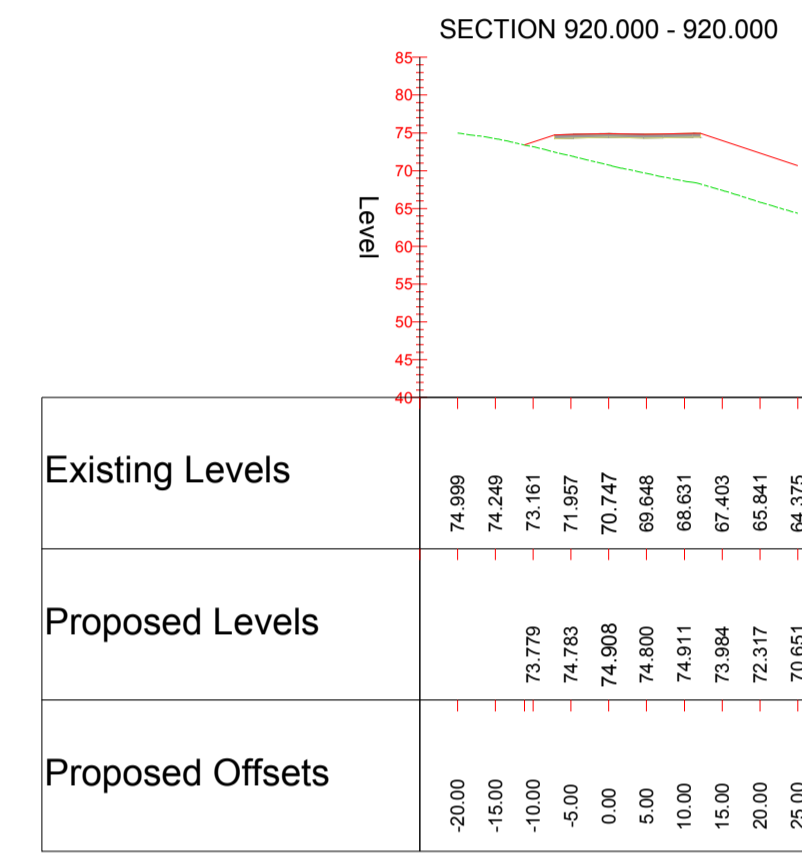
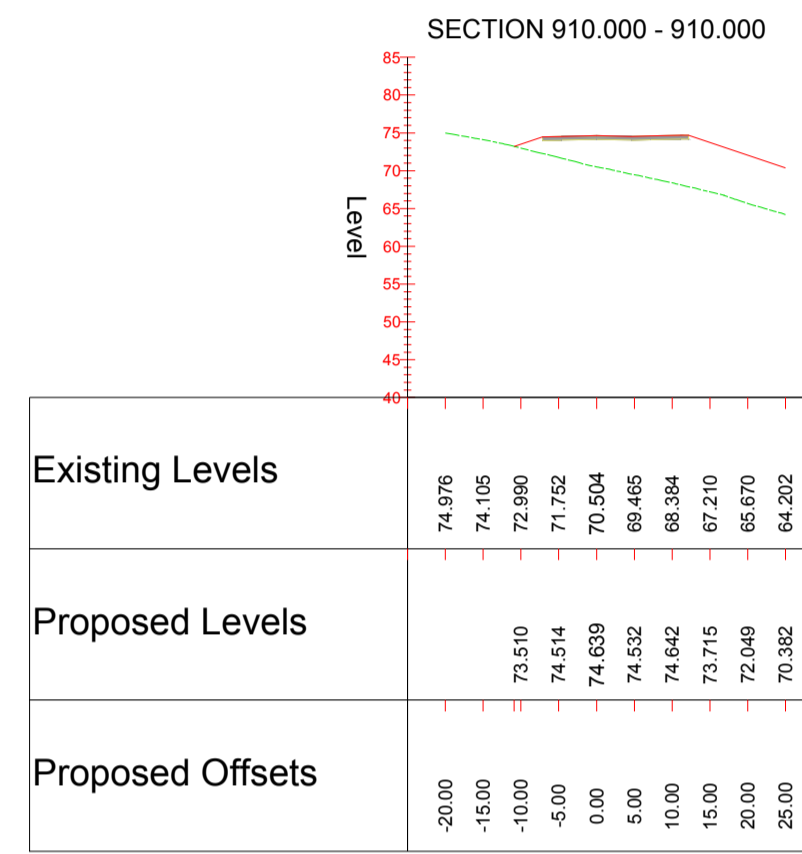
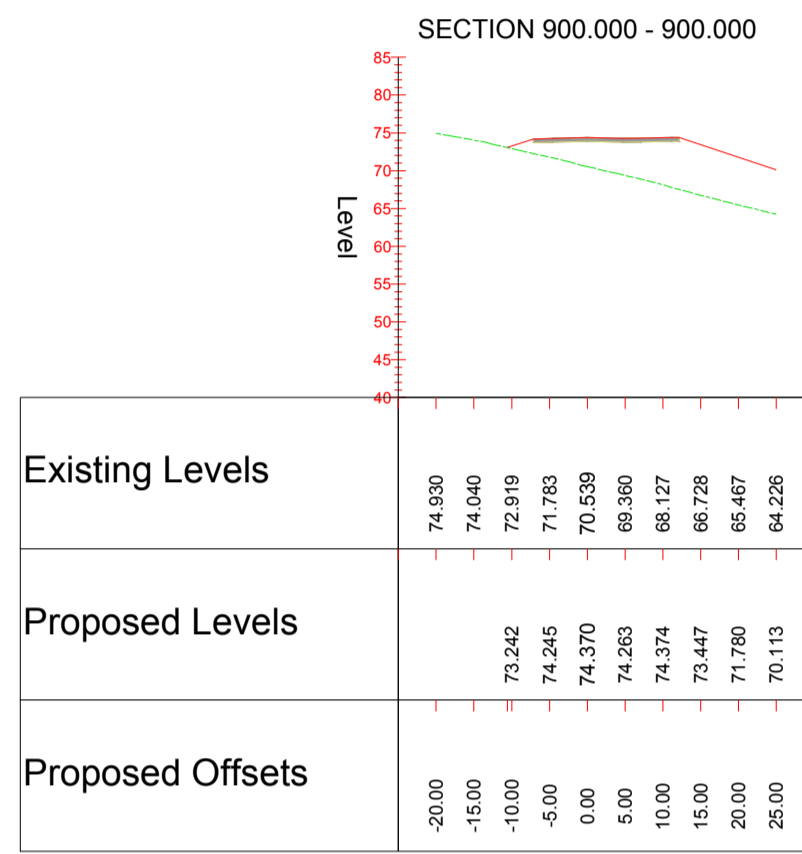
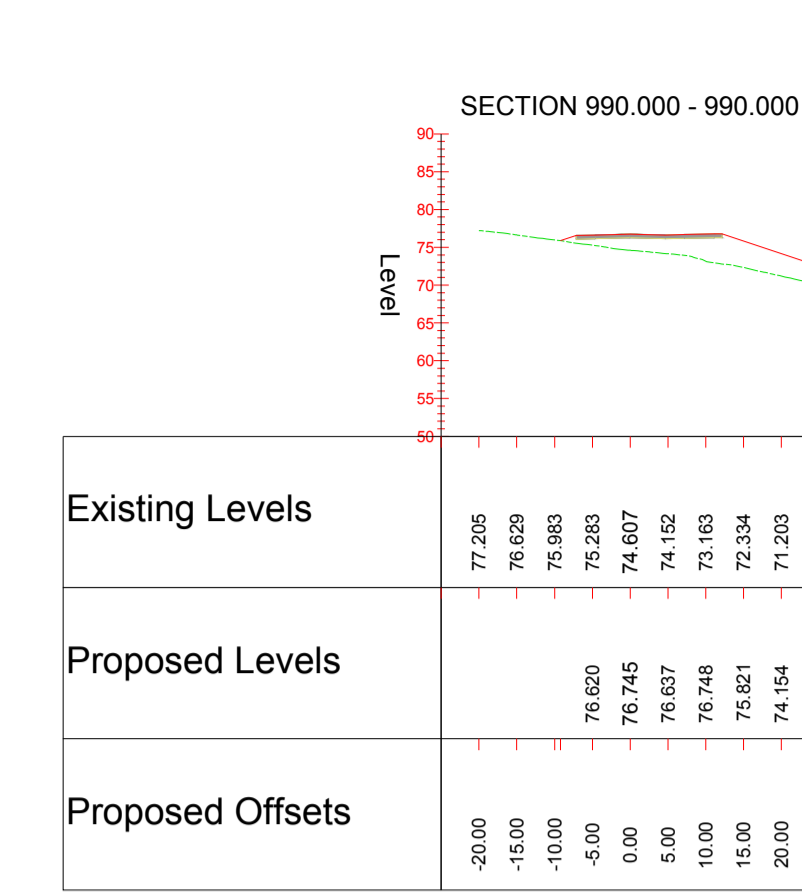
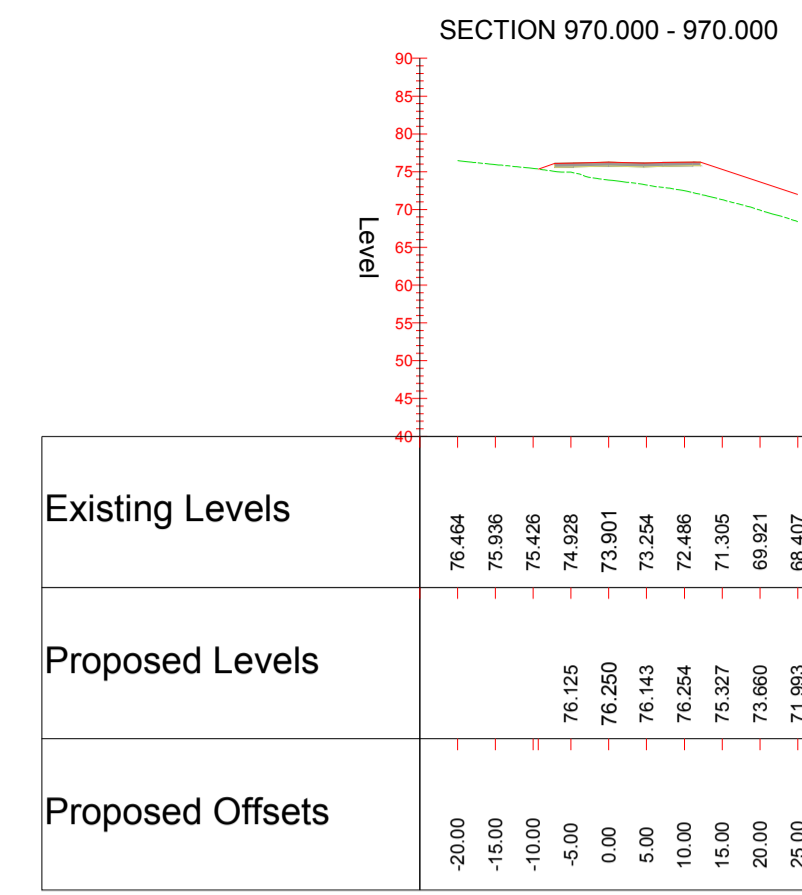
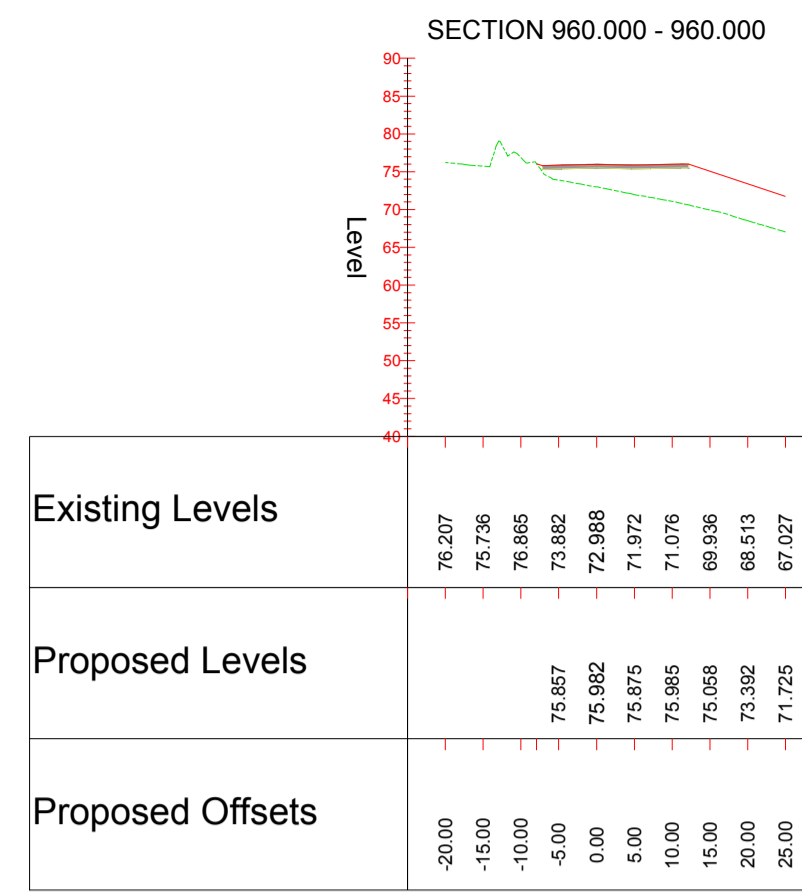
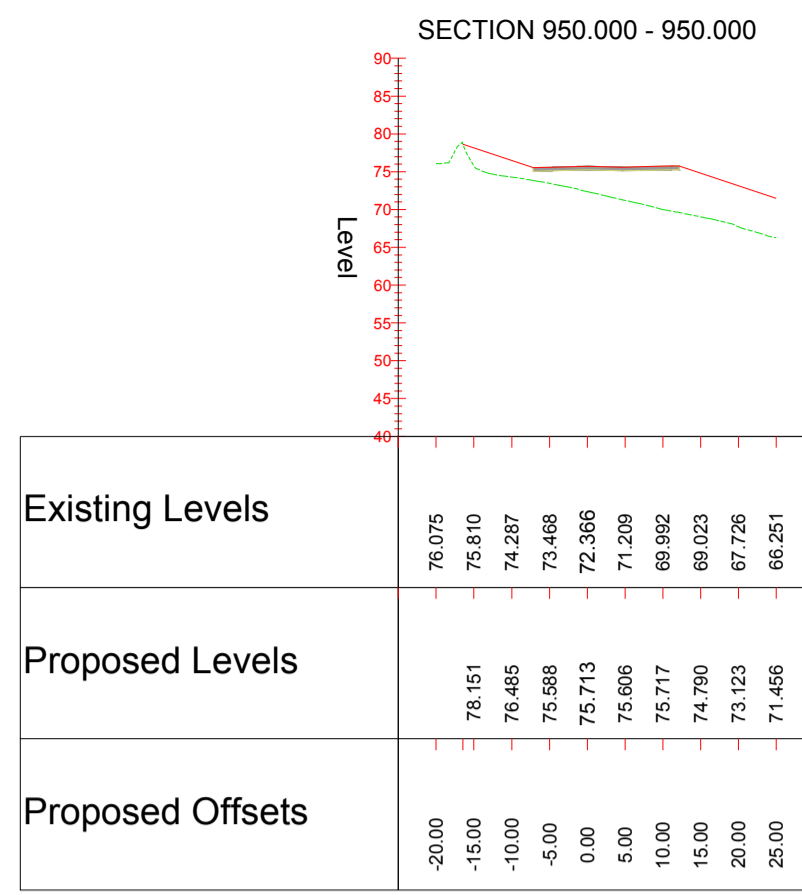
Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
<b>CONSTRUCTION</b>			
NONE			
<b>MAINTENANCE/CLEANING</b>			
NONE			
<b>DECOMMISSIONING/DEMOLITION</b>			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF

Drawing Status <b>FOR INFORMATION</b>		Suitability <b>S2</b>	Project Title <b>WEST OF ENGLAND WP1</b>	
		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Drawing Title <b>A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 4/19</b>
Copyright © Atkins Limited (2014)		Scale 1:1000	Designed EC	Drawn AH
Client <b>WEST OF ENGLAND</b>		Original Size A1	Date 05/02/18	Checked AH
		Drawing Number HA PIN	Date 05/02/18	Authorised Date
		Originator <b>WoE</b>	Date 05/02/18	Project Ref. No. 0000000
		Volume <b>WPG</b>	Date 05/02/18	Revision P1
		Location <b>WP1</b>	Date 05/02/18	
		Type <b>- DR - D - 6507</b>	Date 05/02/18	
		Role <b>- HGN -</b>	Date 05/02/18	
		Number <b>6507</b>	Date 05/02/18	

CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION		
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:		
CONSTRUCTION	NONE	
MAINTENANCE/CLEANING	NONE	
DECOMMISSIONING/DEMOLITION	NONE	
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement		
Rev.	Date	Description
P1	05.02.18	DRAWING CREATED
		By AF
		Chk'd
		App'd

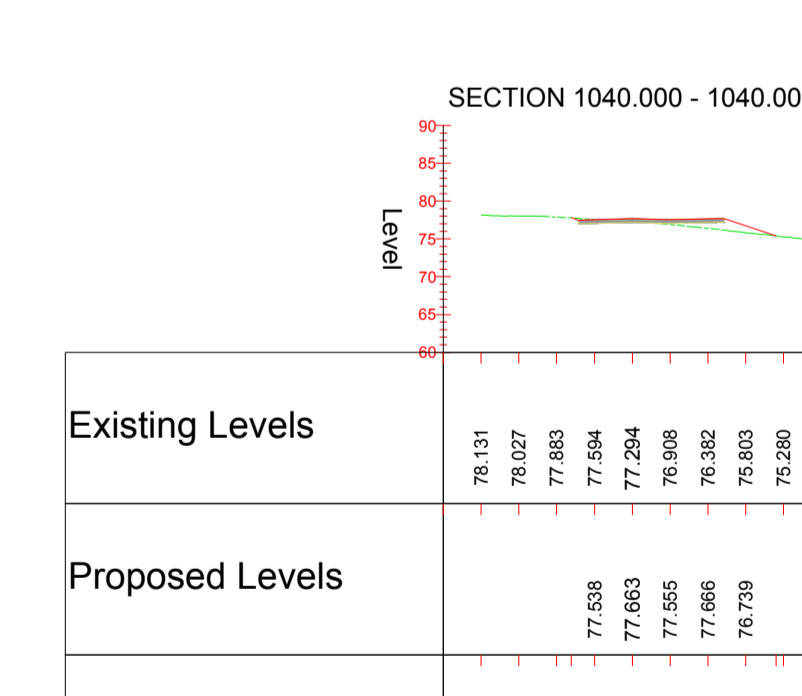
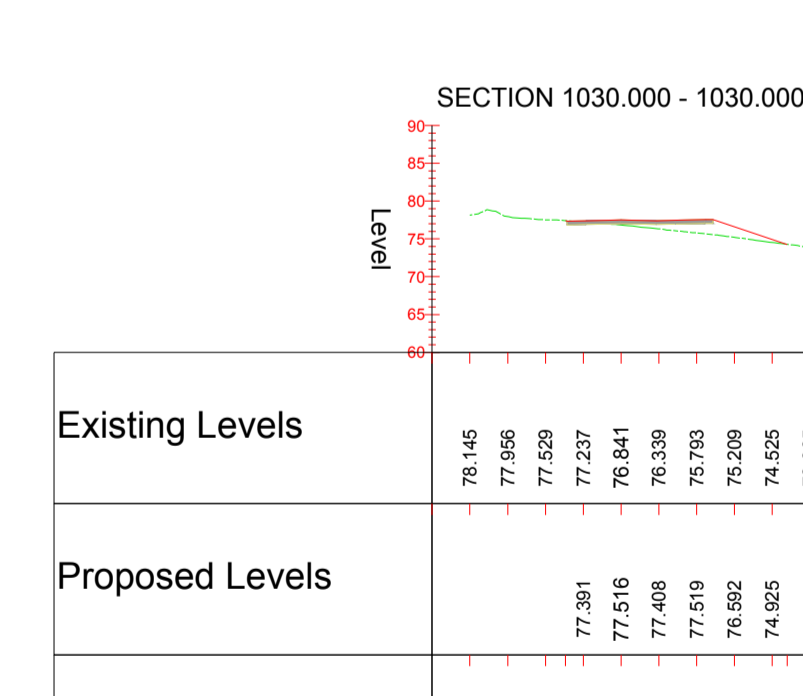
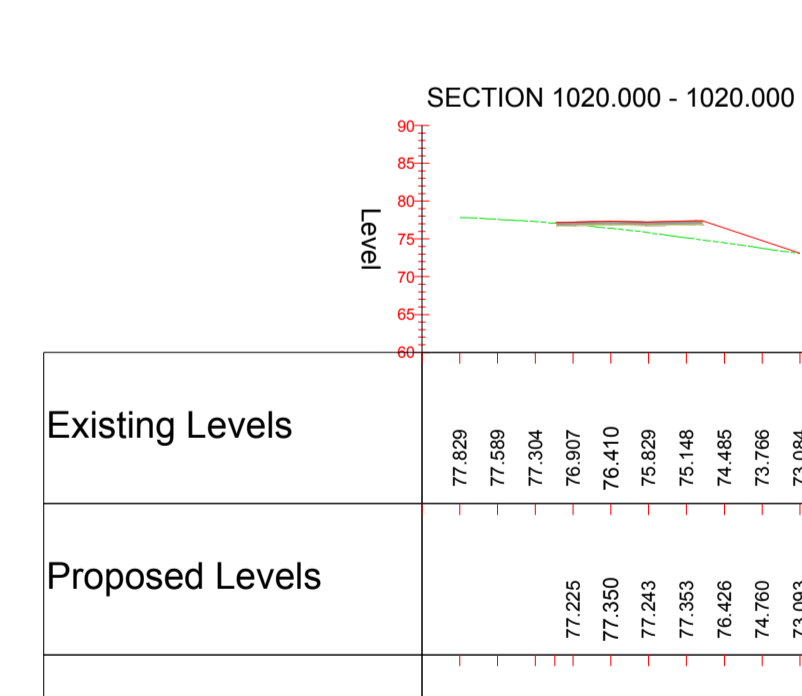
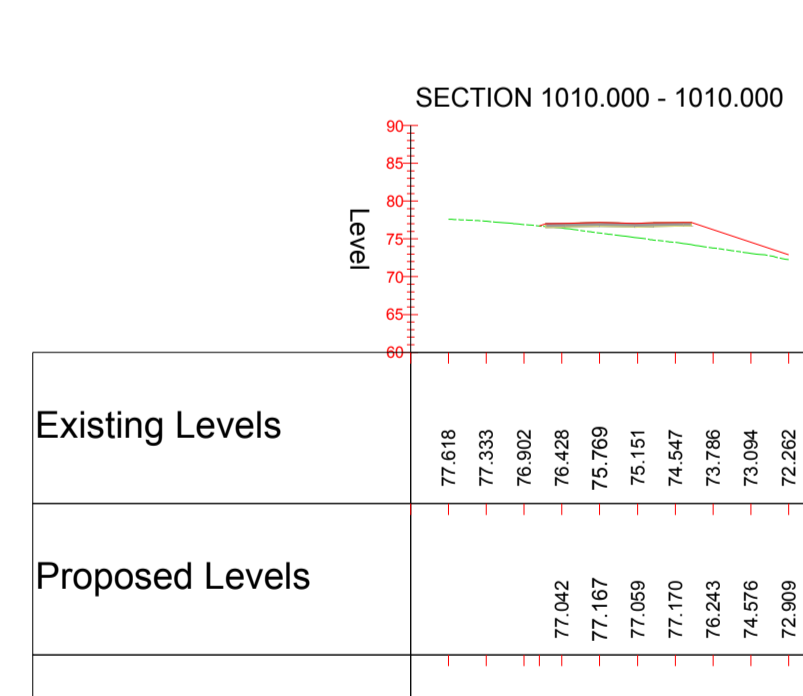
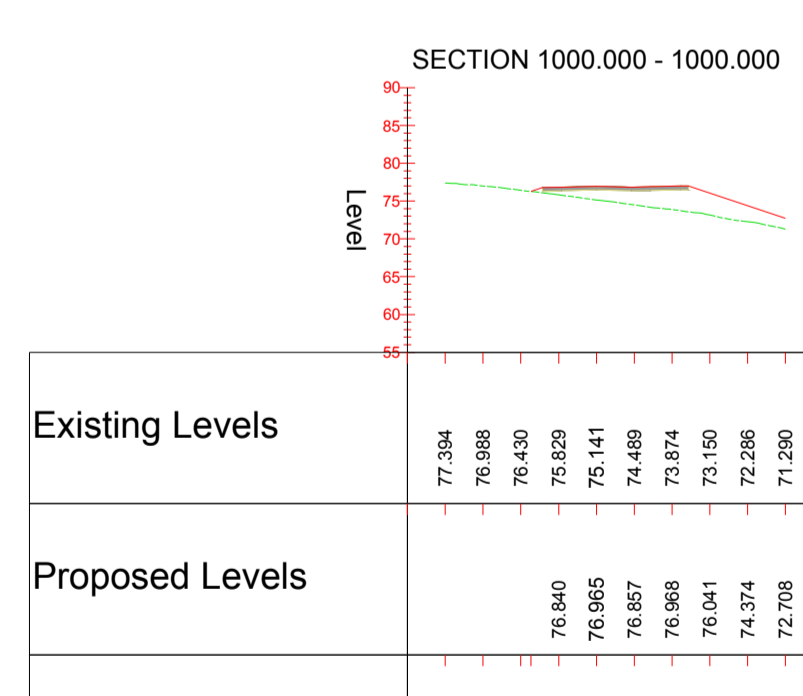
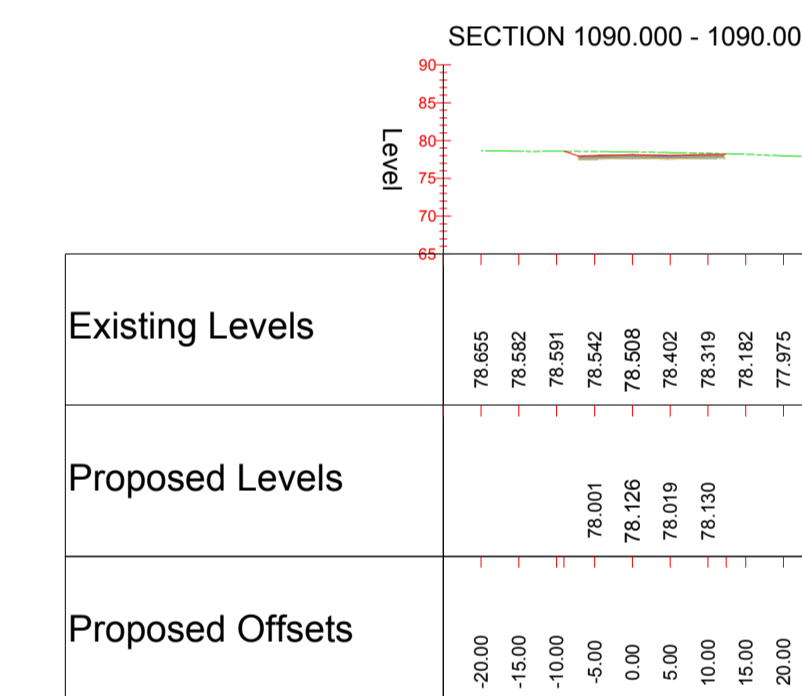
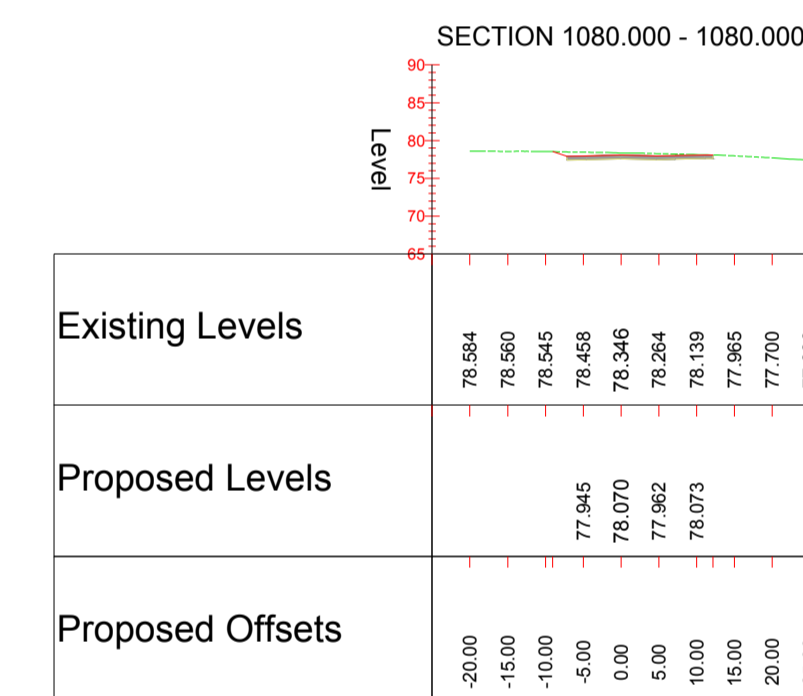
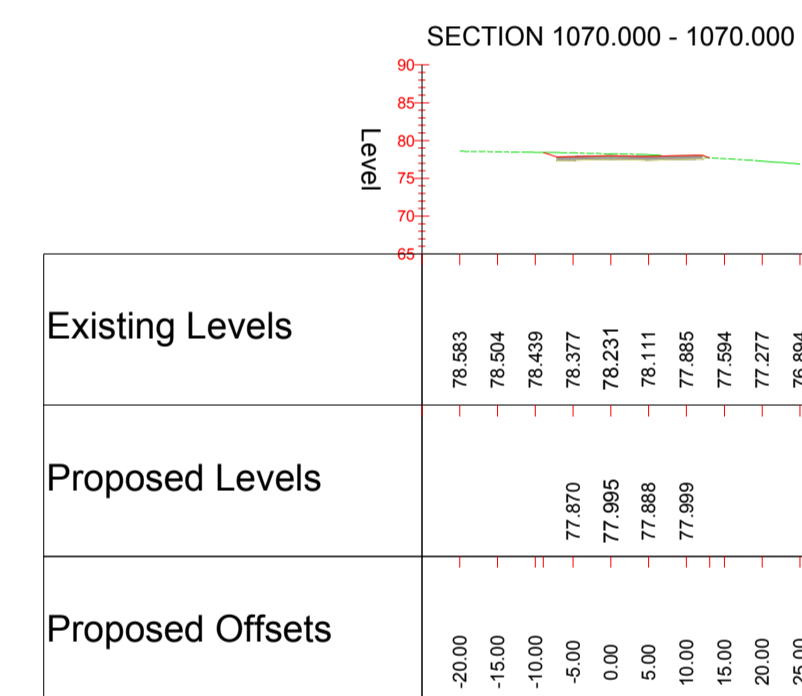
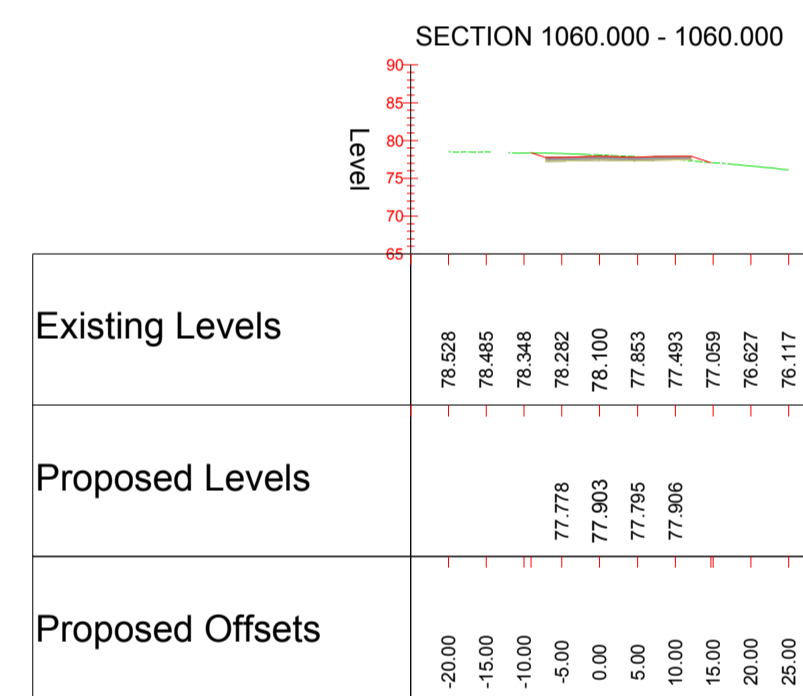
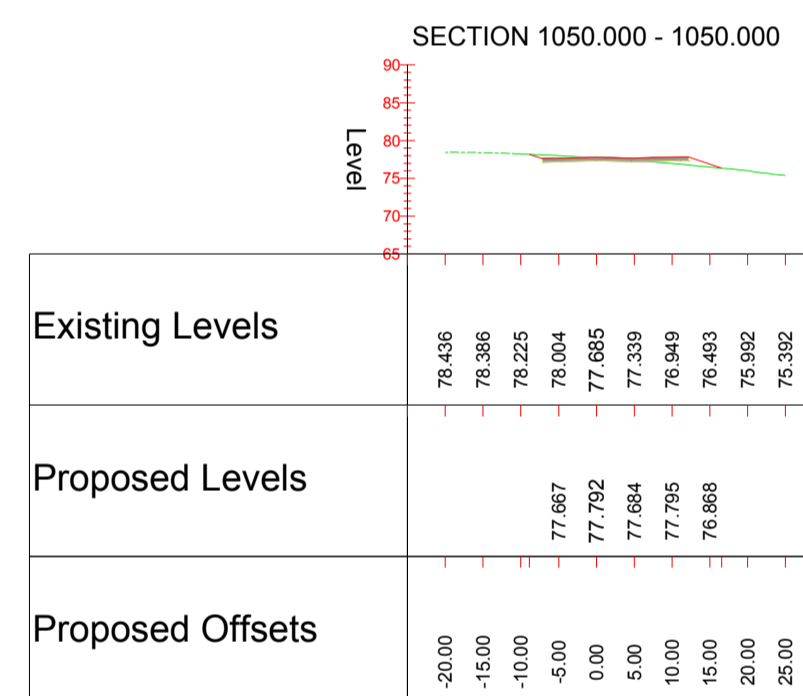
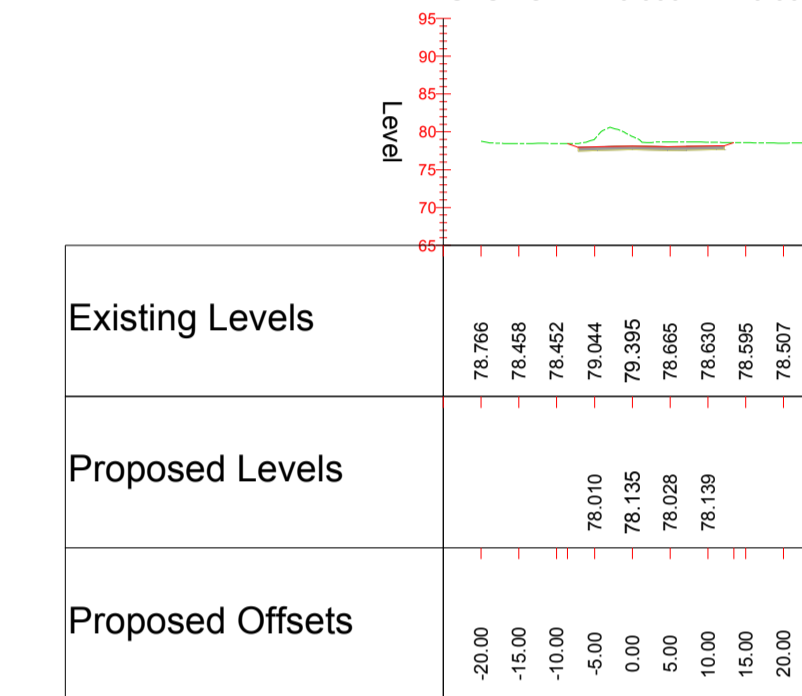
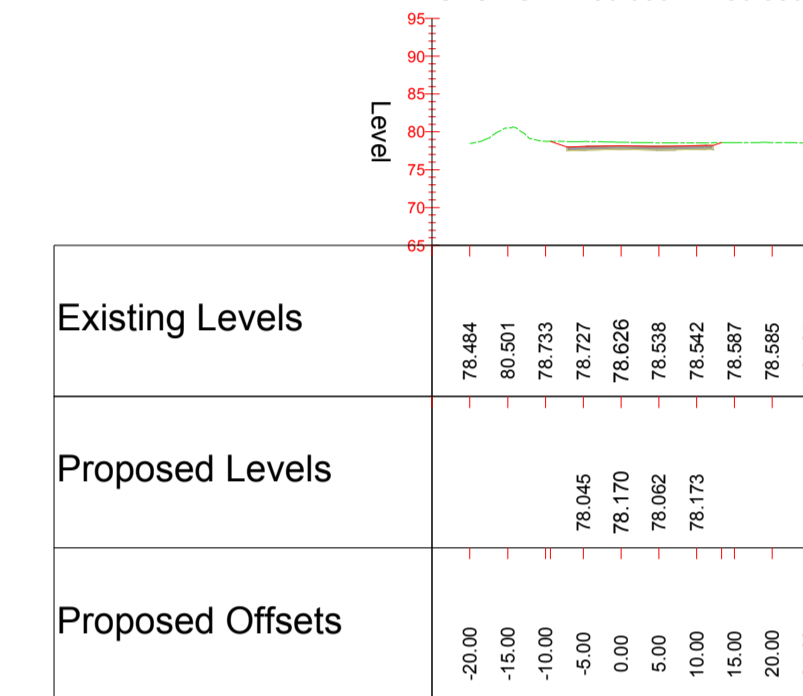
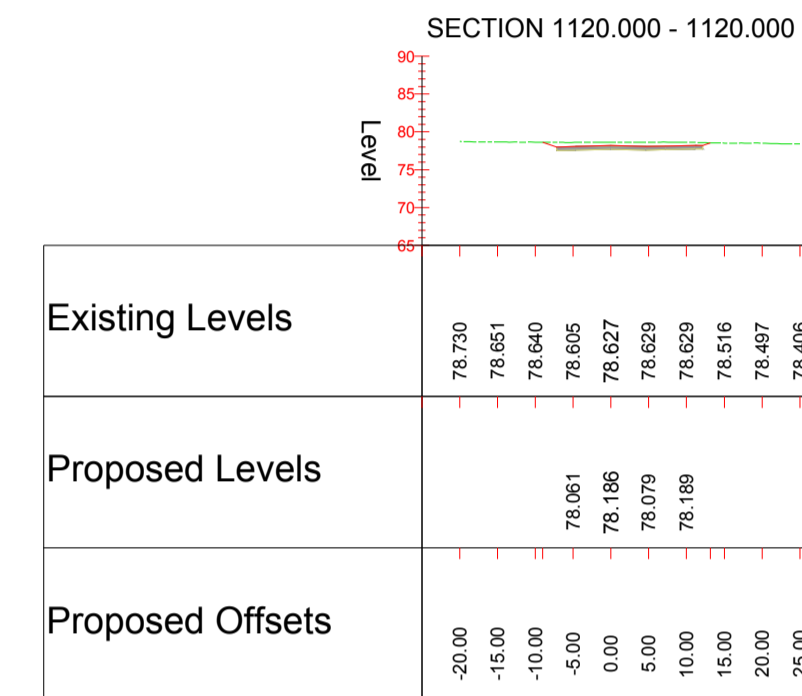
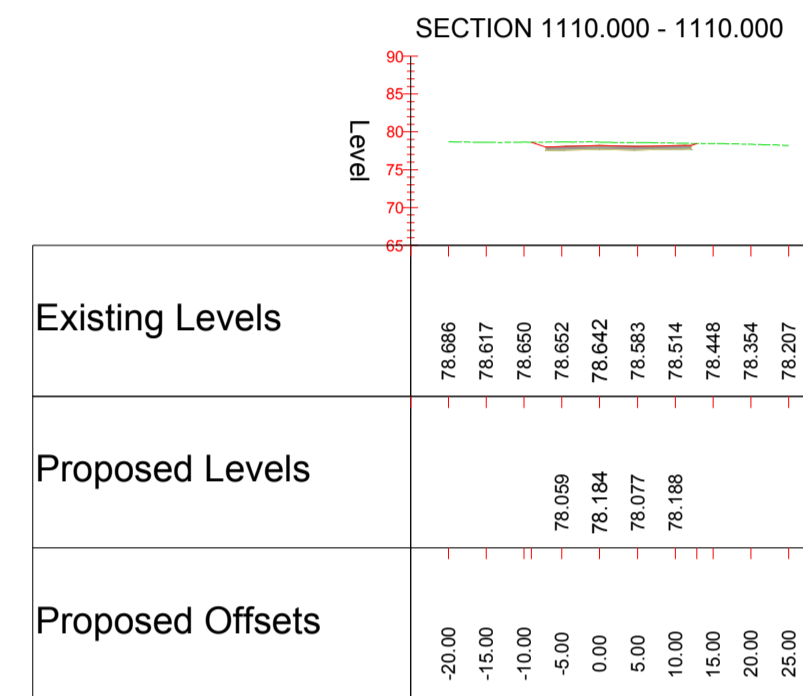
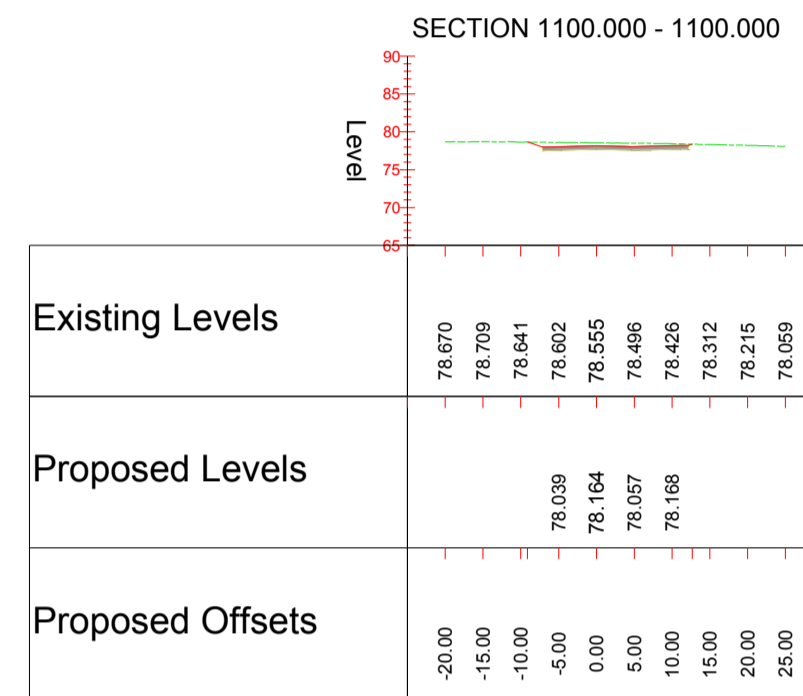
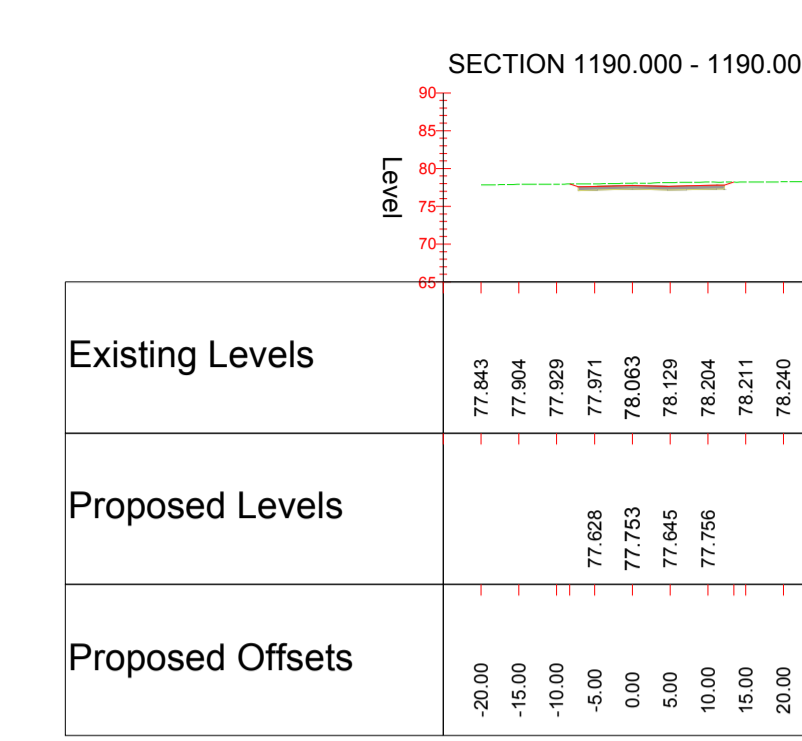
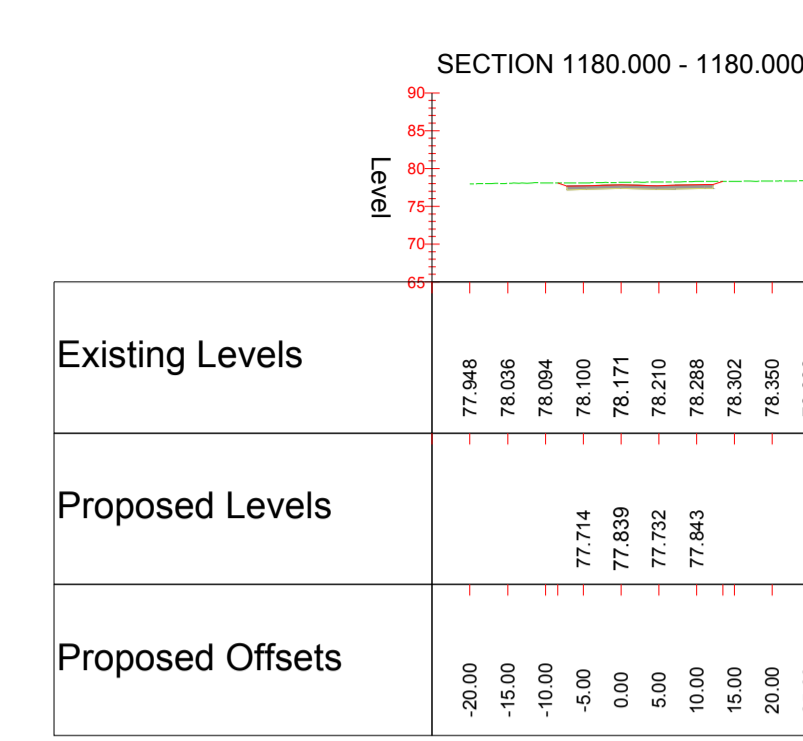
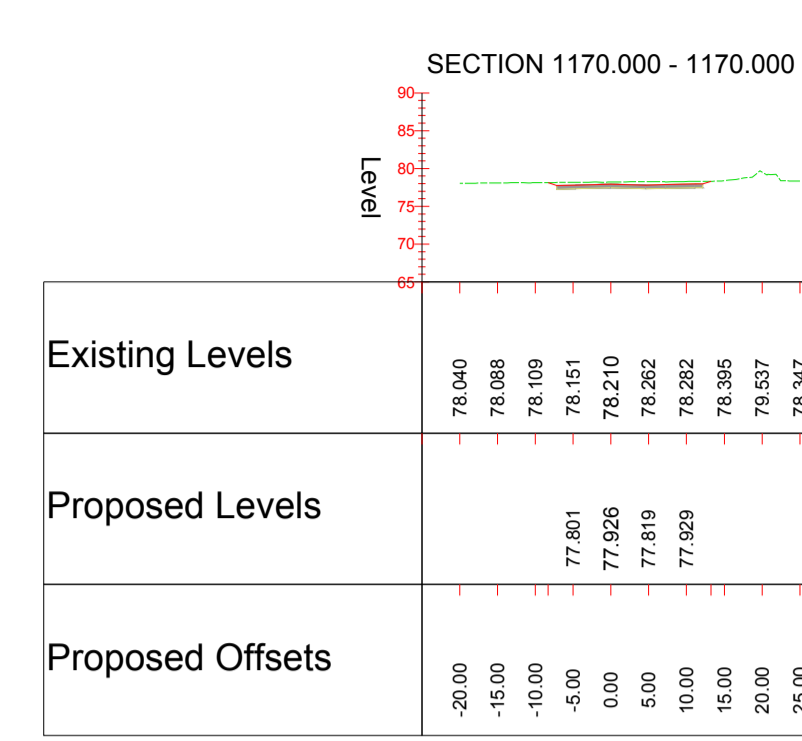
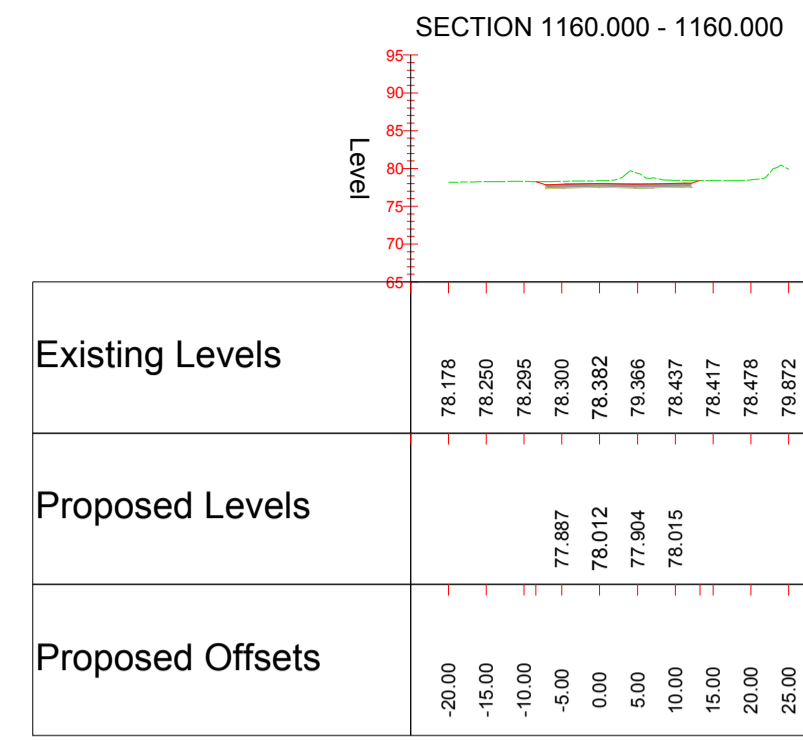
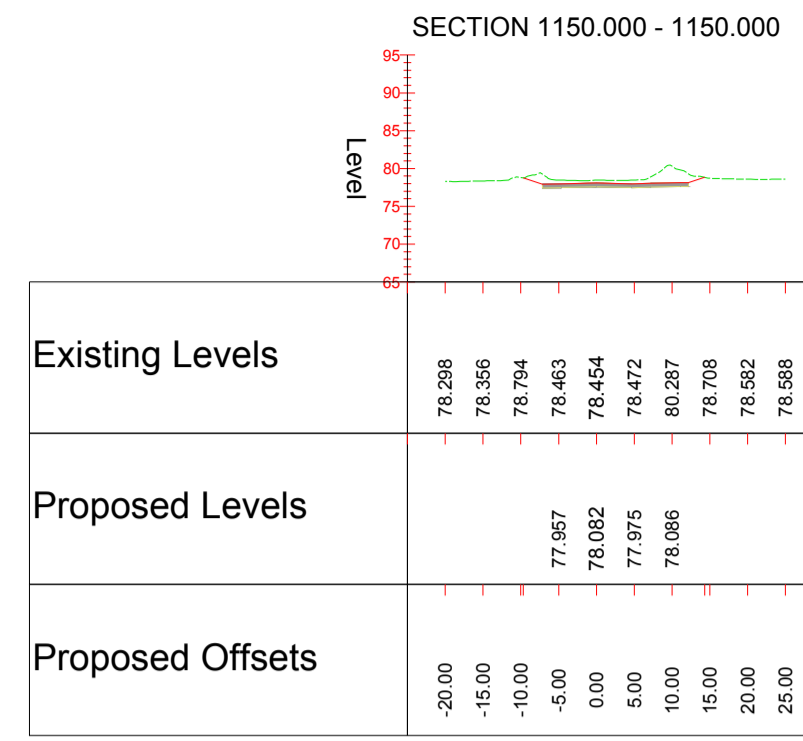
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Sustainability		S2	
Project Title			
WEST OF ENGLAND WP1			
Drawing Title			
A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 019			
Scale	Designed	Drawn	Checked
1:1000	EC	AF	AH
Original Size	Date	Date	Date
A1	05/02/18	05/02/18	05/02/18
Drawing Number	Originator	Volume	Project Ref. No.
HA PIN	Woe	ATK	HGN
	WP1	- DR - D - 6508	0000000
Location	Type	Role	Revision
			P1

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CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION			
NONE			
MAINTENANCE/CLEANING			
NONE			
DECOMMISSIONING/DEMOLITION			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF

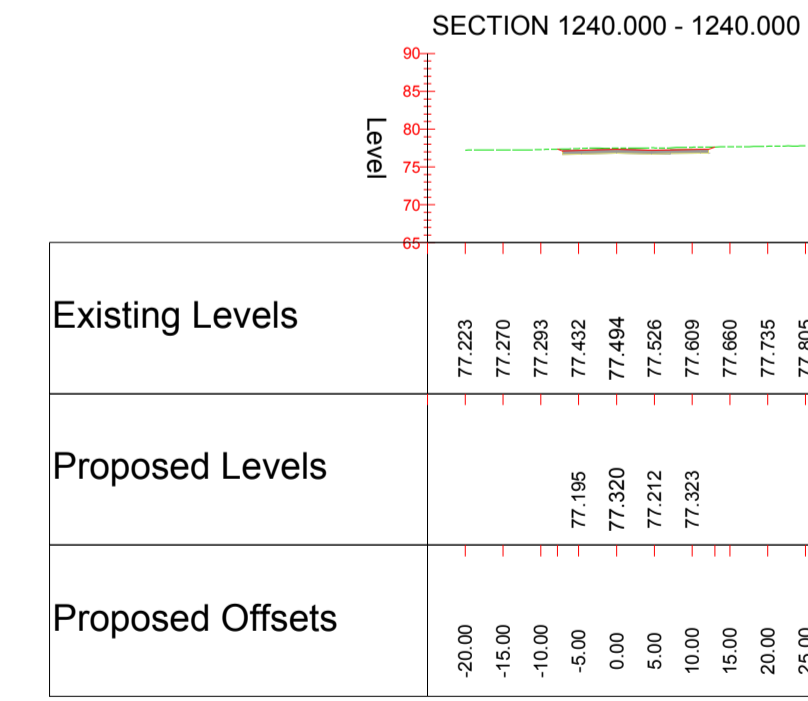
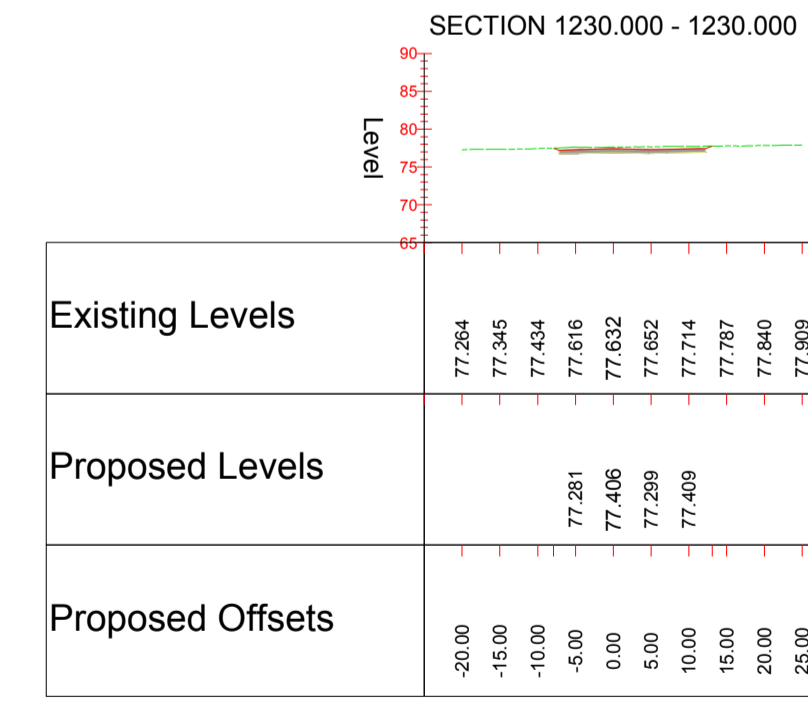
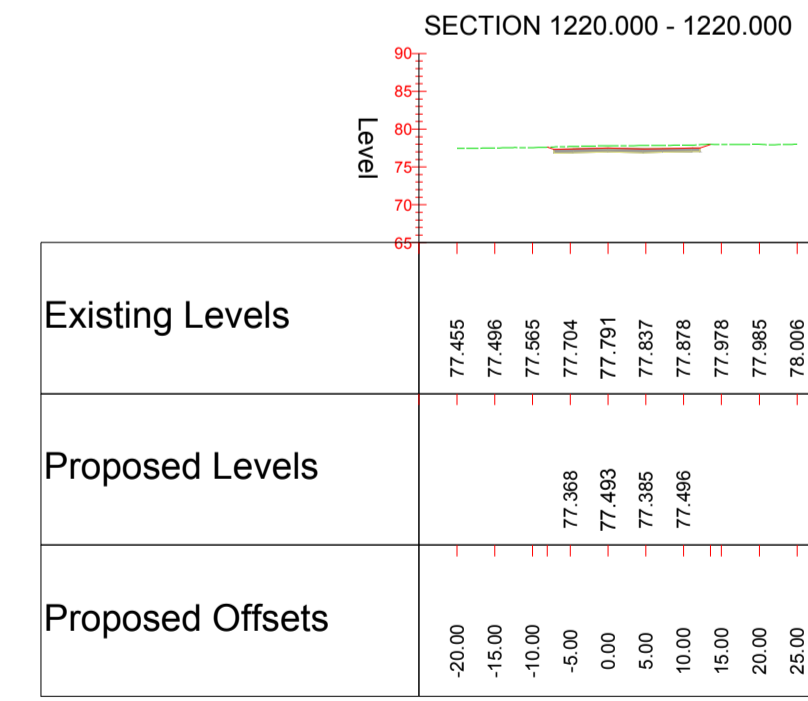
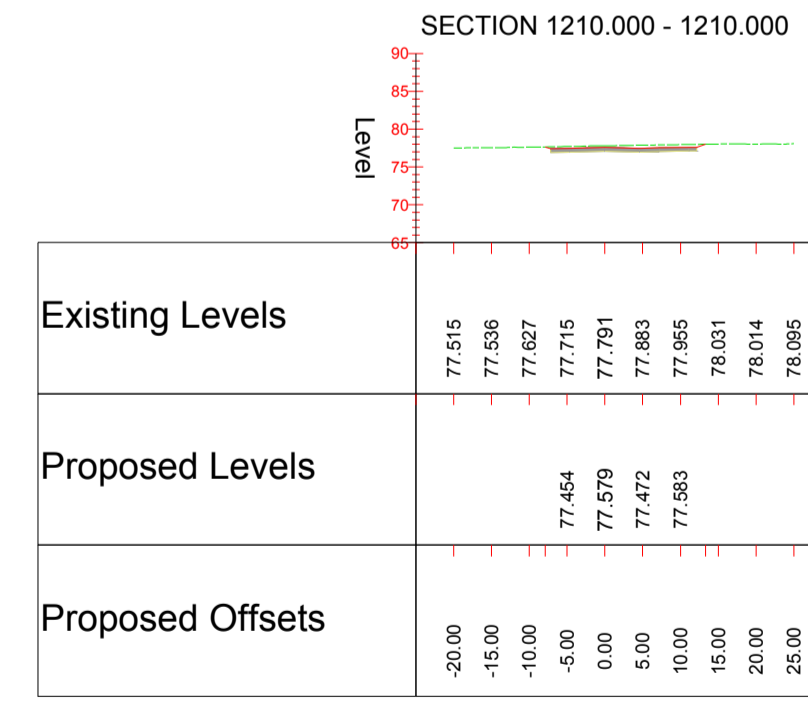
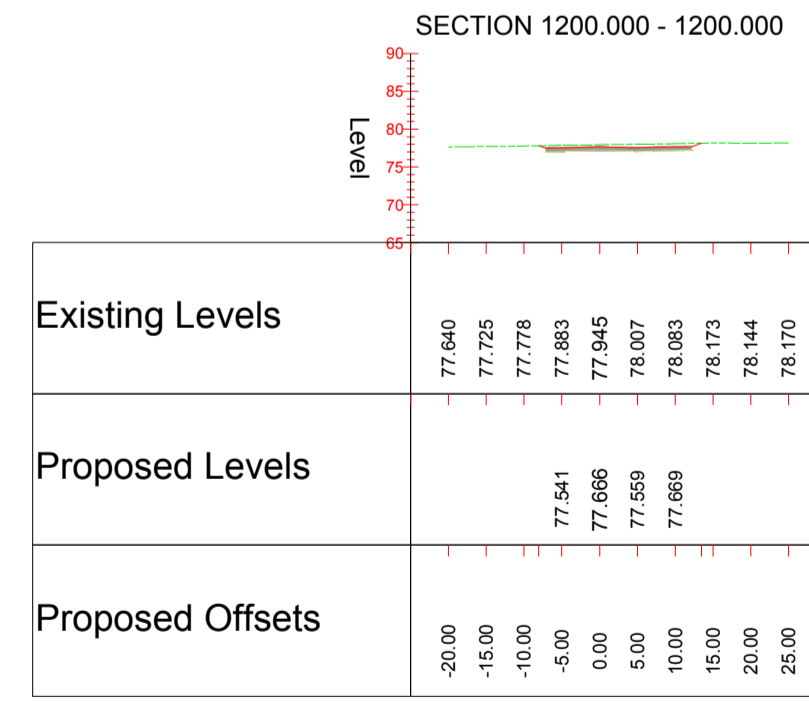
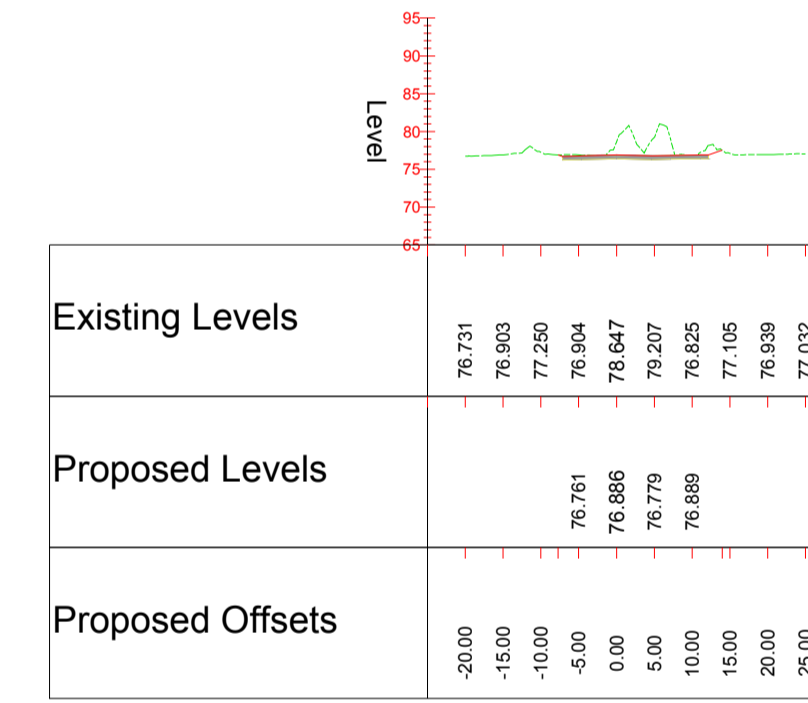
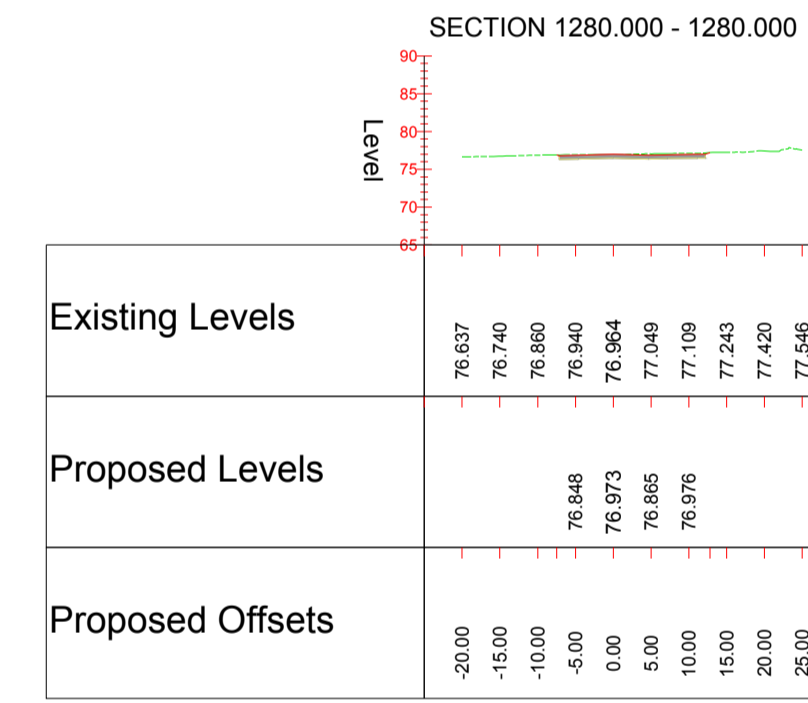
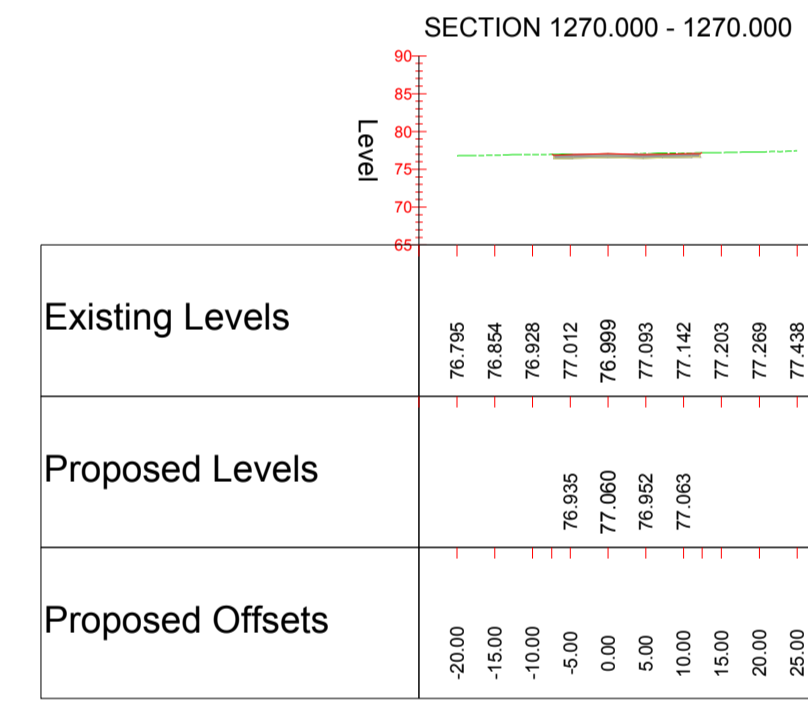
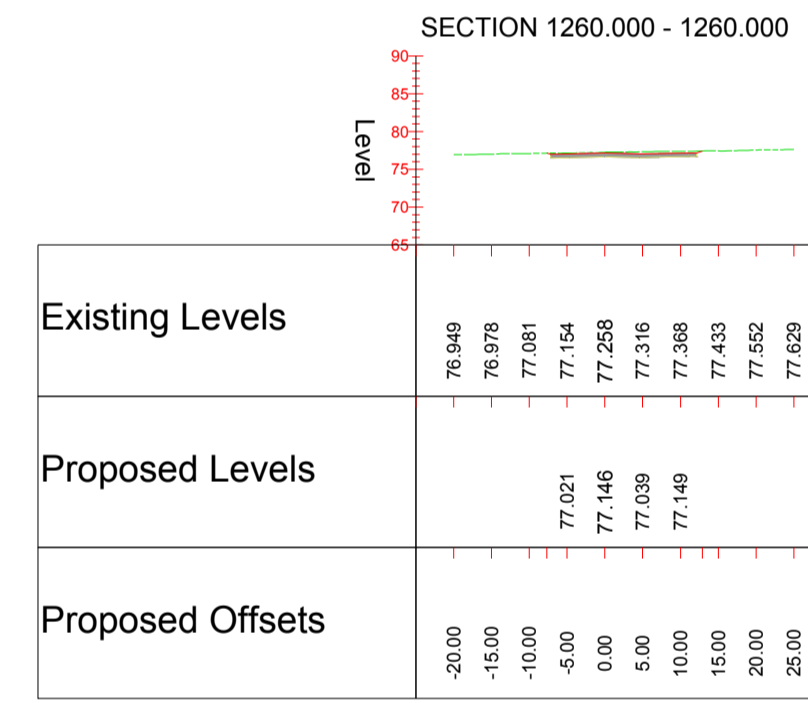
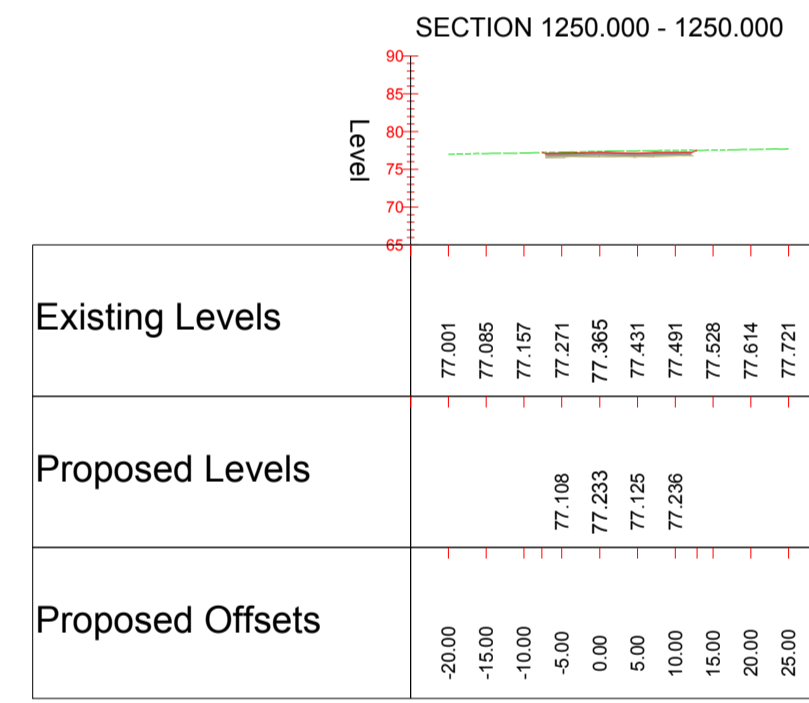
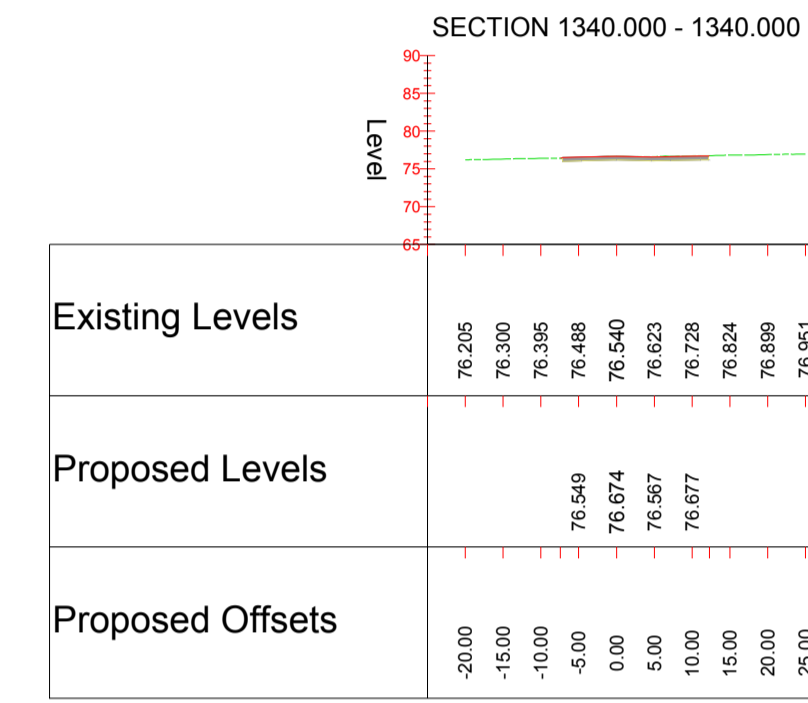
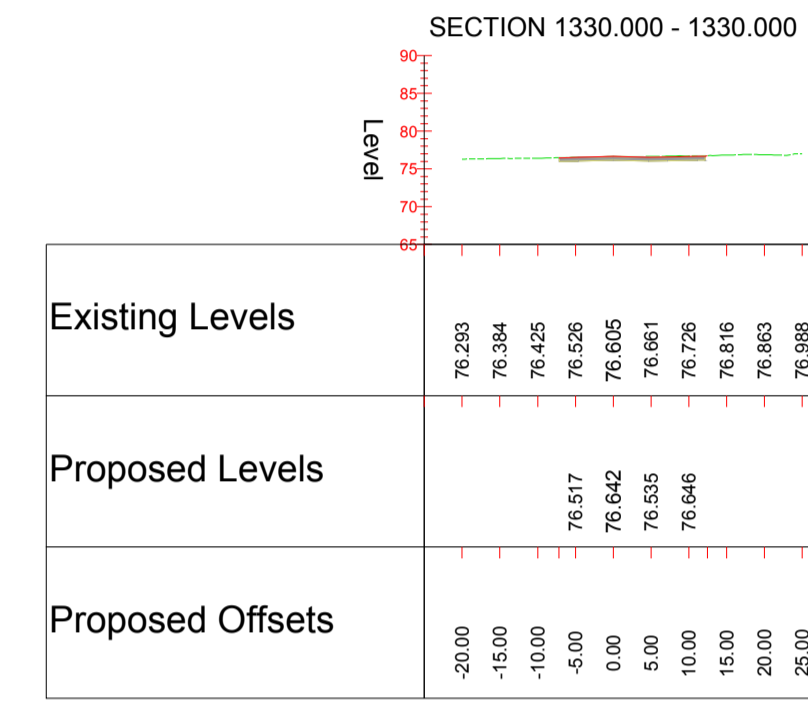
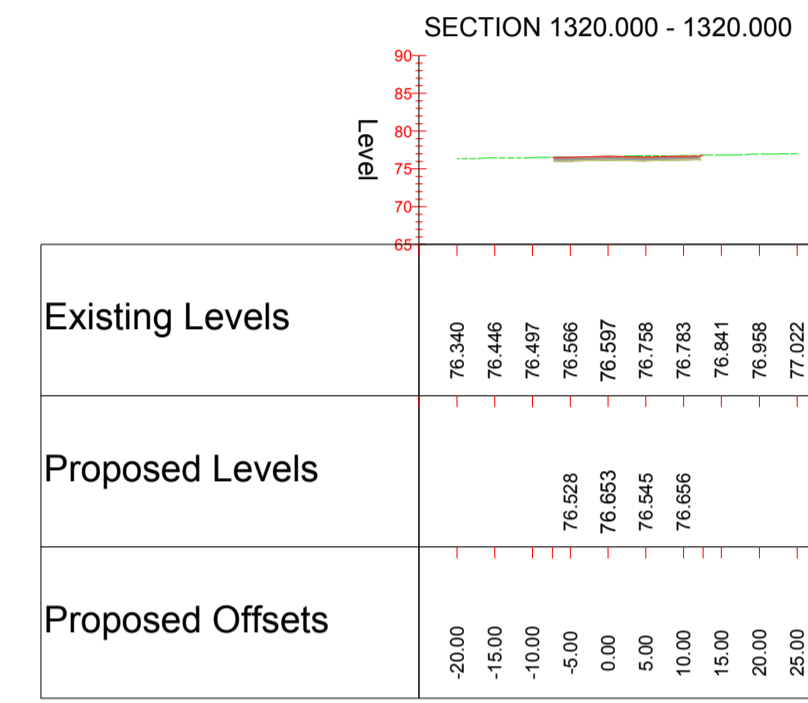
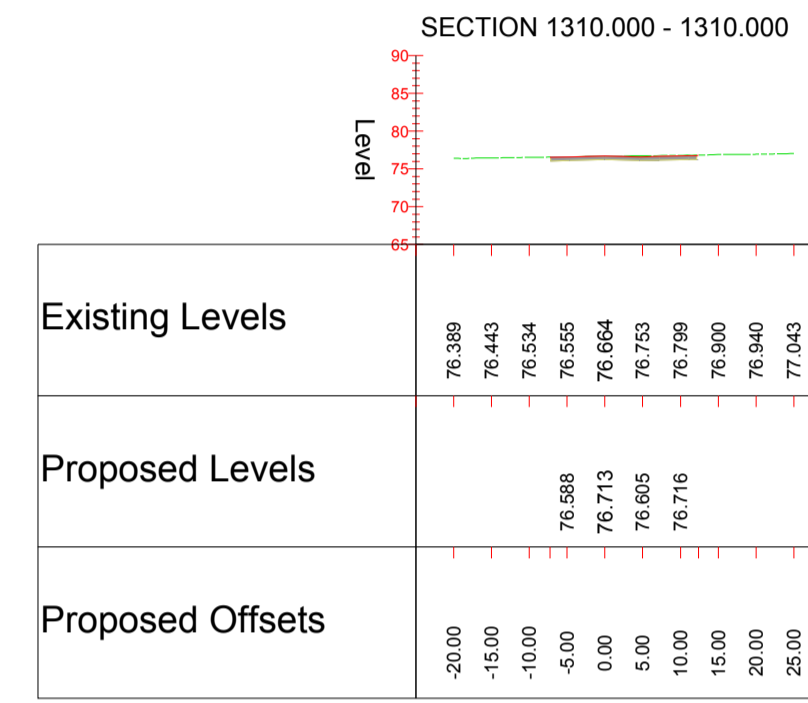
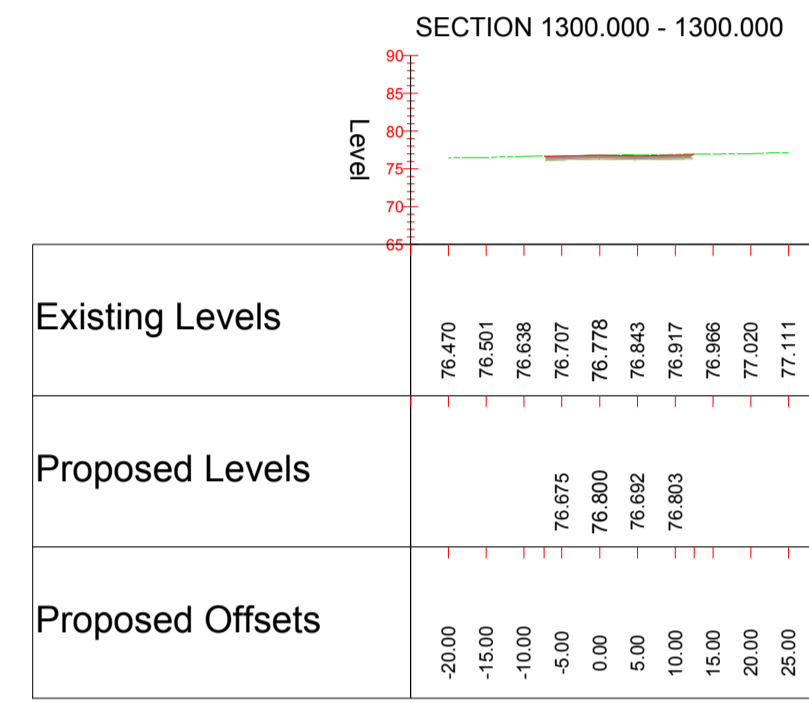
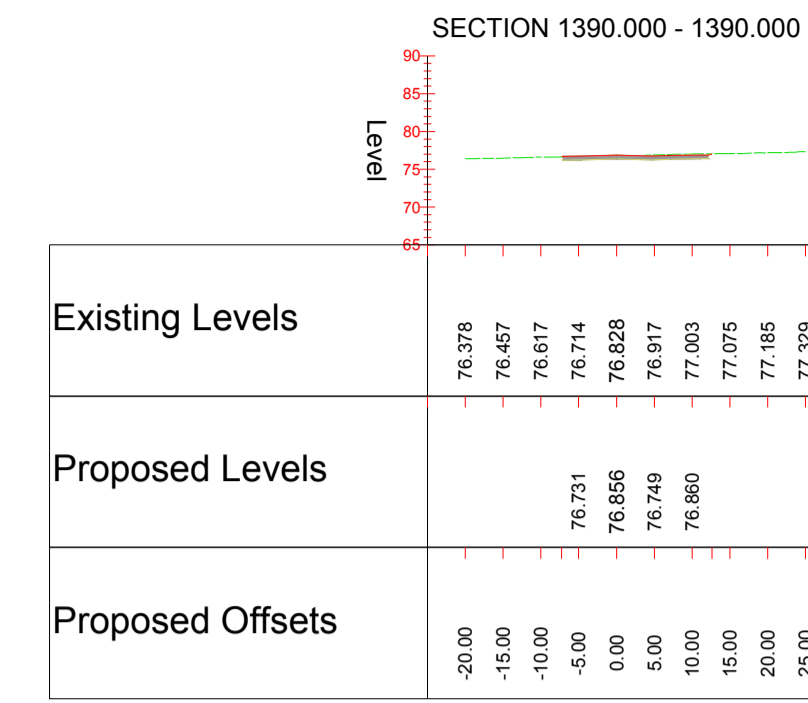
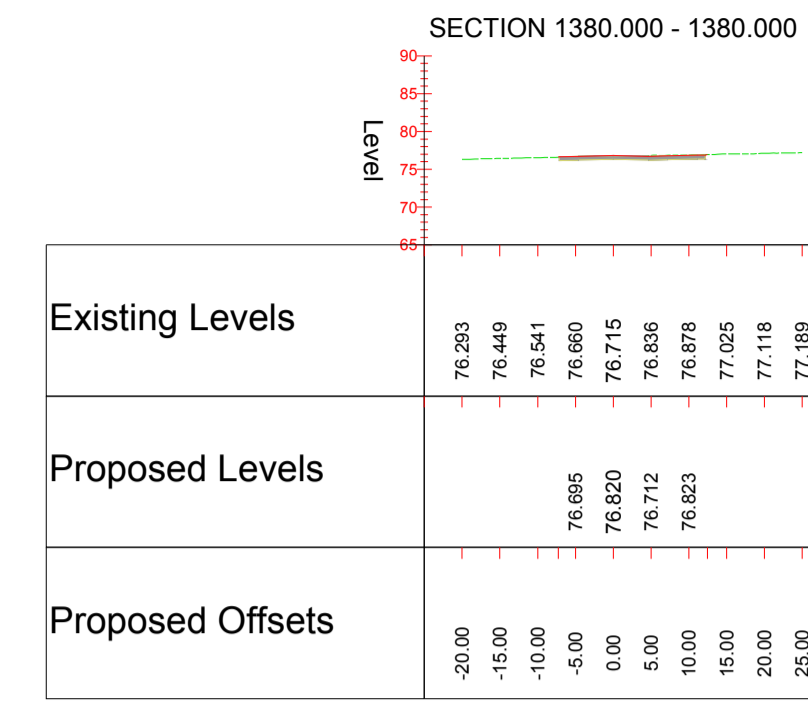
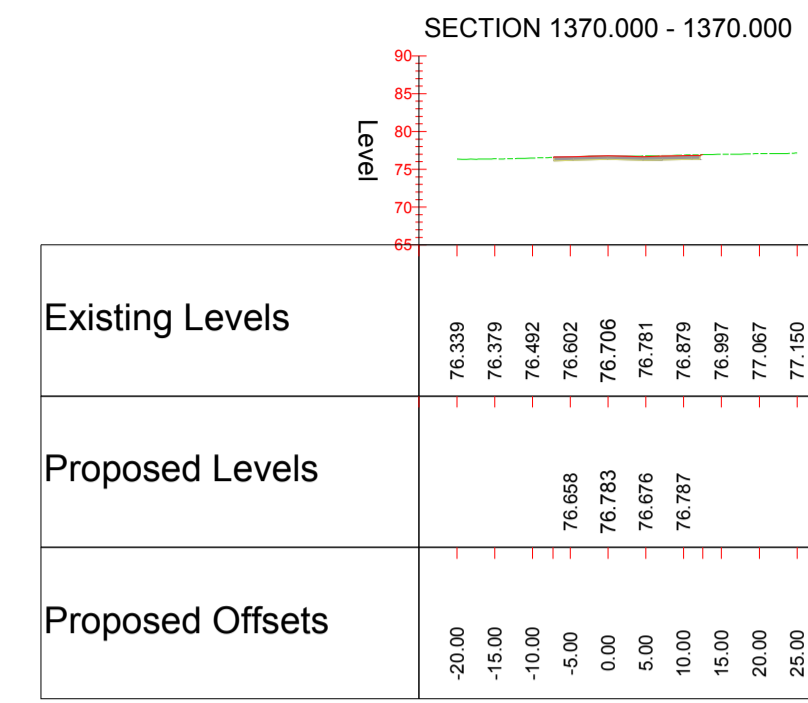
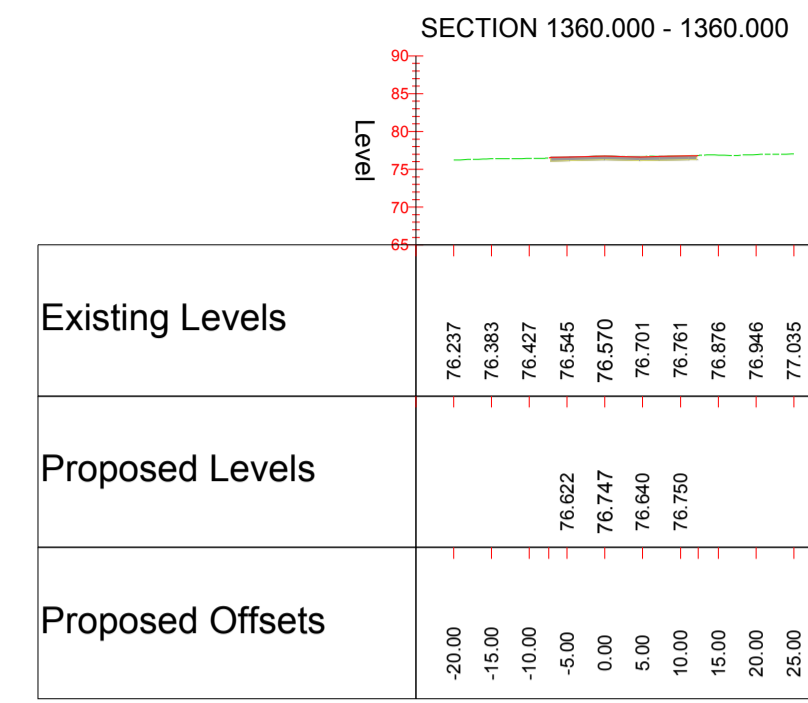
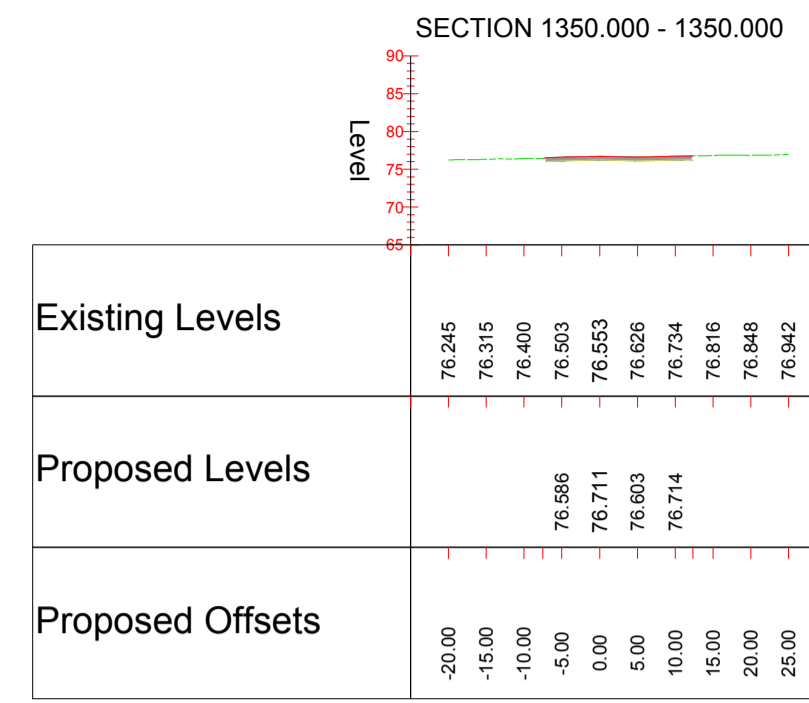
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Suitability	S2
Project Title	WEST OF ENGLAND WP1
Drawing Title	A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 0/19
Scale	1:1000
Designed	EC
Drawn	AF
Checked	AH
Authorised	
Original Size	A1
Date	05/02/18
Date	05/02/18
Date	05/02/18
Drawing Number	Woe
HA PIN	ATK
Volume	HGN
Project Ref. No.	0000000
Revision	
Number	P1

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Fax: +44 (0)1372 663333  
www.atkinsglobal.com

CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION			
NONE			
MAINTENANCE/CLEANING			
NONE			
DECOMMISSIONING/DEMOLITION			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF

Drawing Status	<b>FOR INFORMATION</b>
Suitability	<b>S2</b>
Client	WEST OF ENGLAND

Project Title	WEST OF ENGLAND WP1			
Drawing Title	A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 1/19			
Scale	1:1000	Designed	EC	Checked
Original Size	A1	Date	05/02/18	05/02/18
Drawing Number	Woe	Originator	ATK	Volume
HA PIN	WP1	Number	- DR - D - 6510	Project Ref. No.
Location		Type		Revision
		Role		P1

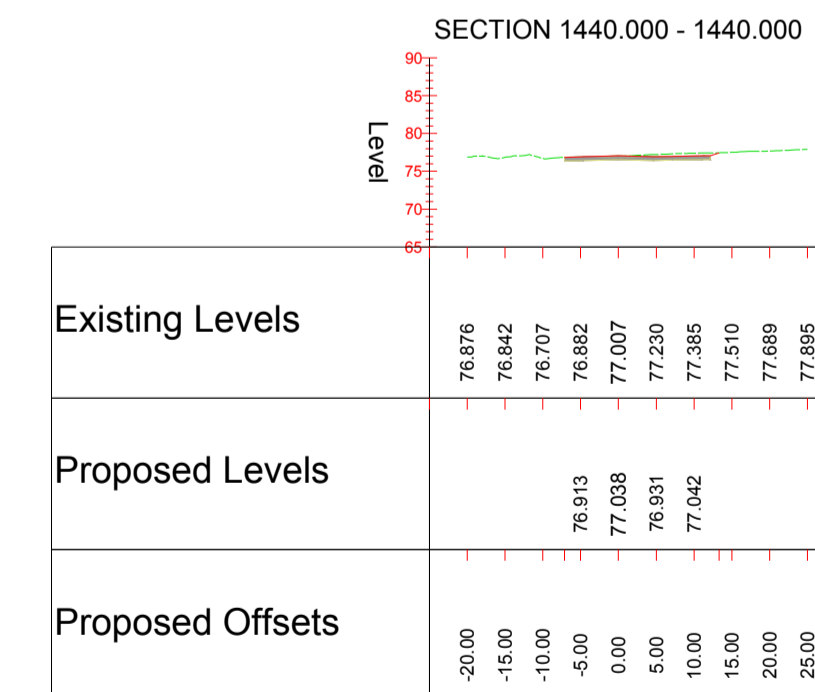
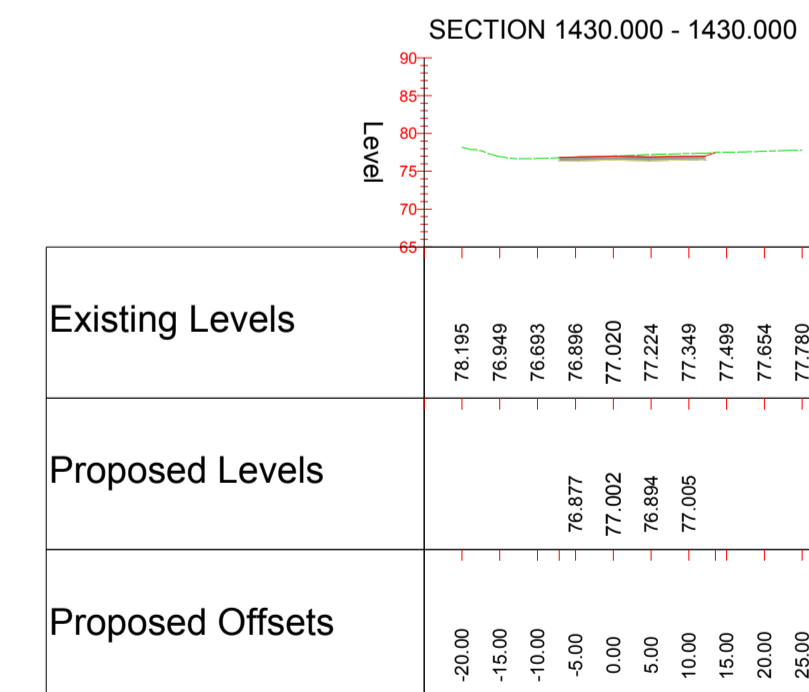
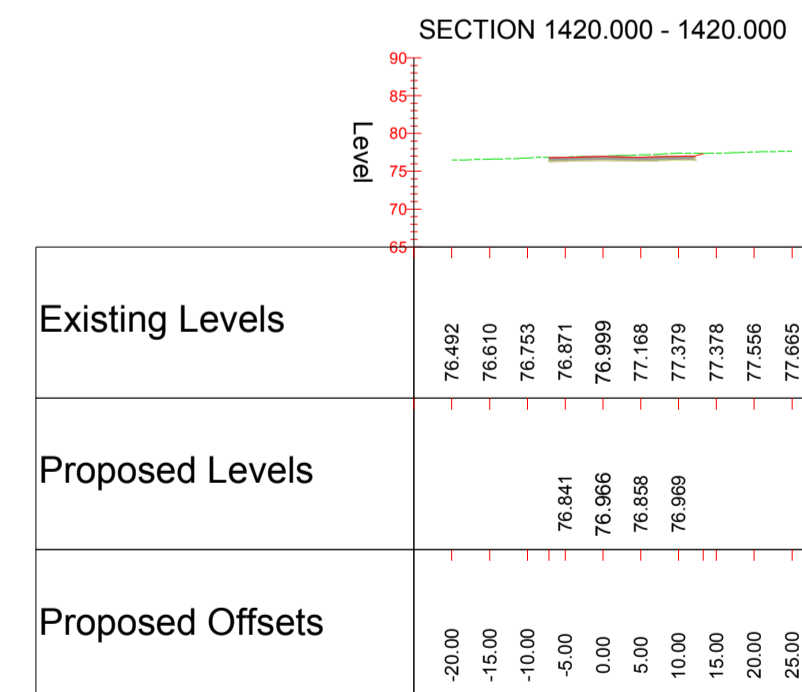
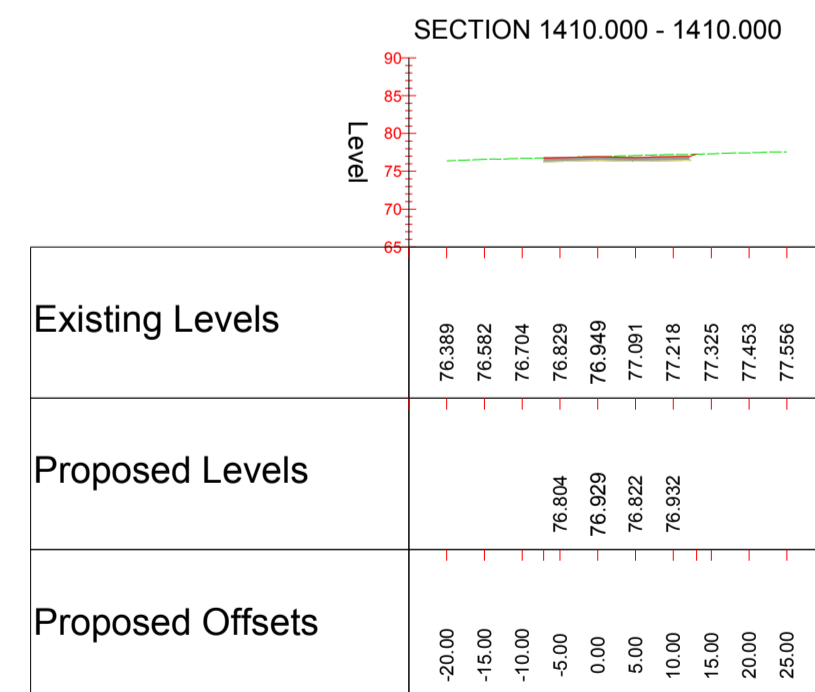
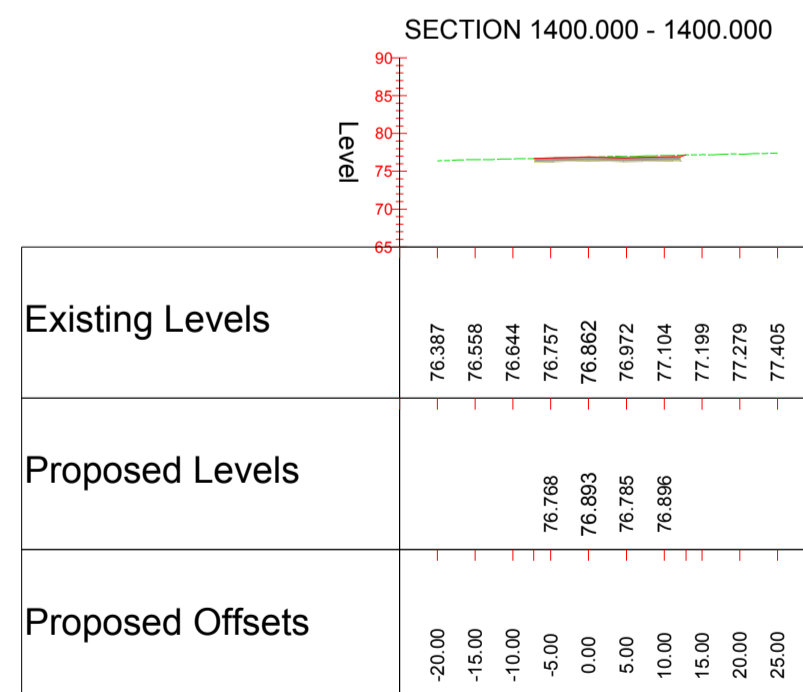
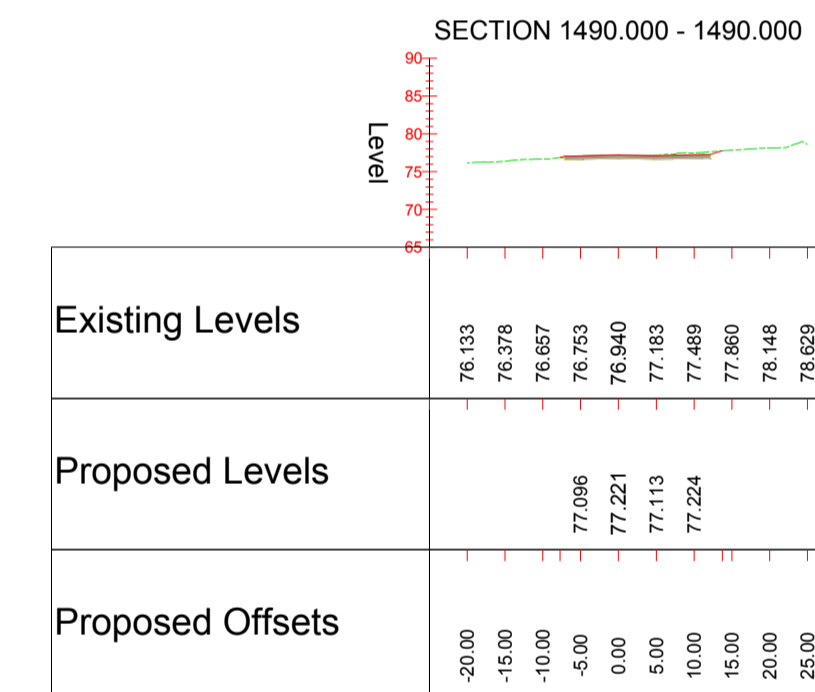
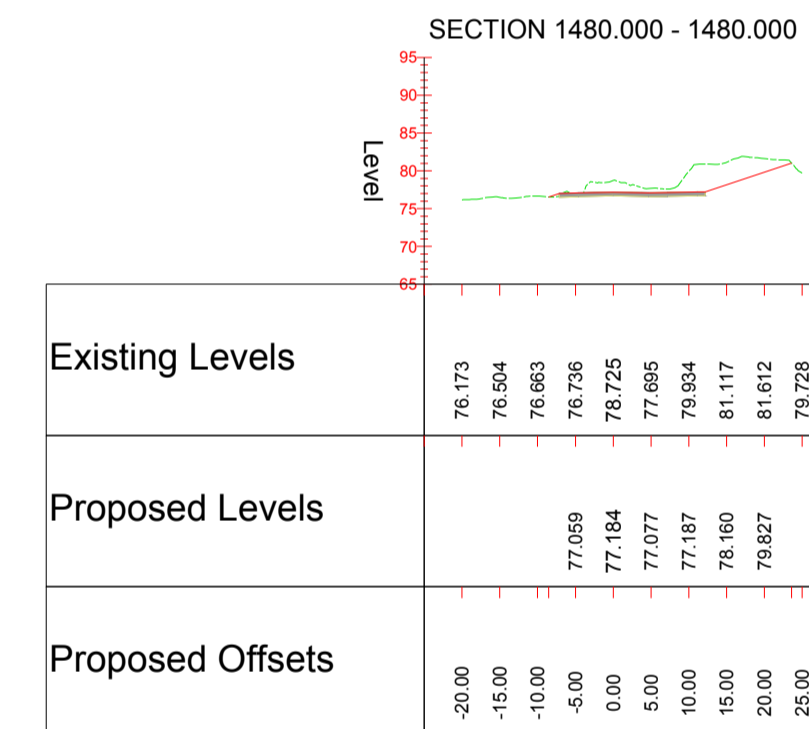
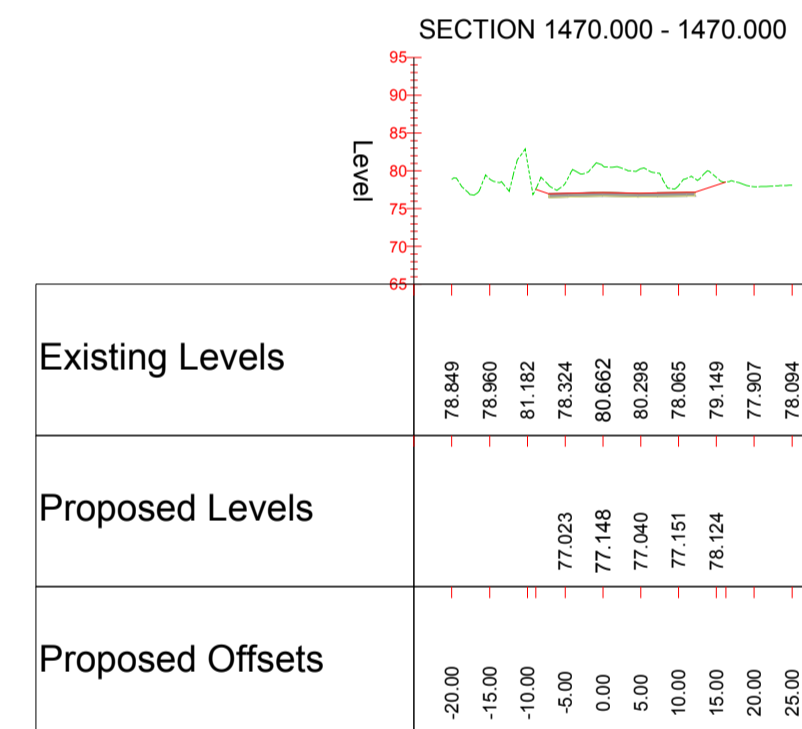
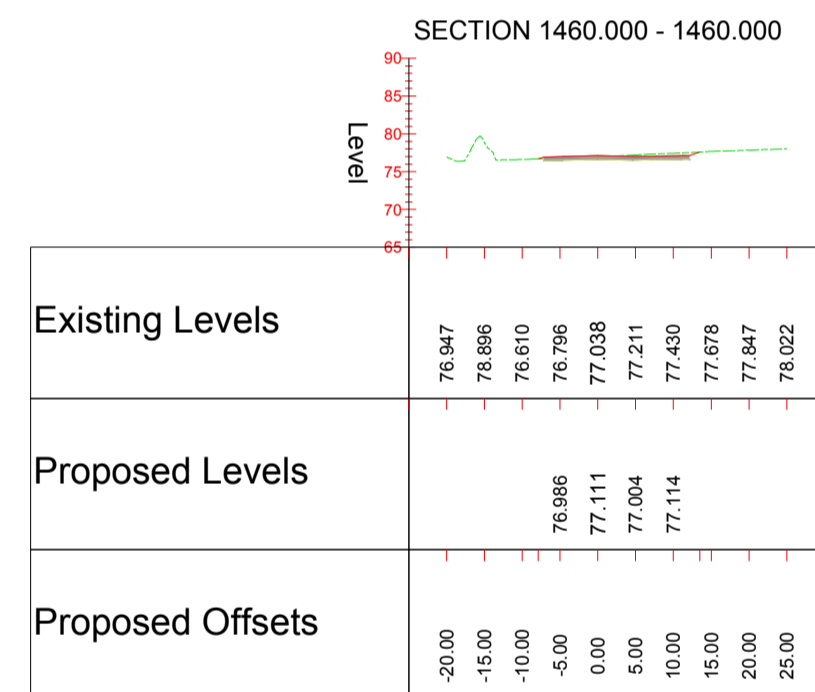
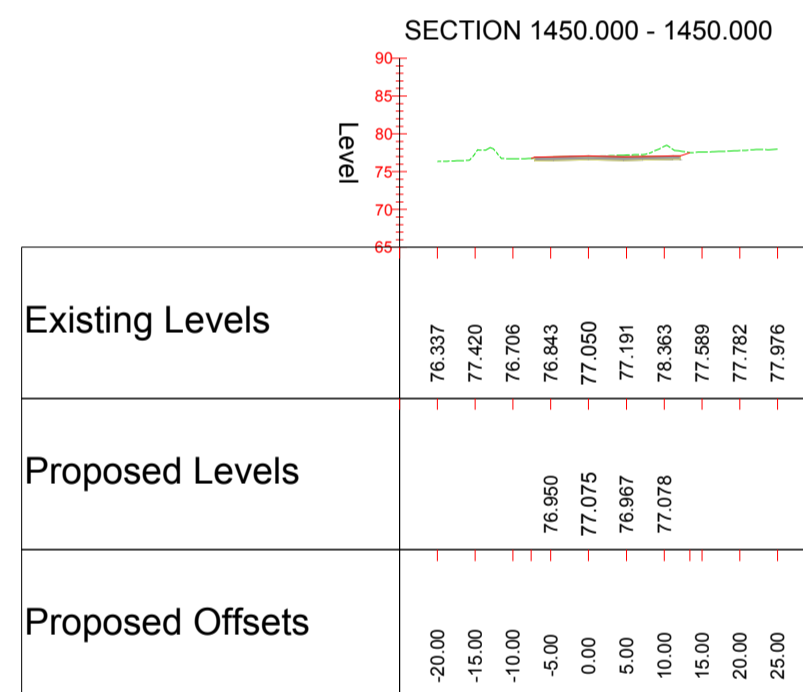
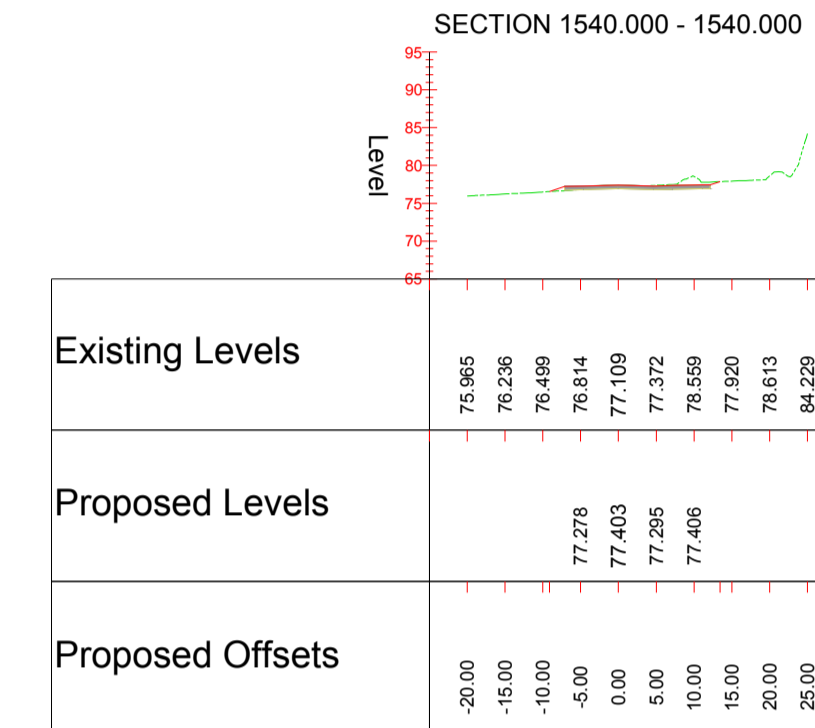
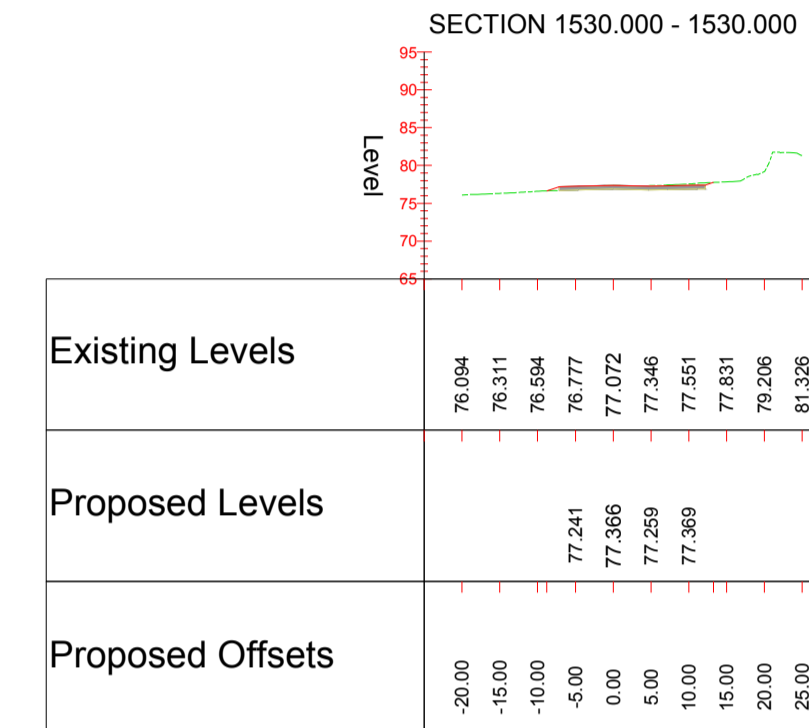
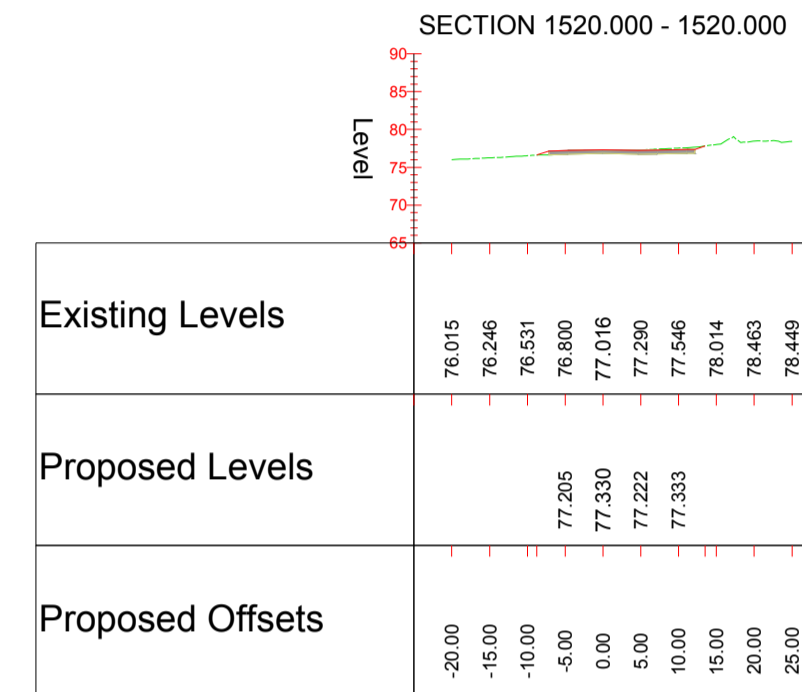
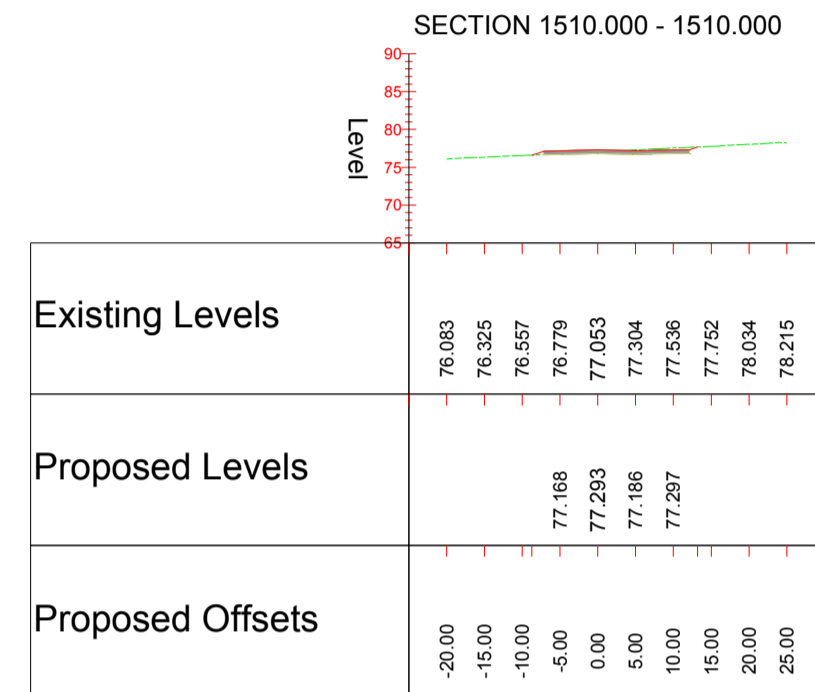
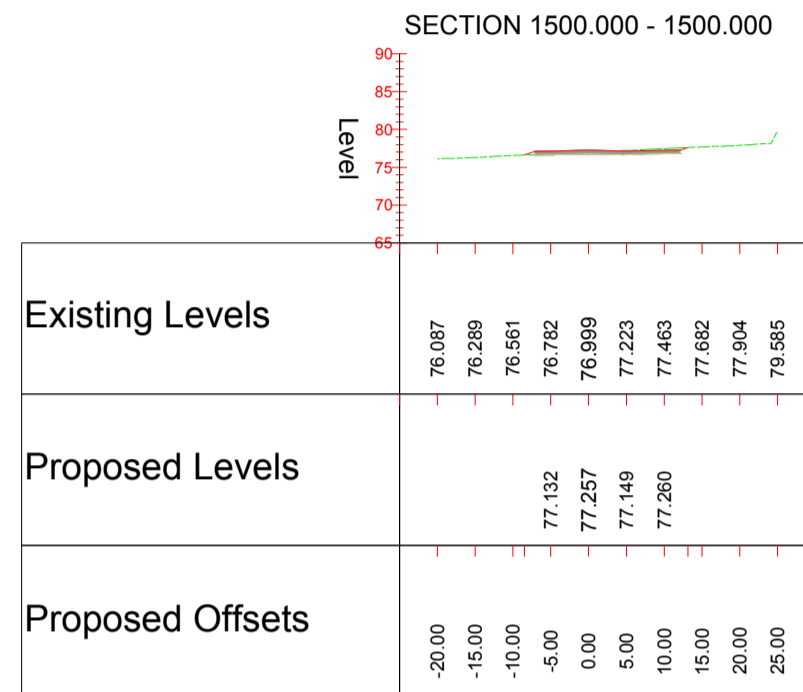
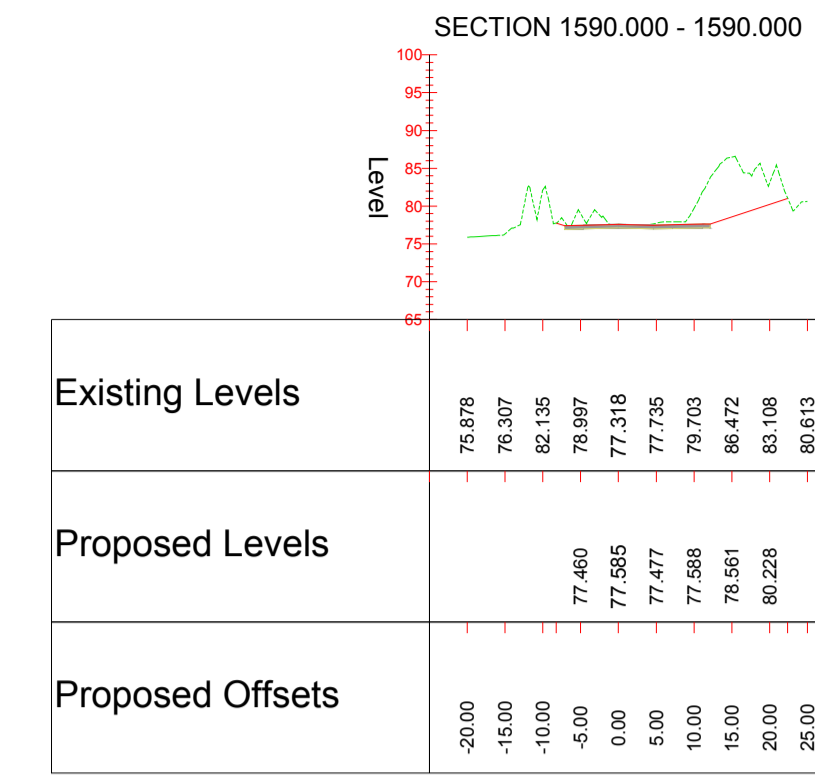
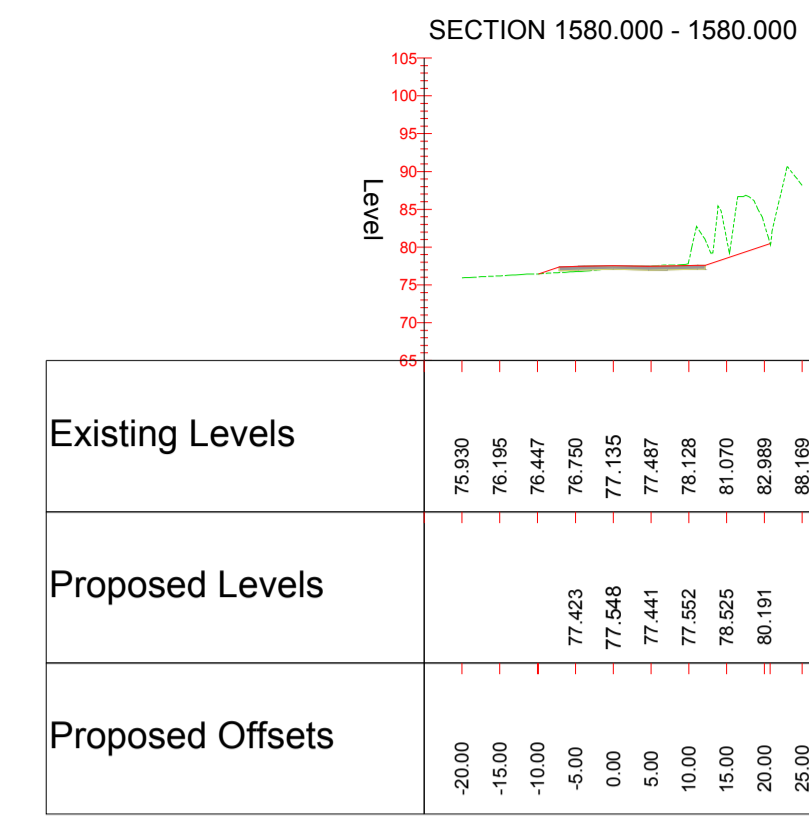
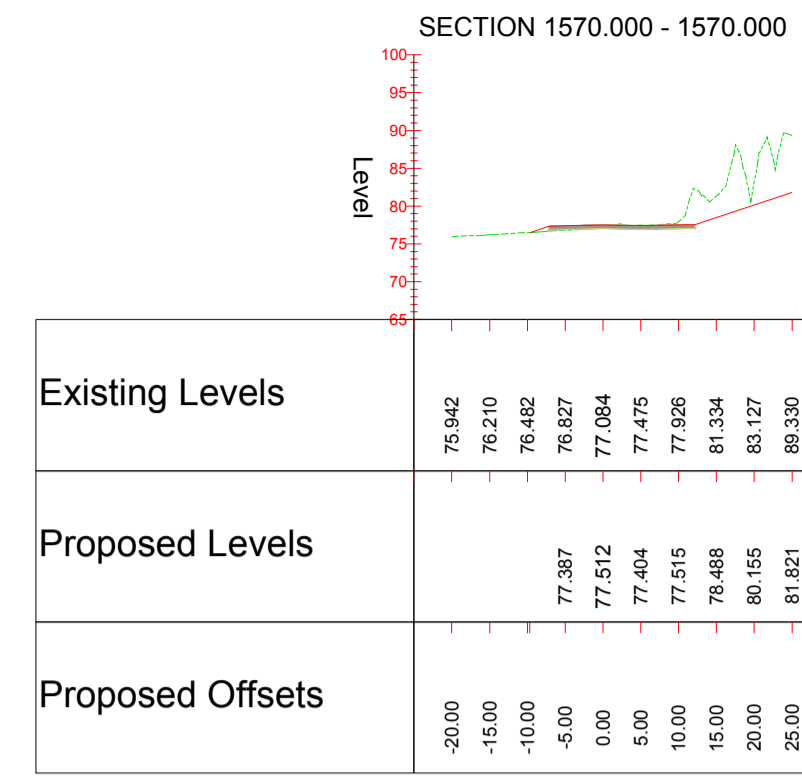
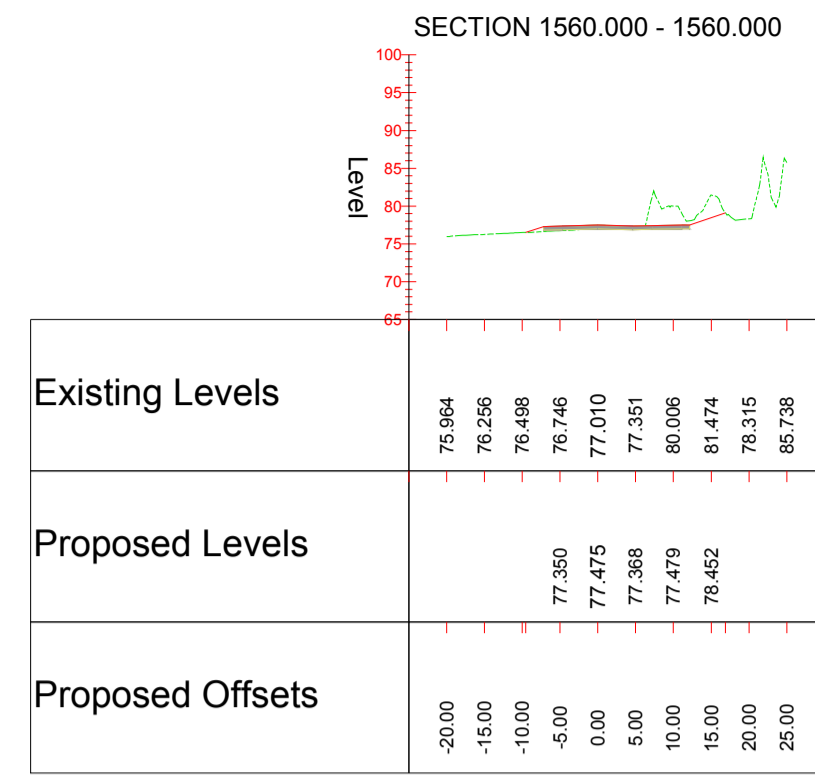
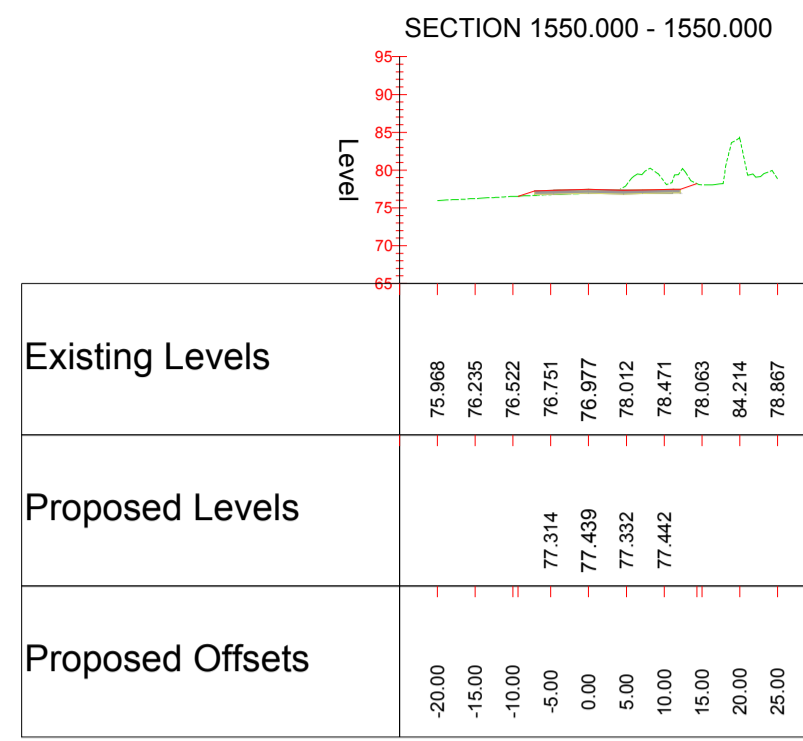
Authorised	
Date	
Project Ref. No.	0000000
Revision	P1



100  
0 10  
Millimetres

**CROSS SECTIONS**  
Scale 1:1000

DO NOT SCALE



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION			
NONE			
MAINTENANCE/CLEANING			
NONE			
DECOMMISSIONING/DEMOLITION			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	
P1	05.02.18	DRAWING CREATED	
		By	AF
		Chkd	
		App'd	

Drawing Status		FOR INFORMATION		S2		Project Title	
Client		WEST OF ENGLAND		WEST OF ENGLAND		WEST OF ENGLAND WP1	
Originator		Woe		ATK		HGN	
Date		05/02/18		05/02/18		05/02/18	
Revision		DR - D		- 6511		P1	

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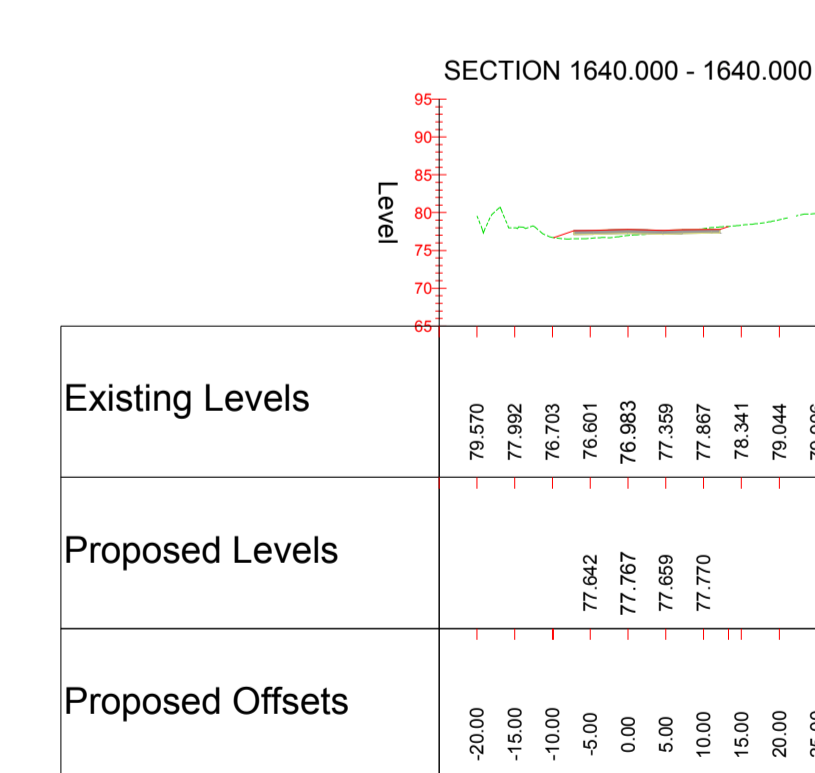
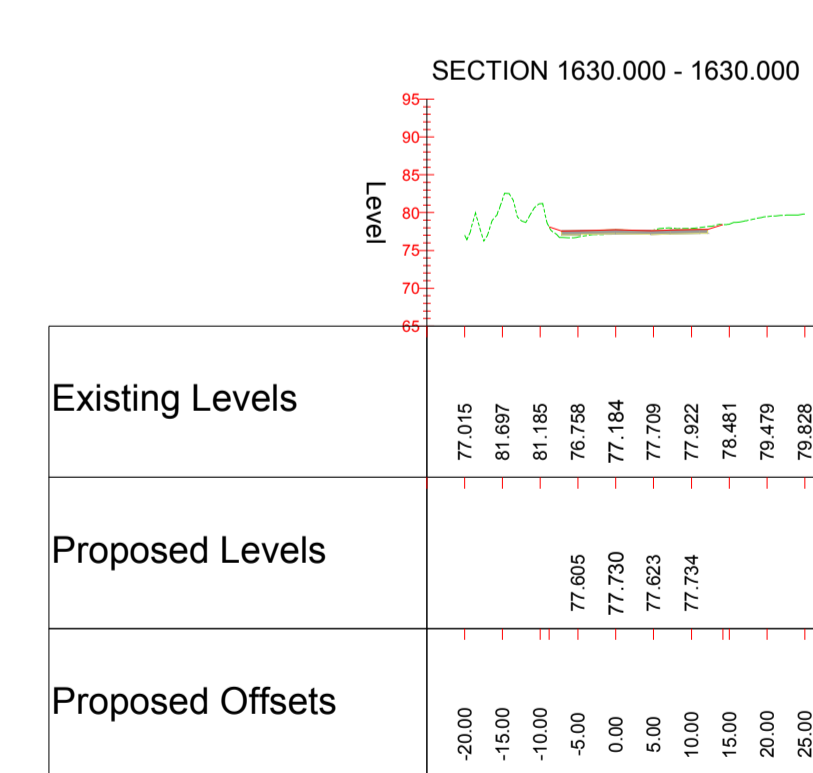
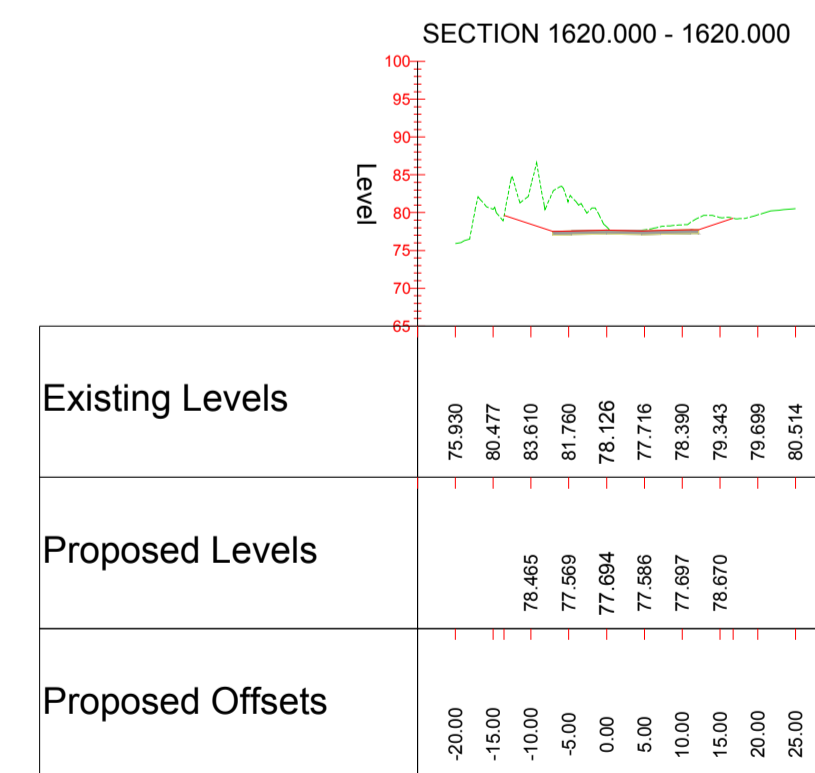
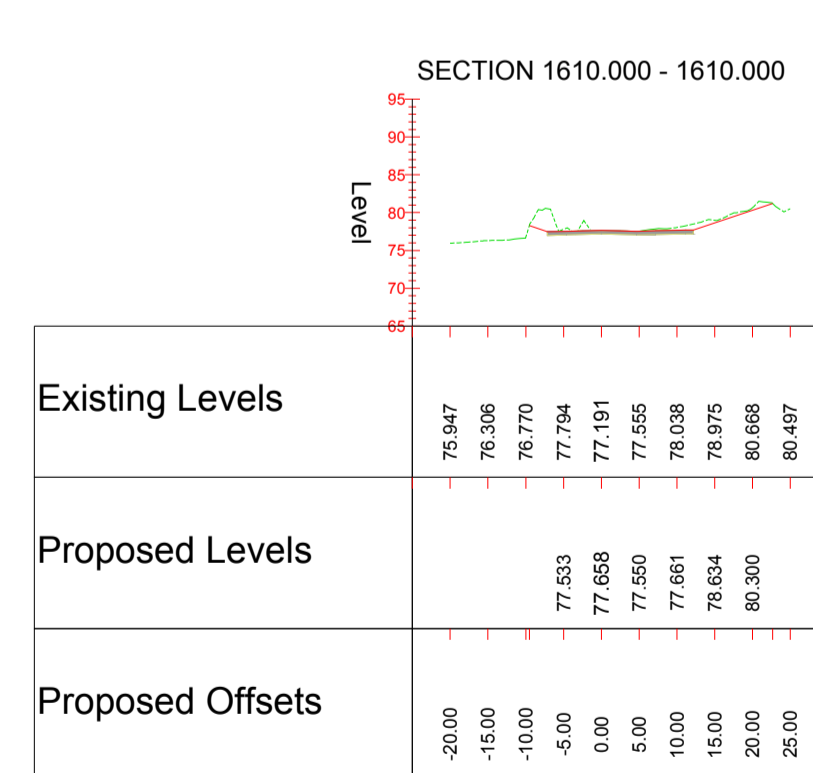
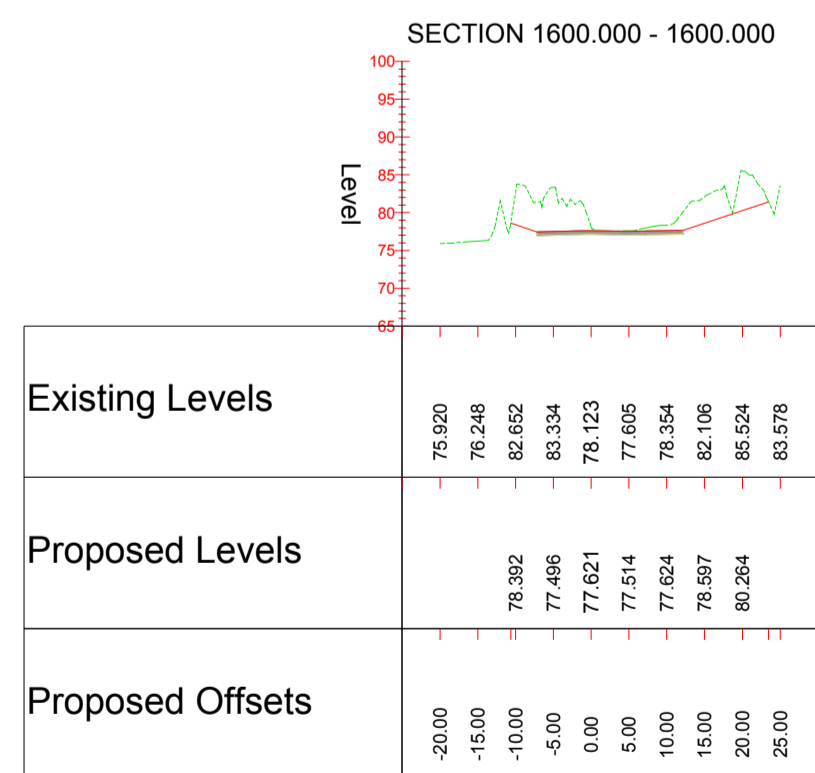
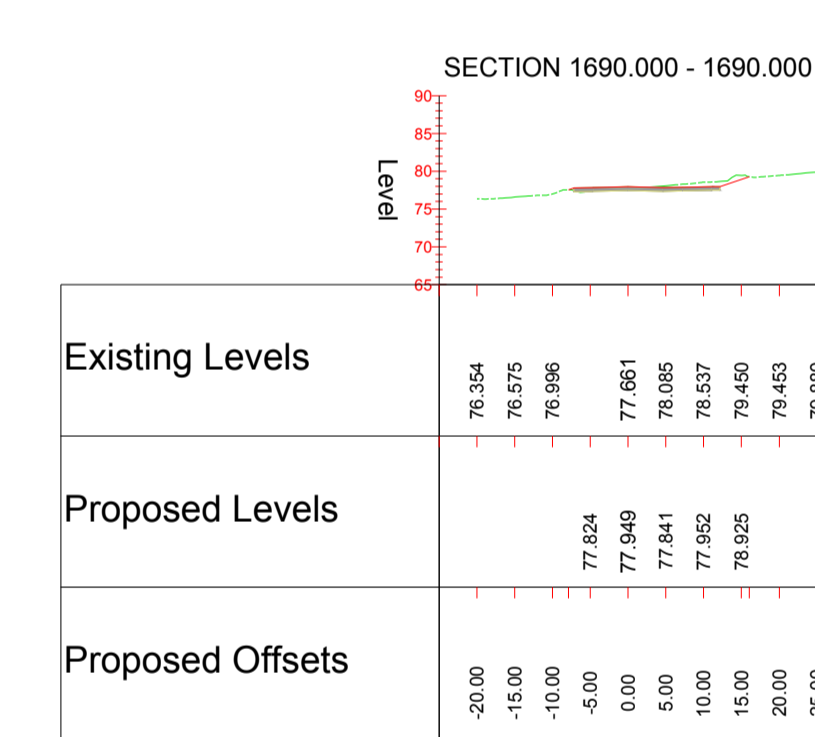
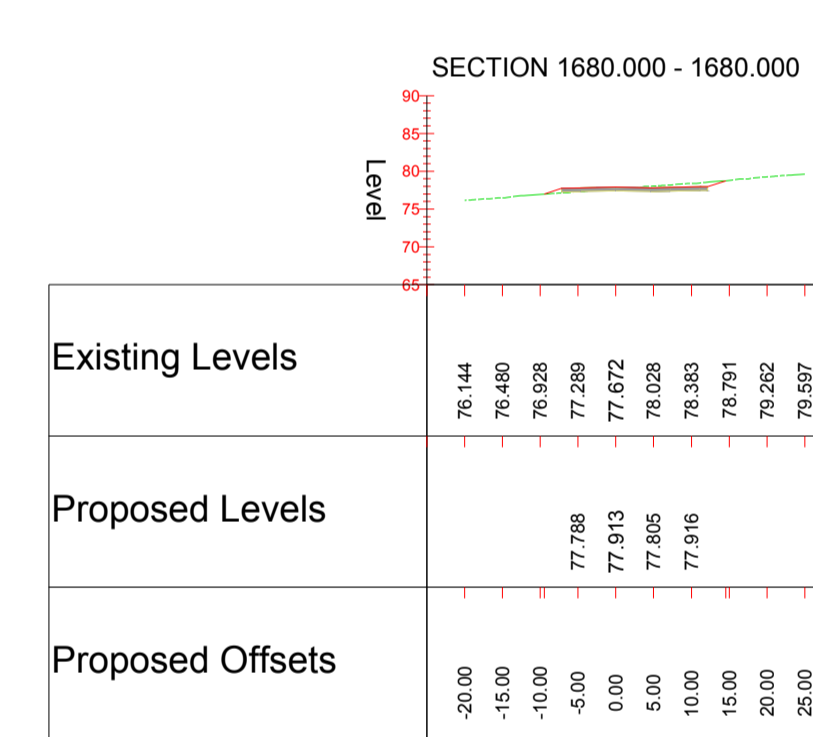
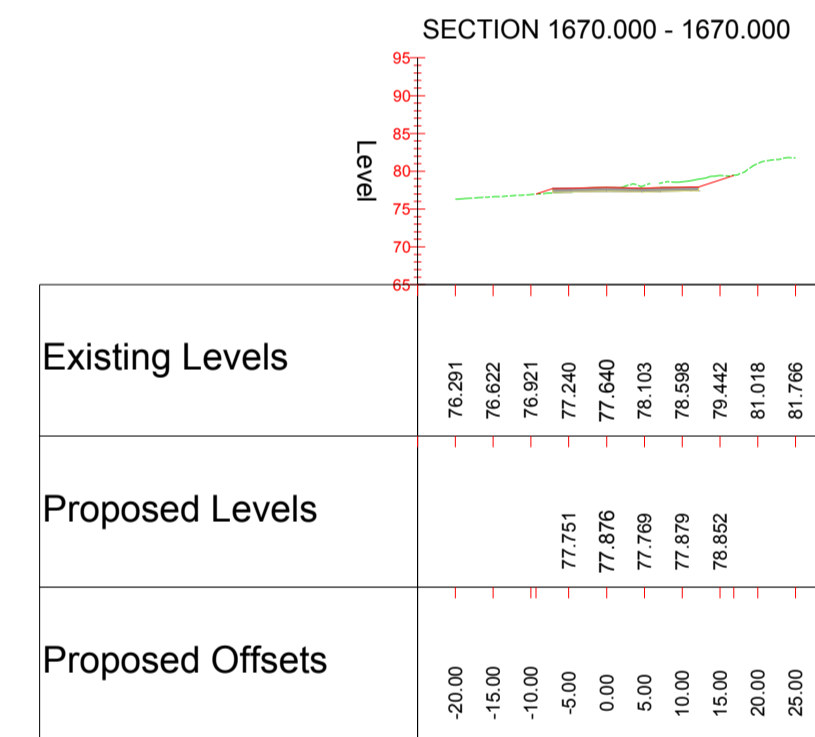
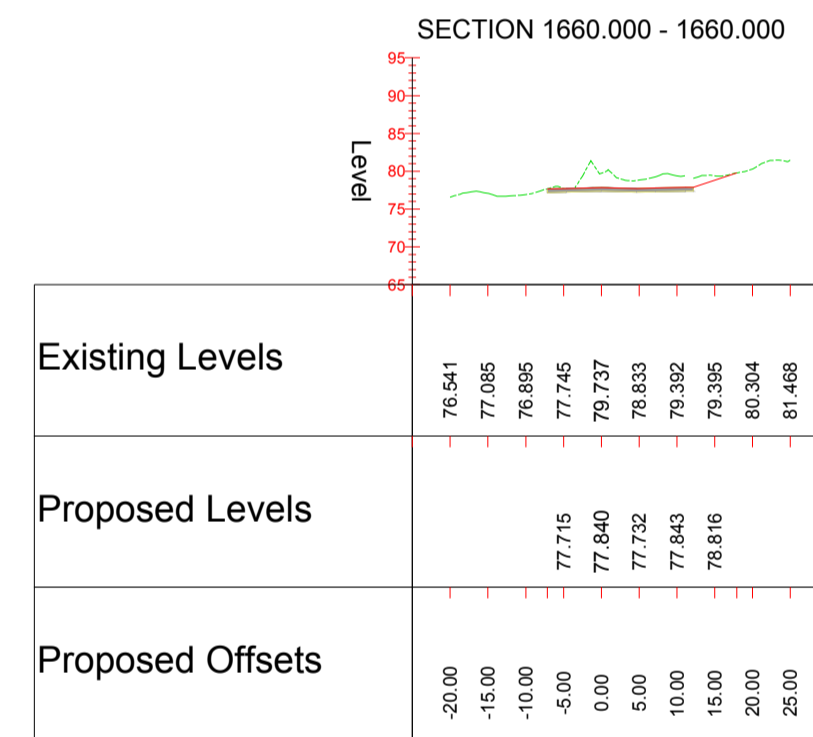
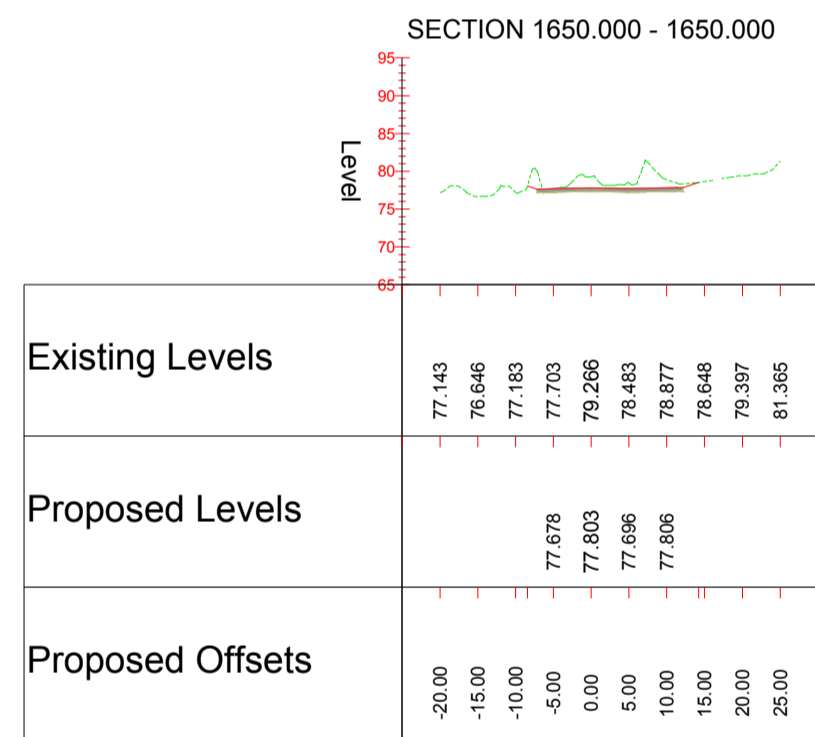
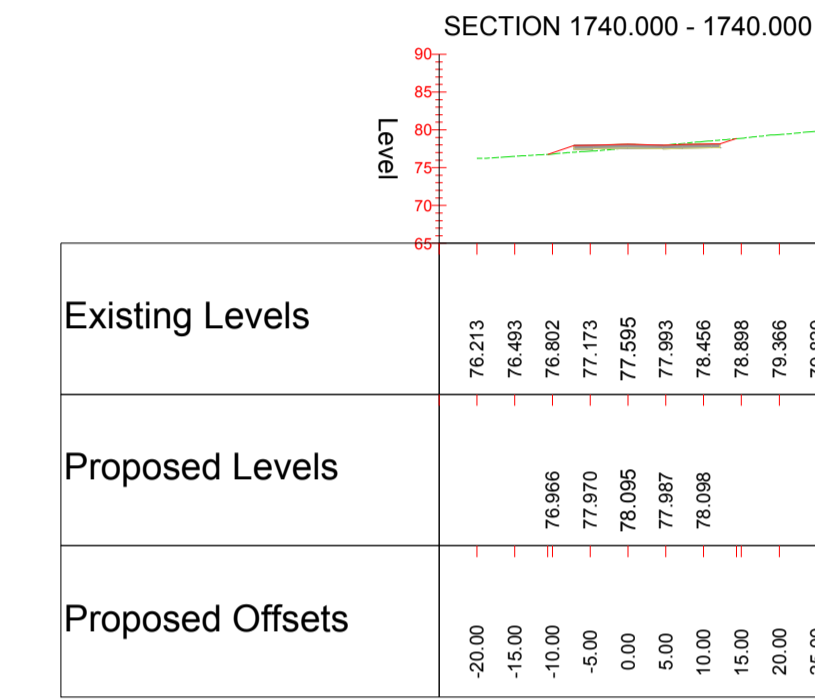
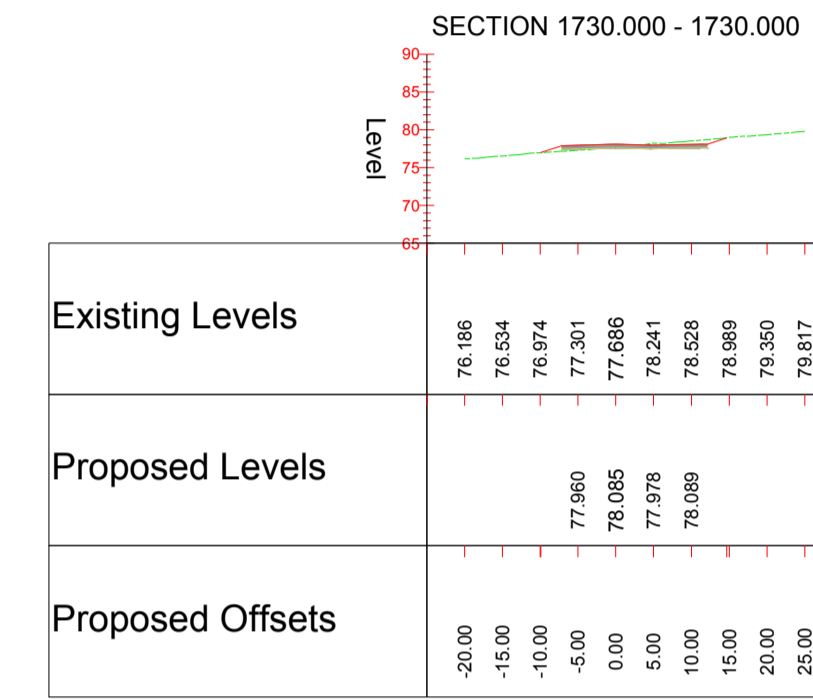
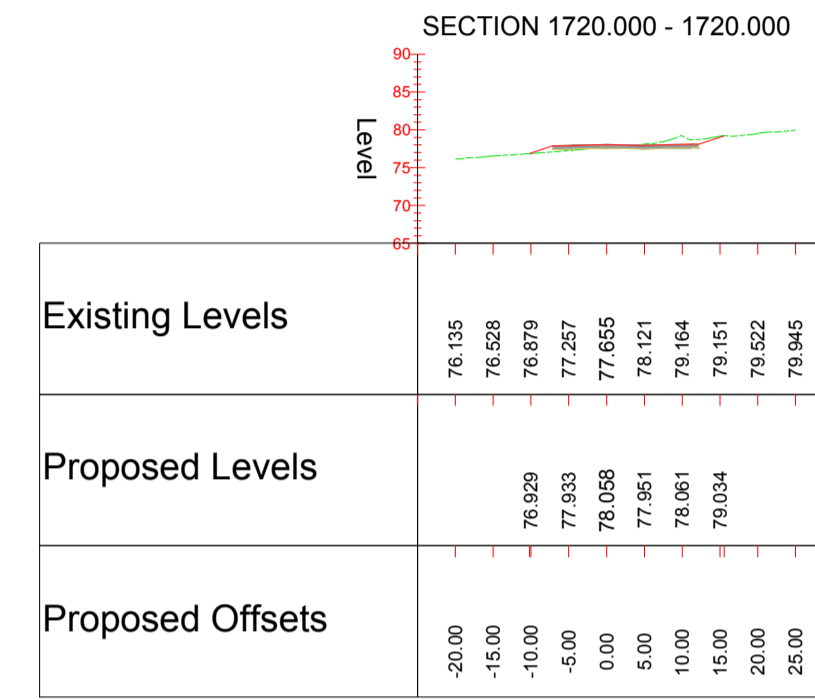
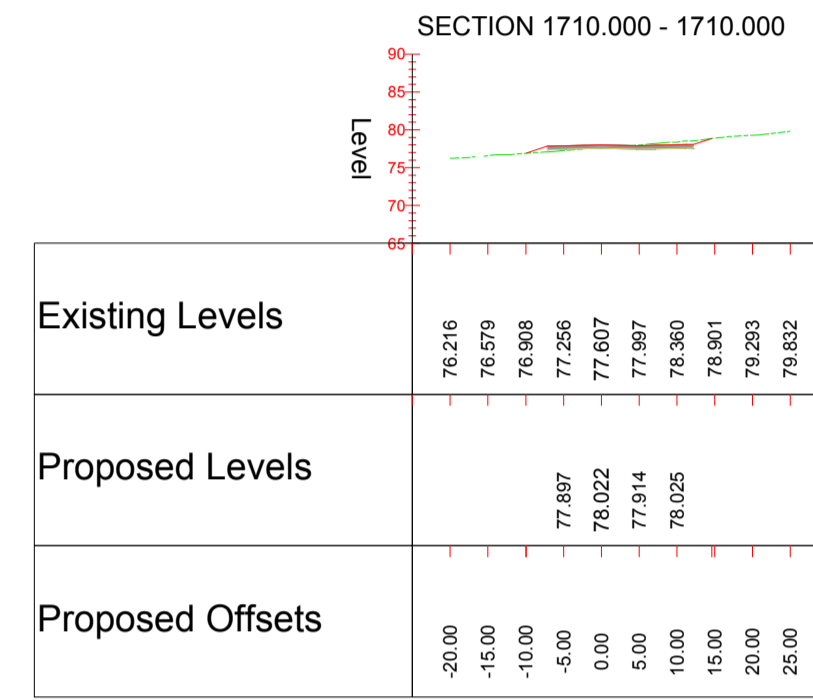
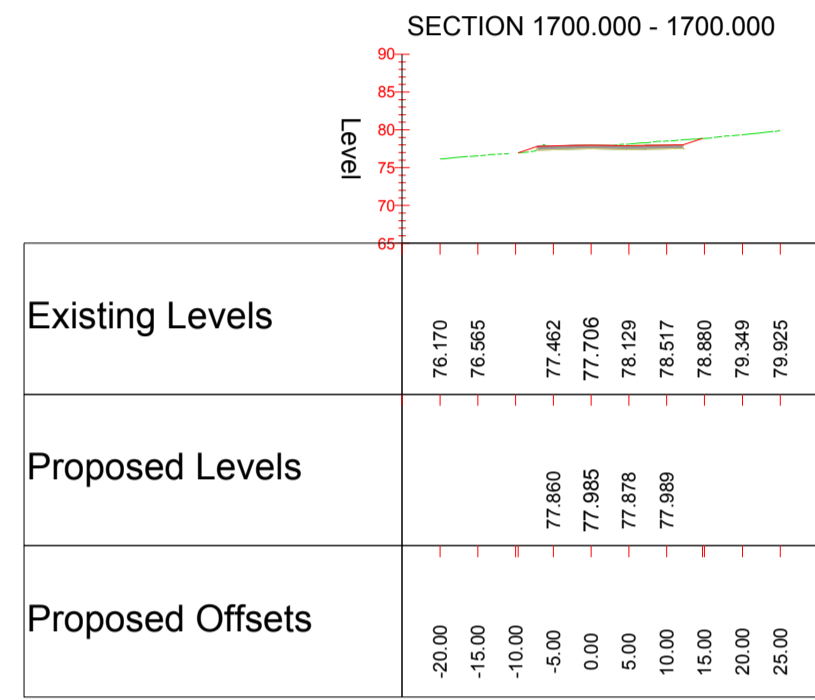
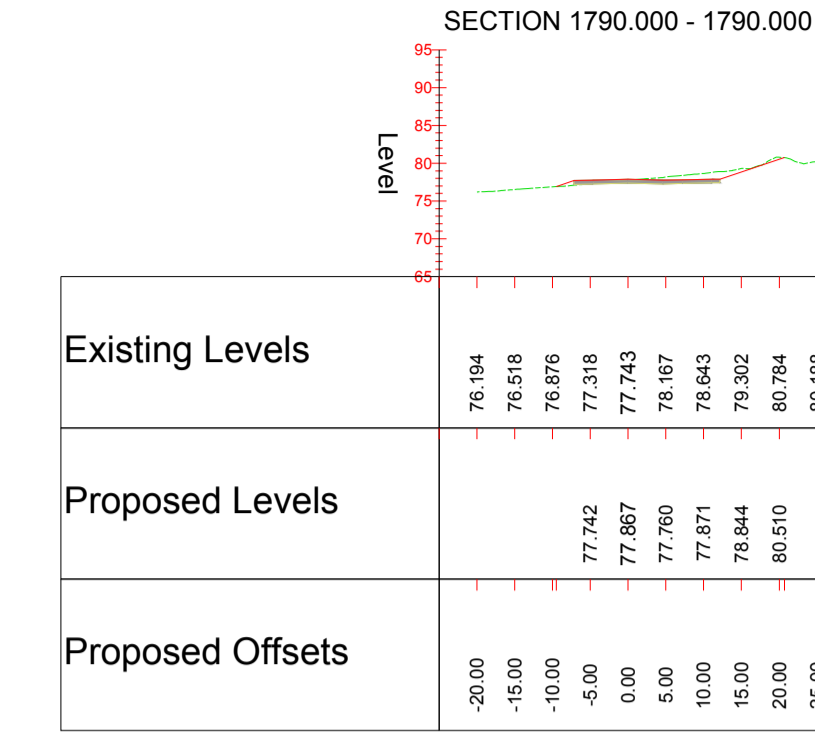
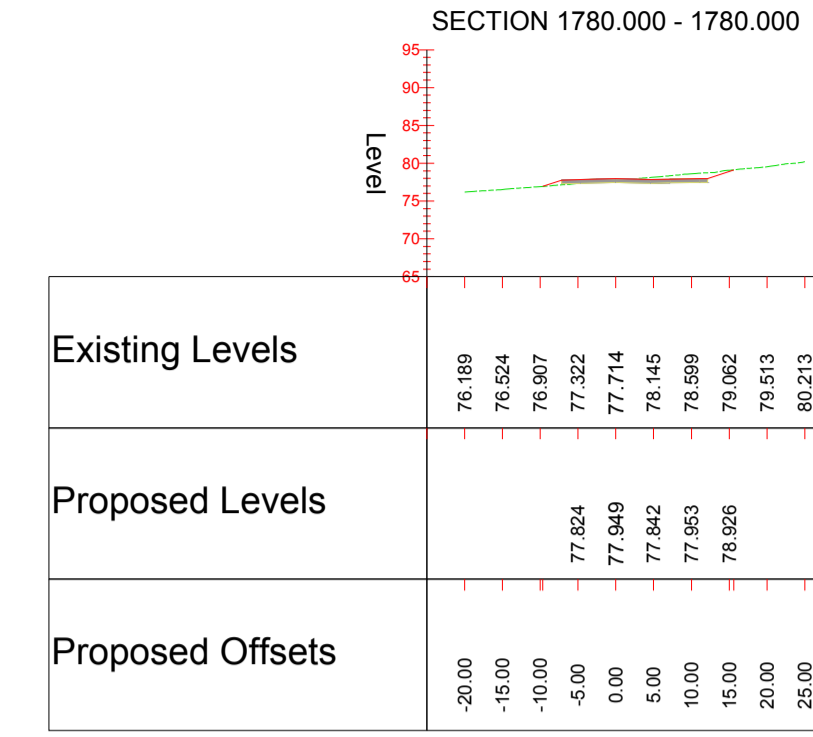
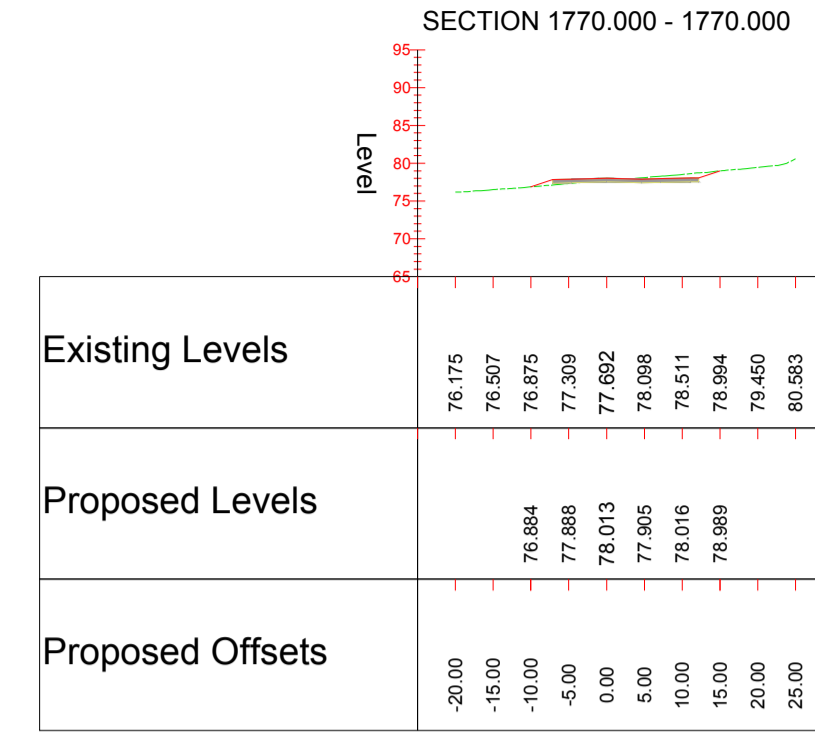
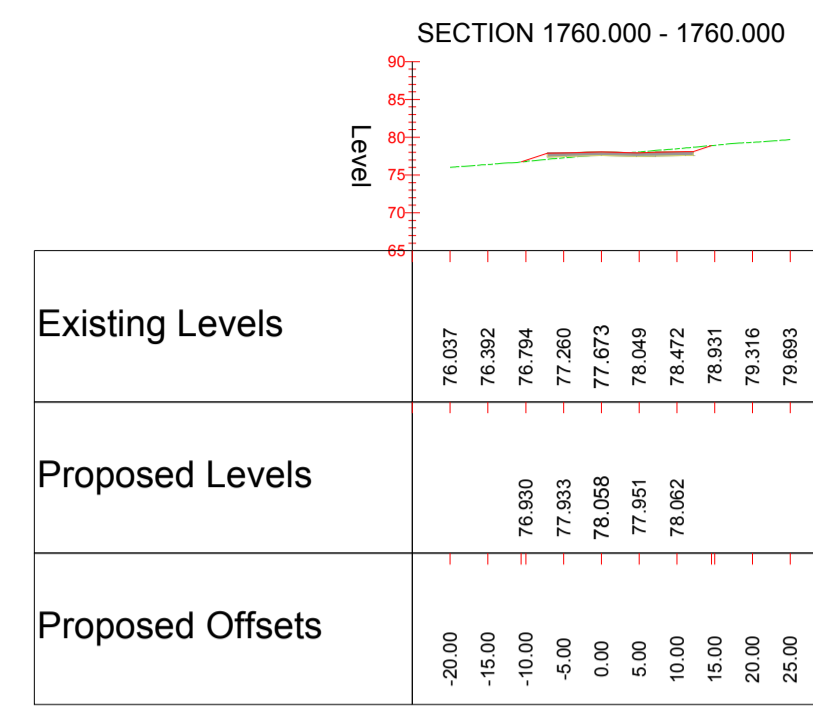
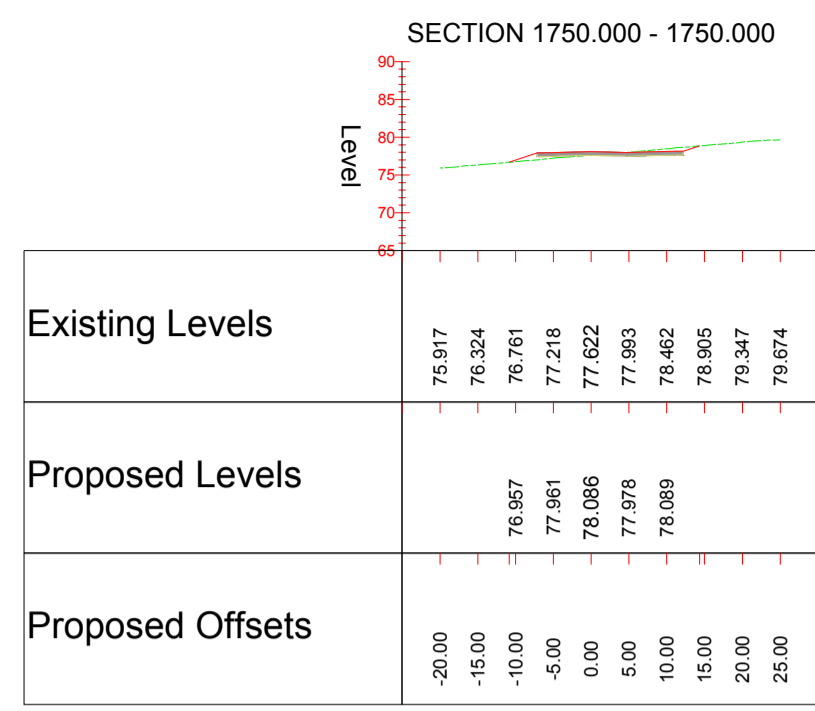
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Project Title: WEST OF ENGLAND WP1

Drawing Title: A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 2/19

Scale	1:1000	Designed	EC	Drawn	AF	Checked	AH	Authorised	
Original Size	A1	Date	05/02/18	Date	05/02/18	Date	05/02/18	Date	
Drawing Number	Woe	Originator	ATK	Volume	HGN	Project Ref. No.	0000000	Revision	
HA PIN	WP1	Type	- DR - D	Number	6511	Revision			P1

CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

**SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION**

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

**CONSTRUCTION**  
NONE

**MAINTENANCE/CLEANING**  
NONE

**DECOMMISSIONING/DEMOLITION**  
NONE

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

P1	05.02.18	DRAWING CREATED	AF		
Rev.	Date	Description	By	Chkd	App'd

Drawing Status: **FOR INFORMATION**

Subsidiary: **S2**

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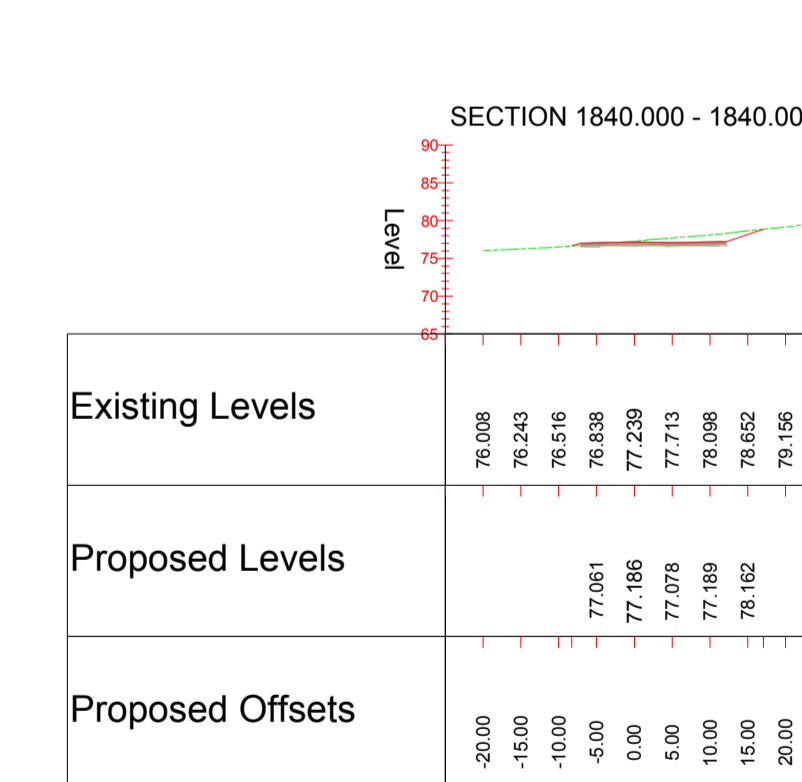
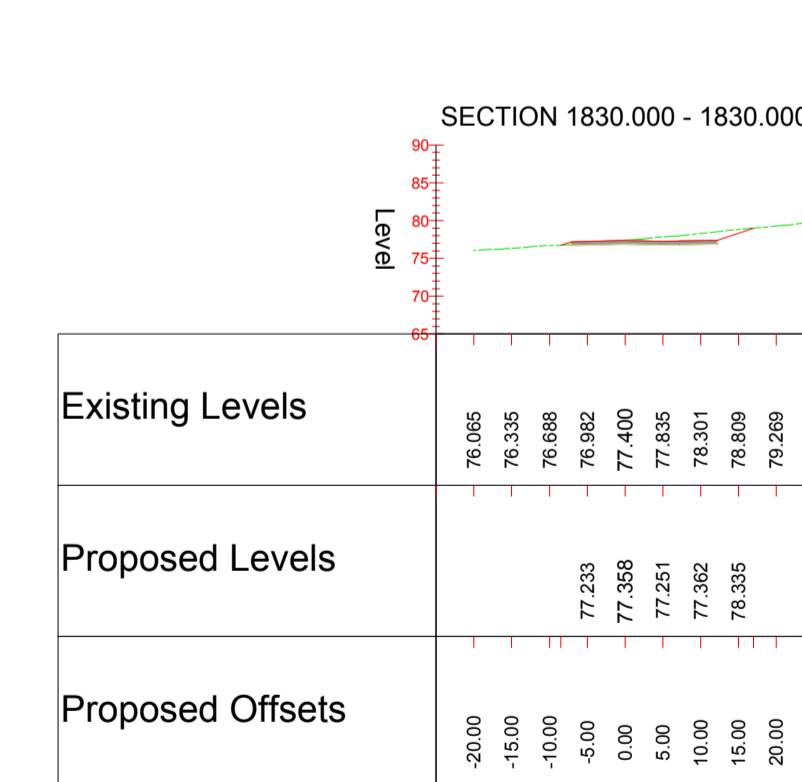
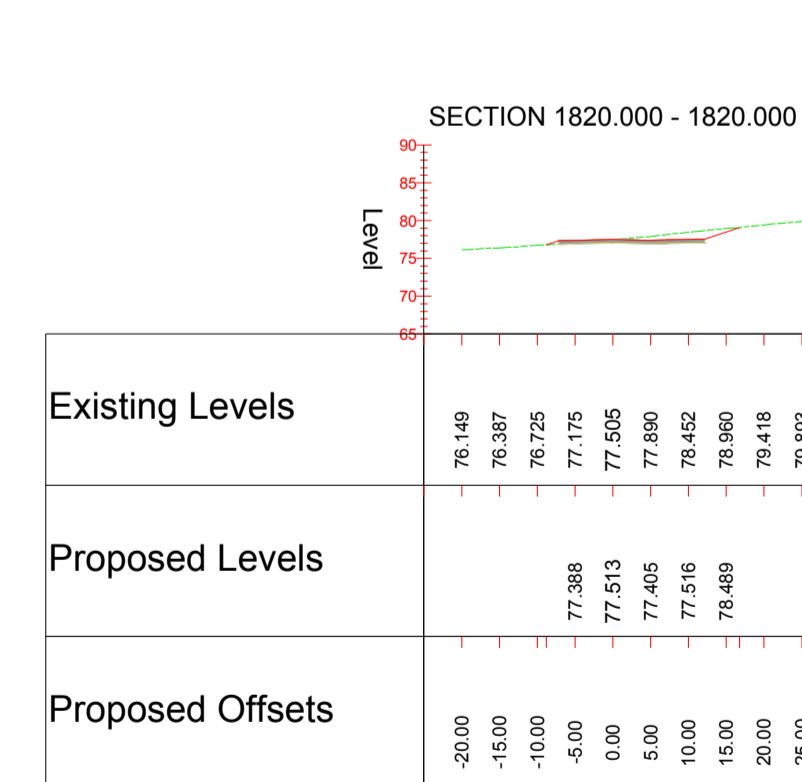
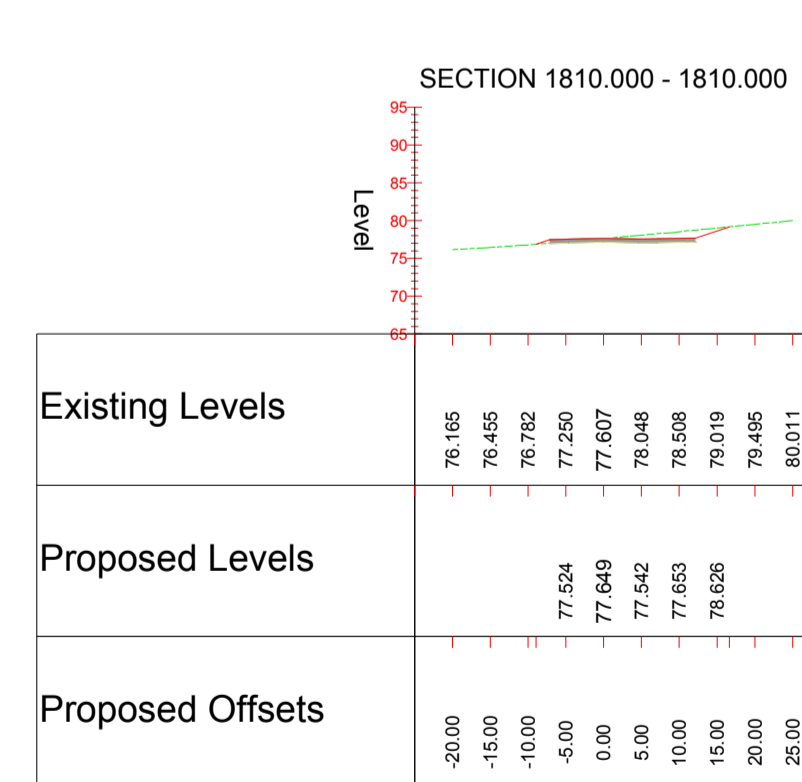
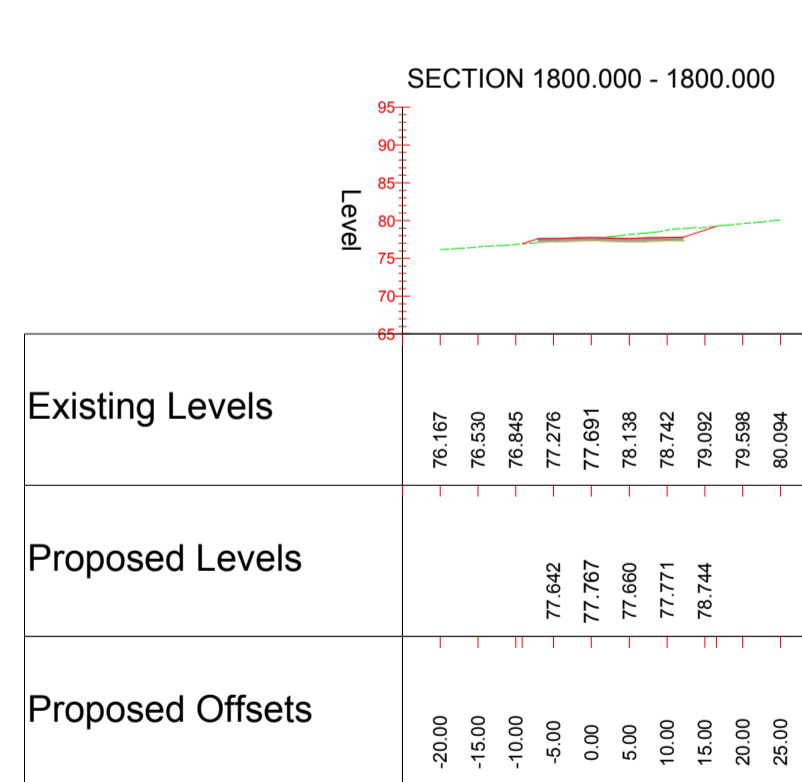
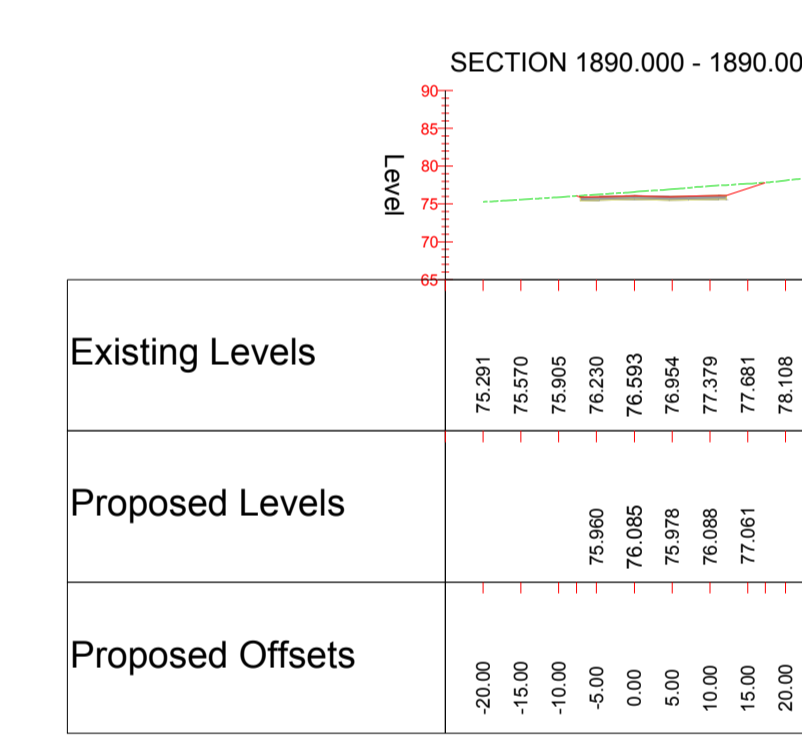
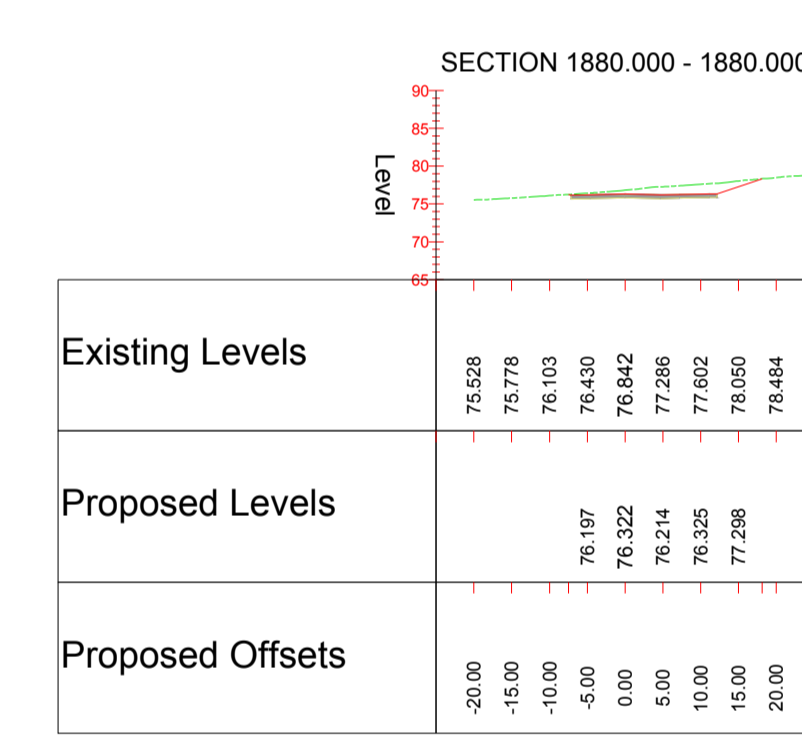
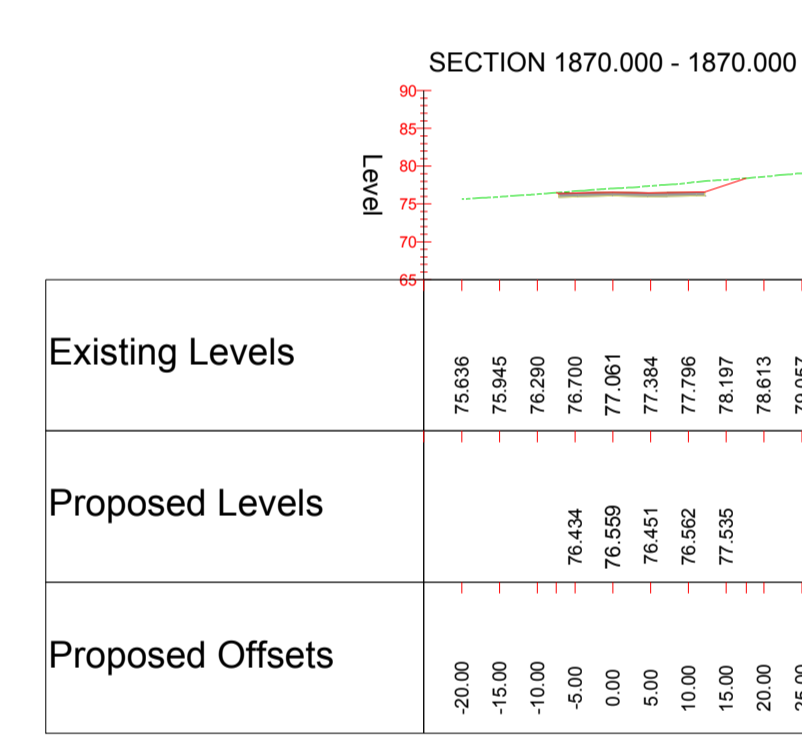
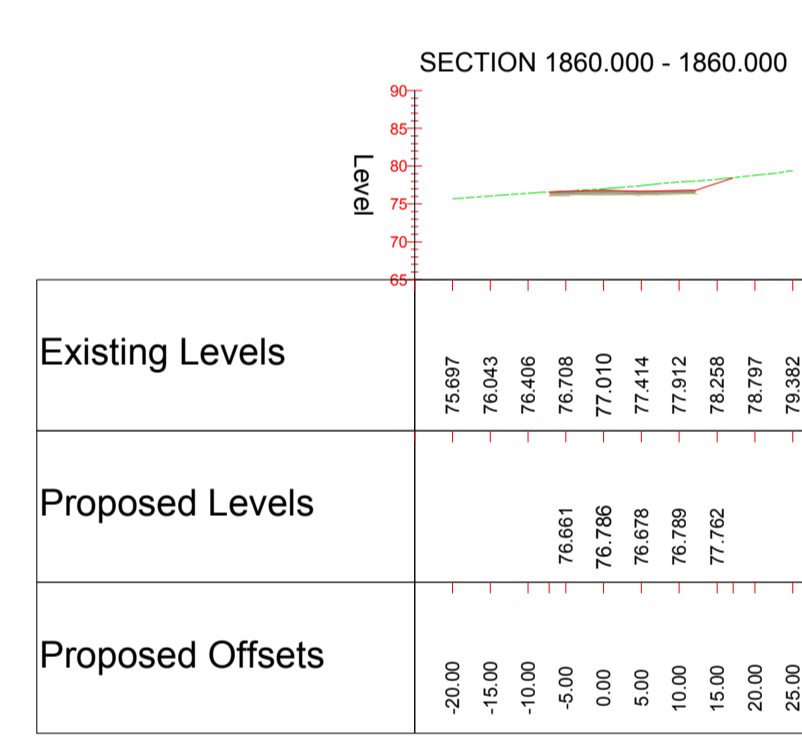
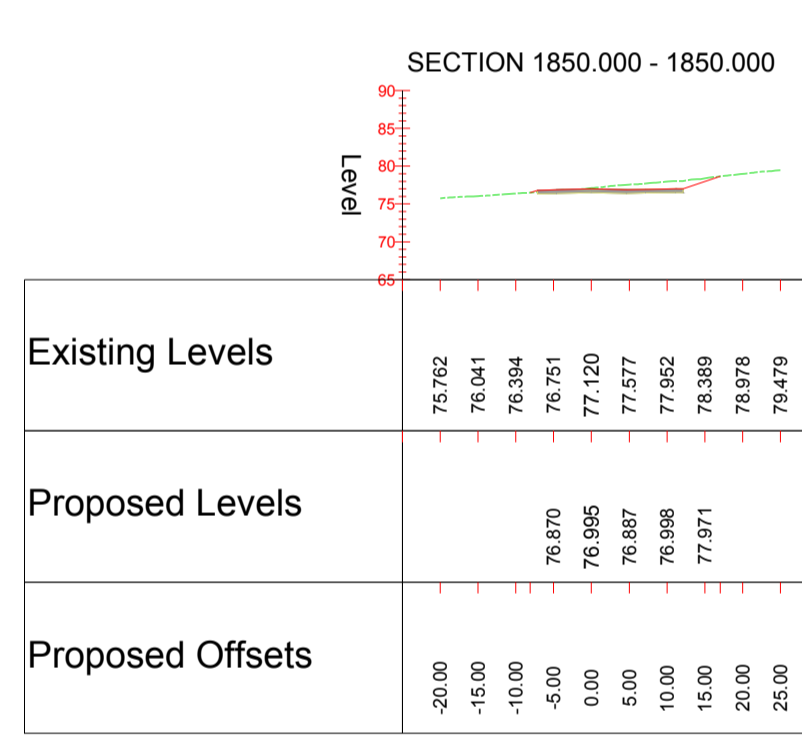
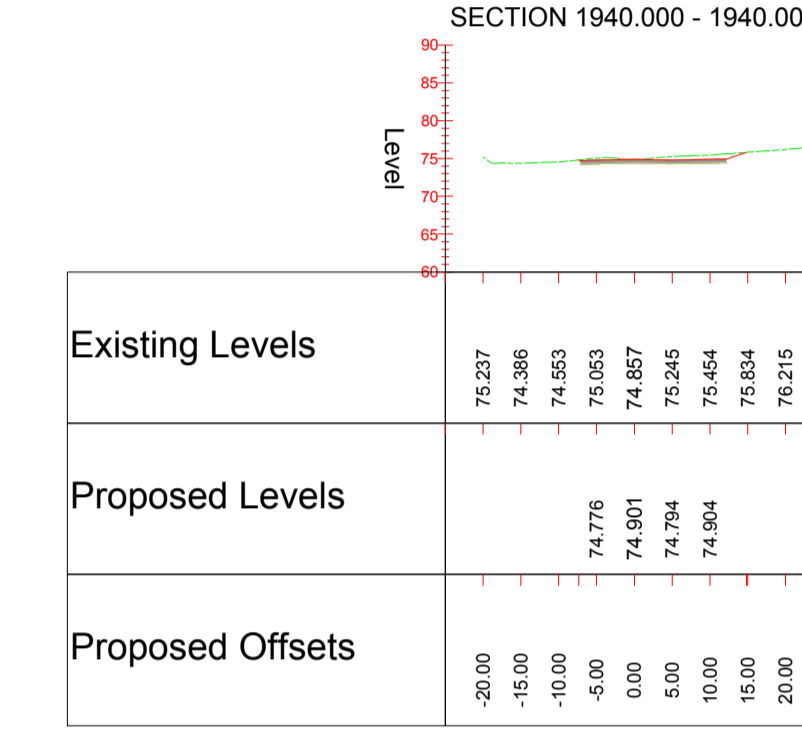
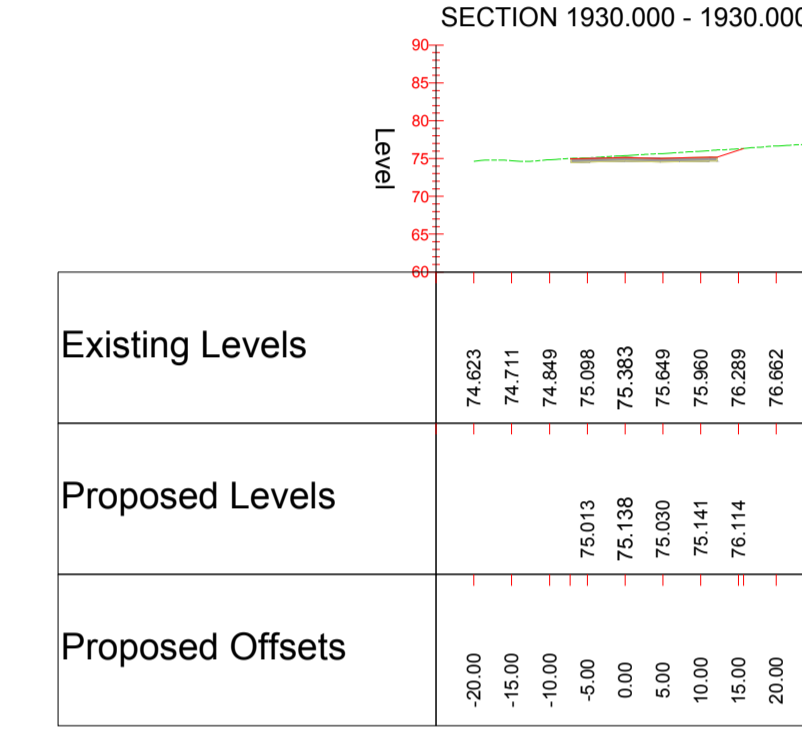
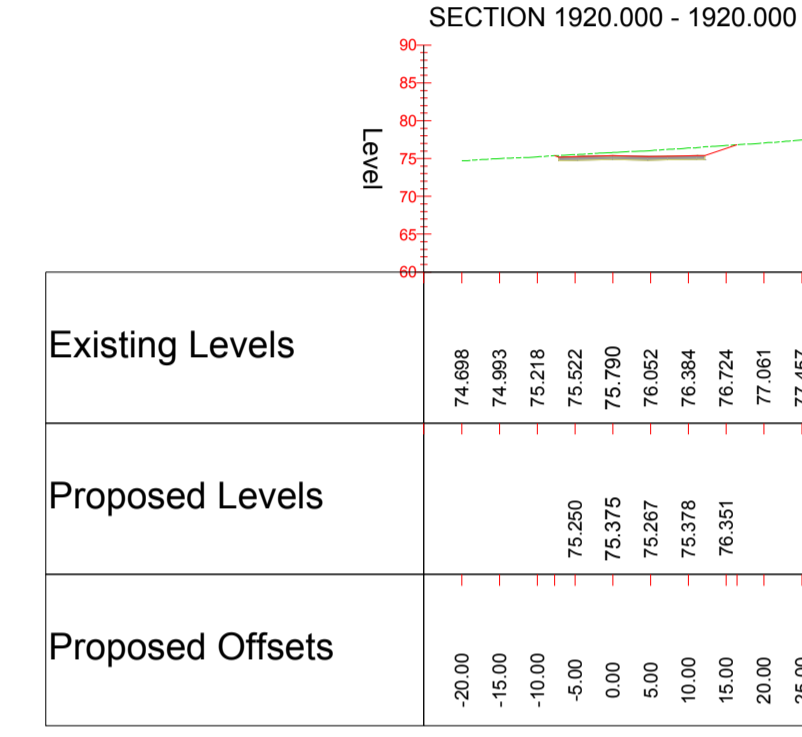
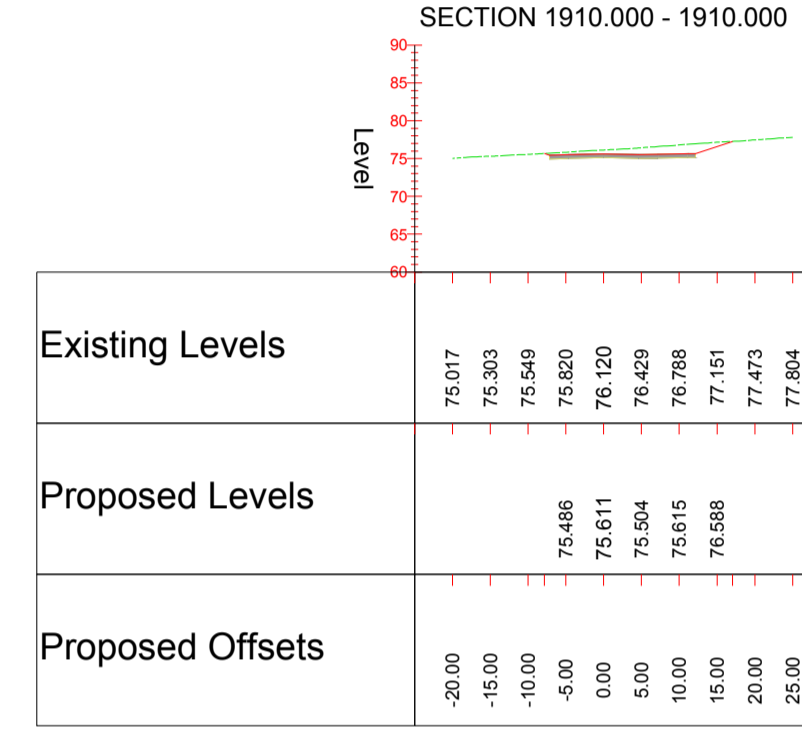
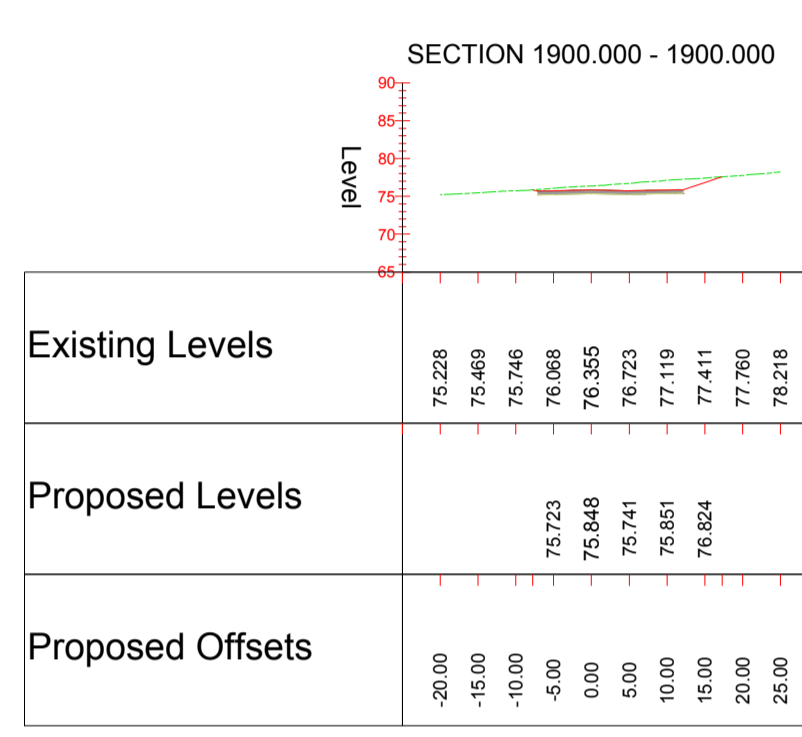
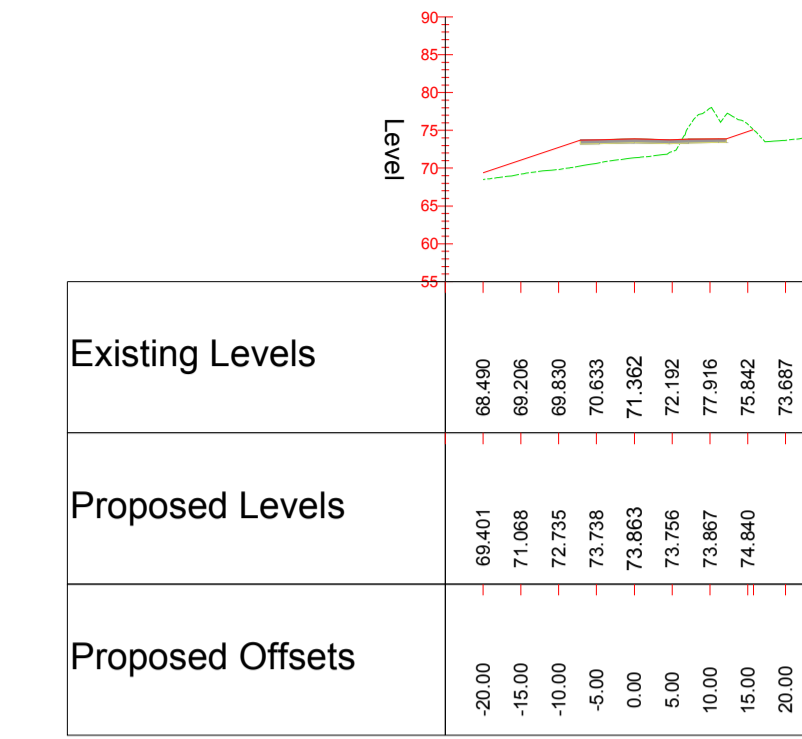
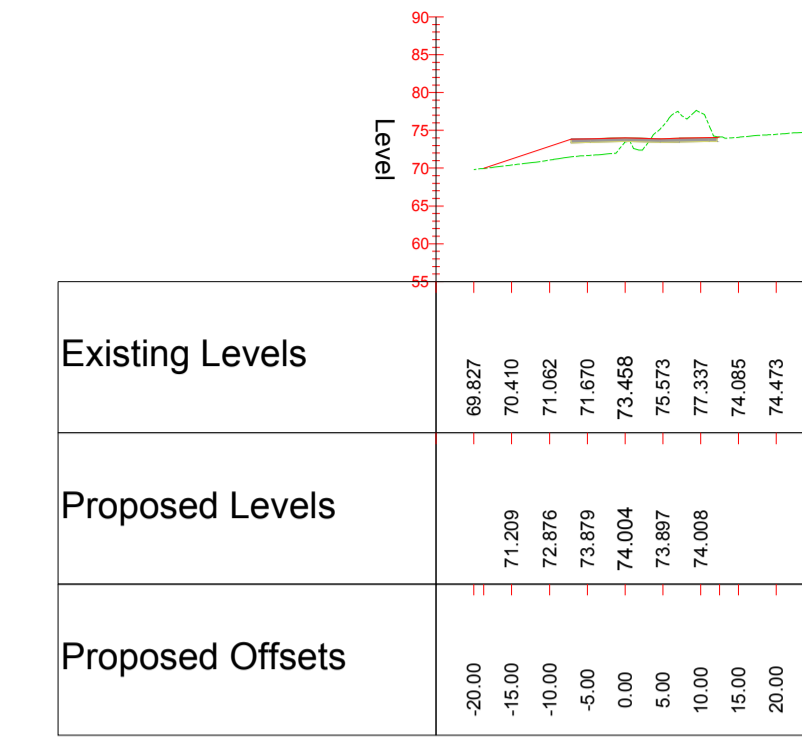
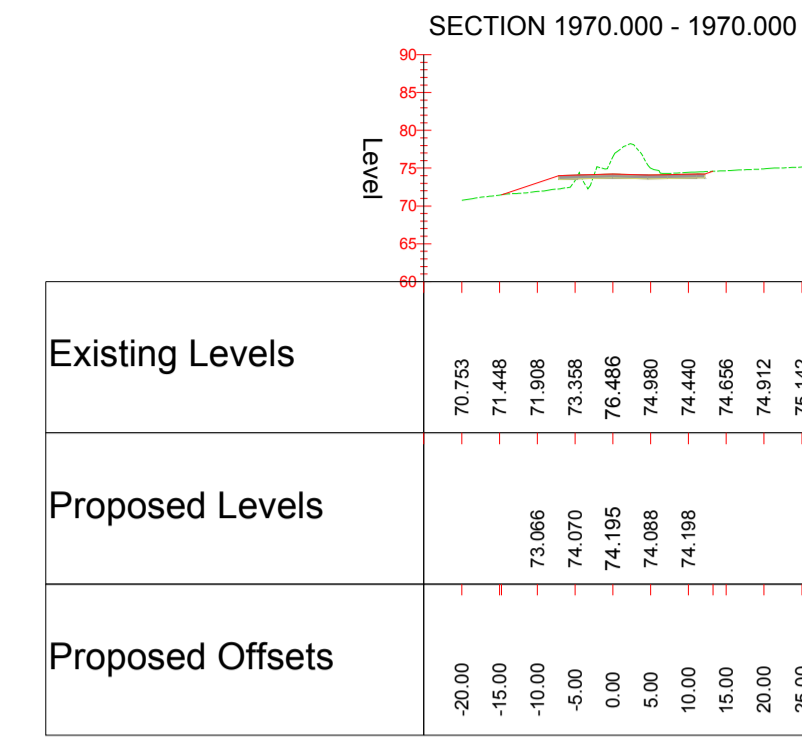
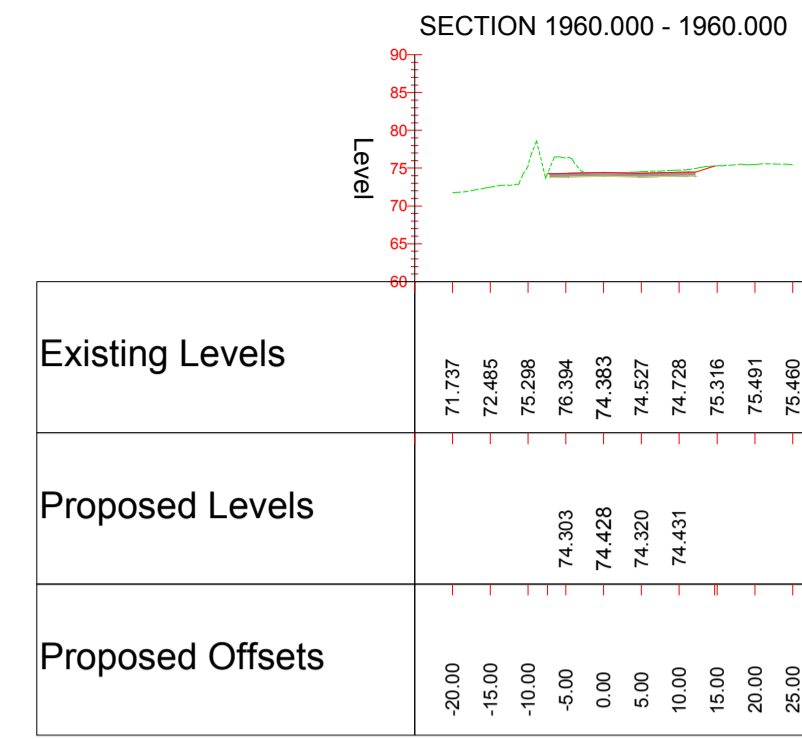
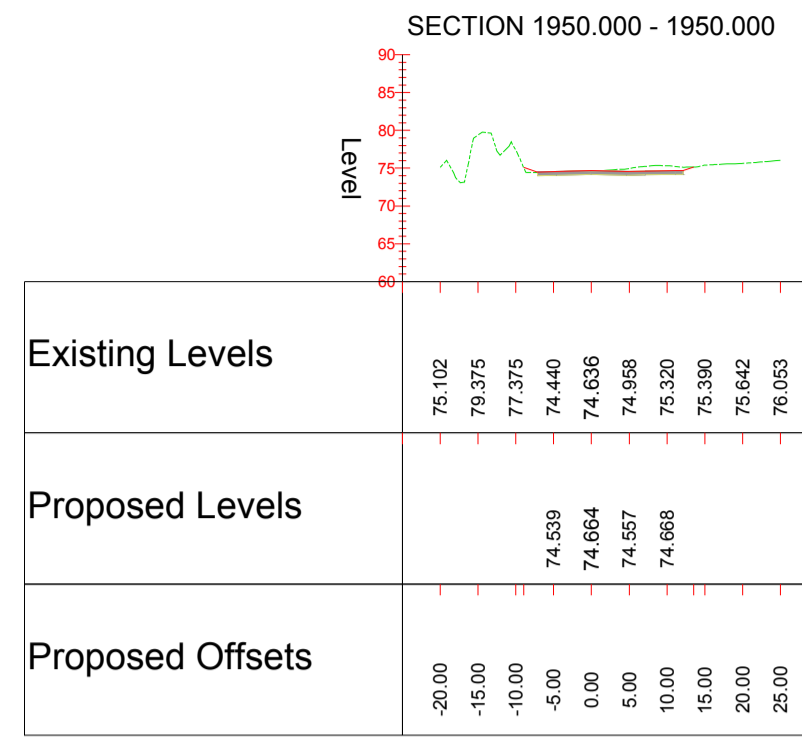
Client: **WEST OF ENGLAND**

Project Title: **WEST OF ENGLAND WP1**

Drawing Title: **A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 9/19**

Scale: 1:1000	Designed: EC	Drawn: AH	Checked: AH	Authorised:
Original Size: A1	Date: 05/02/18	Date: 05/02/18	Date: 05/02/18	Date:
Drawing Number: Woe WP1	Originator: ATK	Volume: HGN	Project Ref. No.: 0000000	Revision: P1
Location:	Type: DR - D - 6512	Role:	Number:	

CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

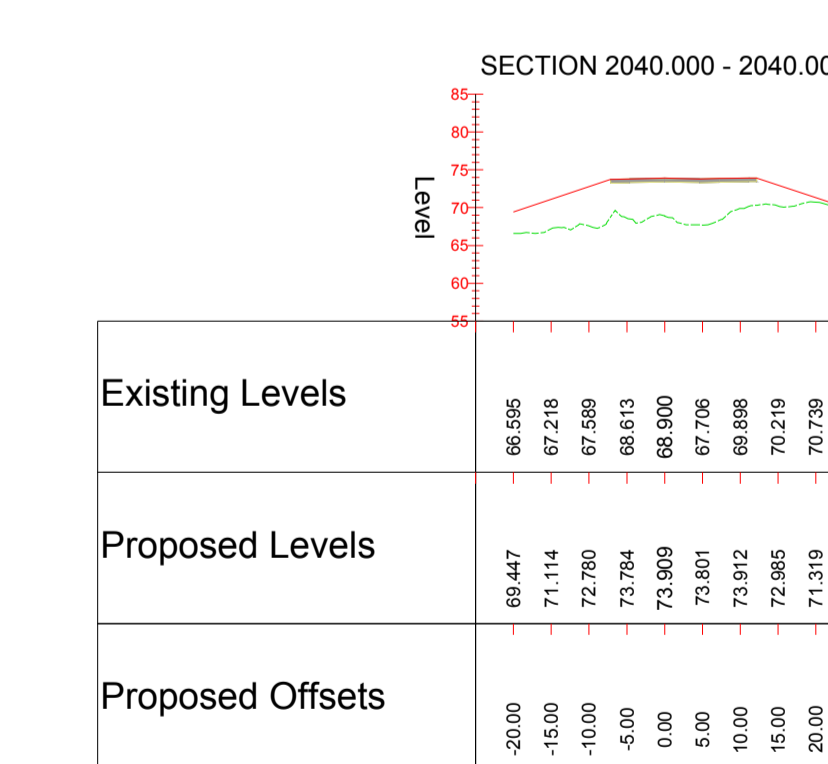
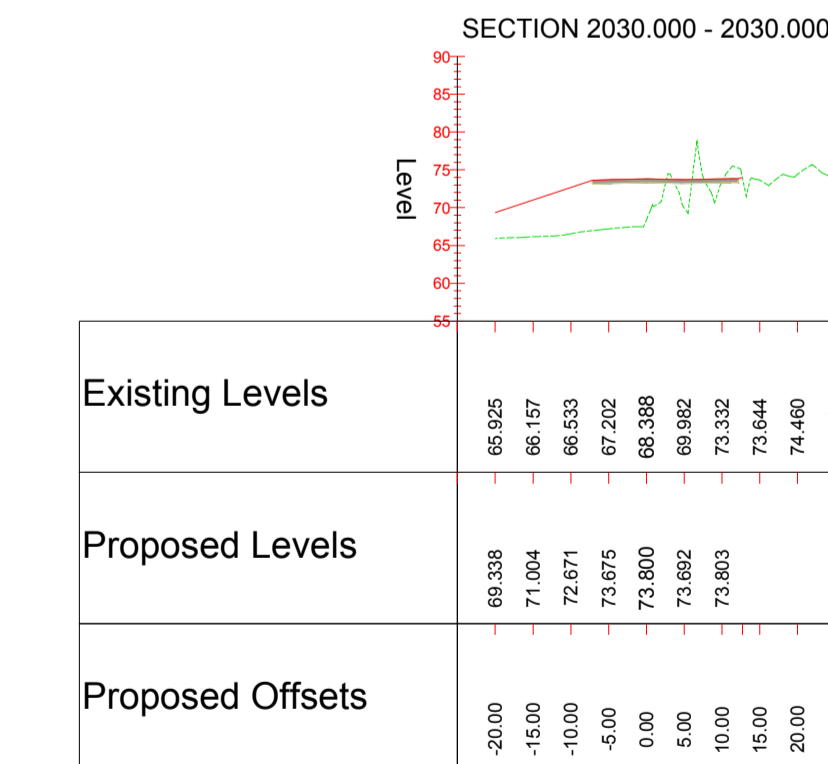
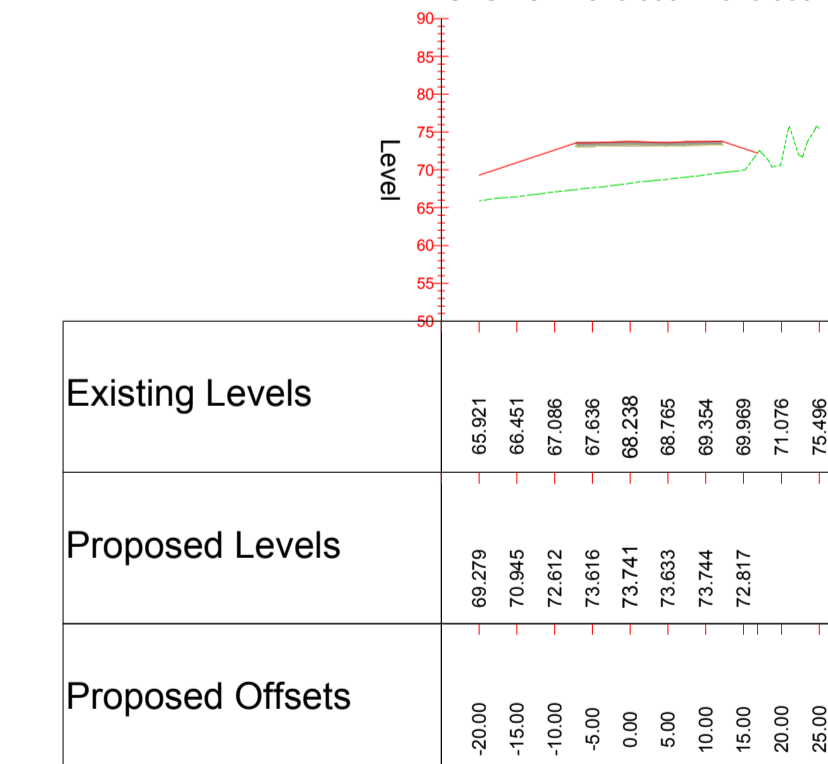
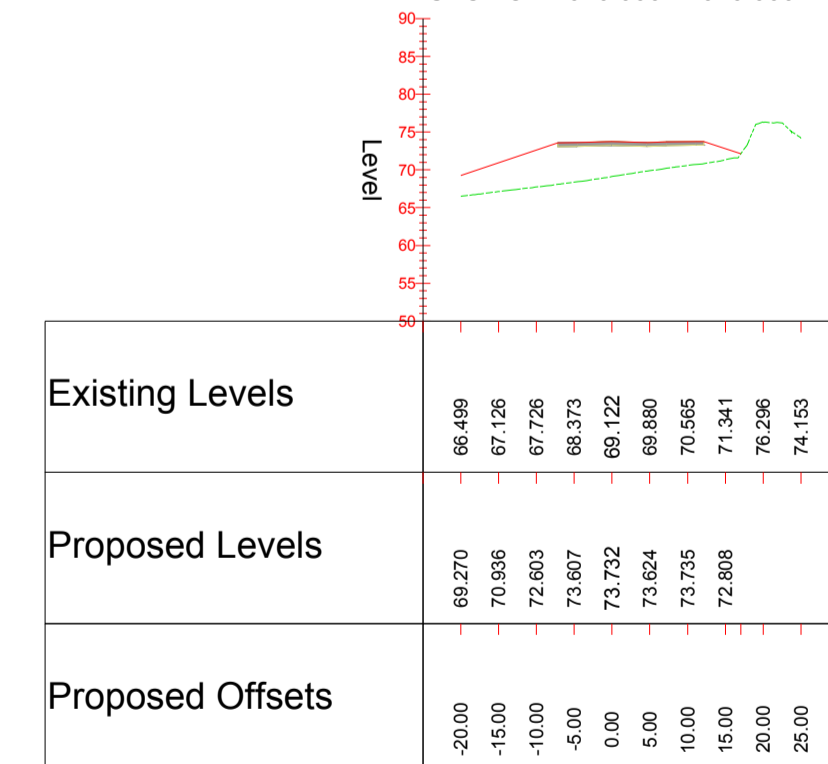
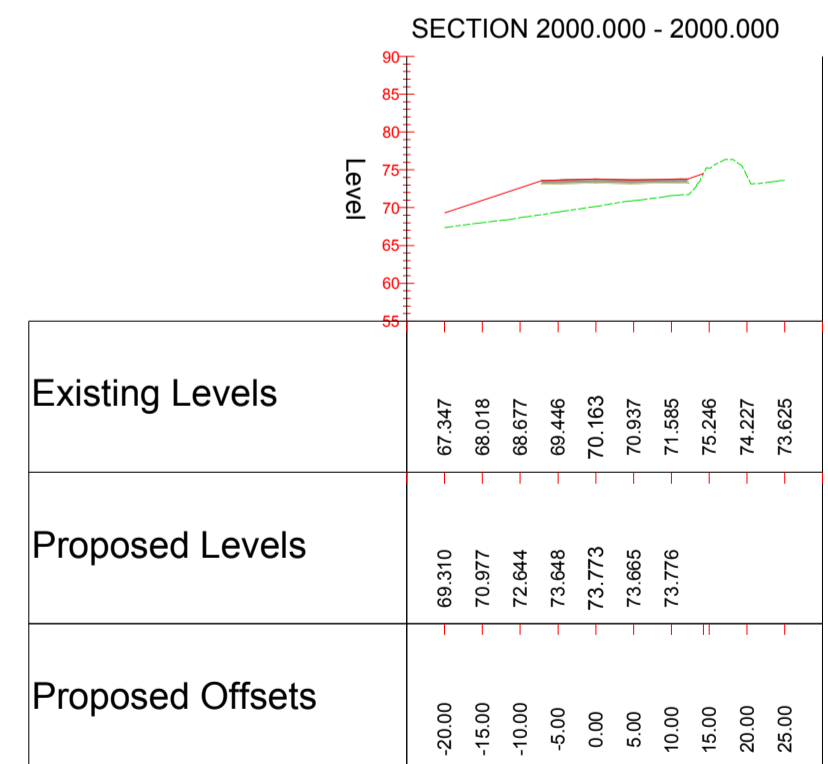
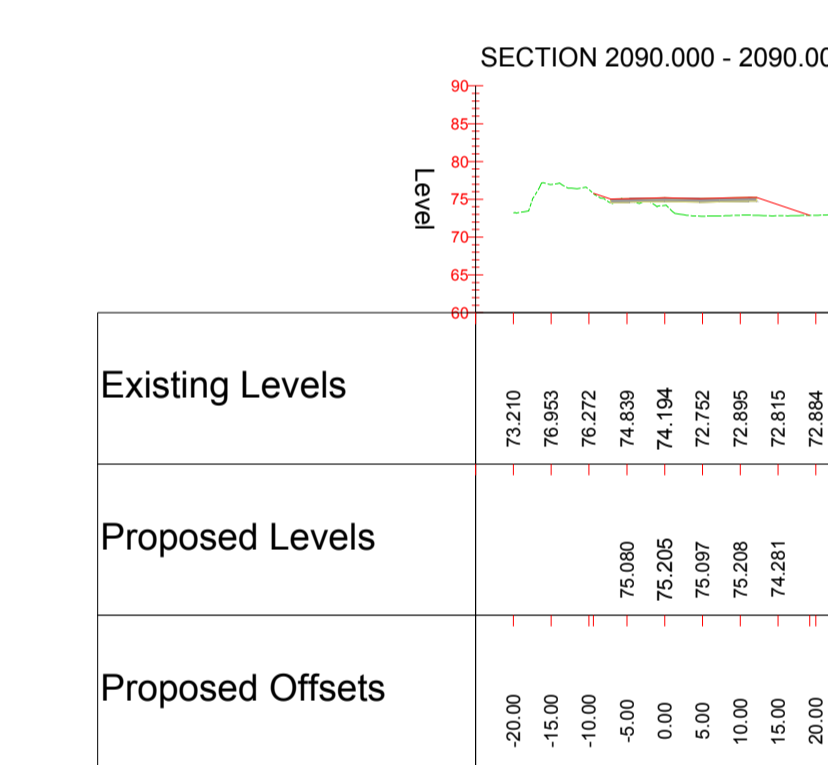
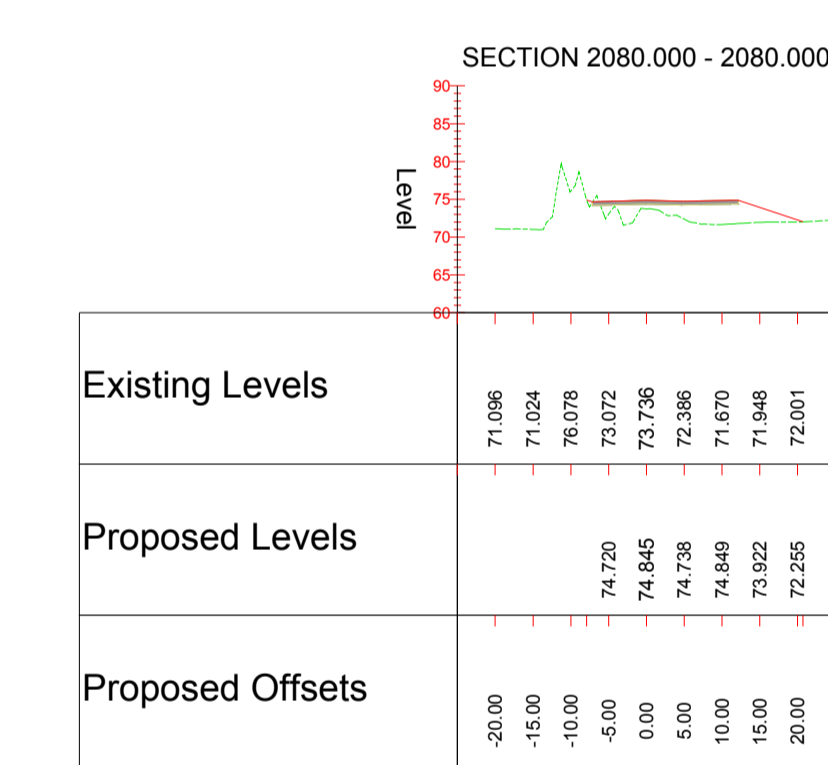
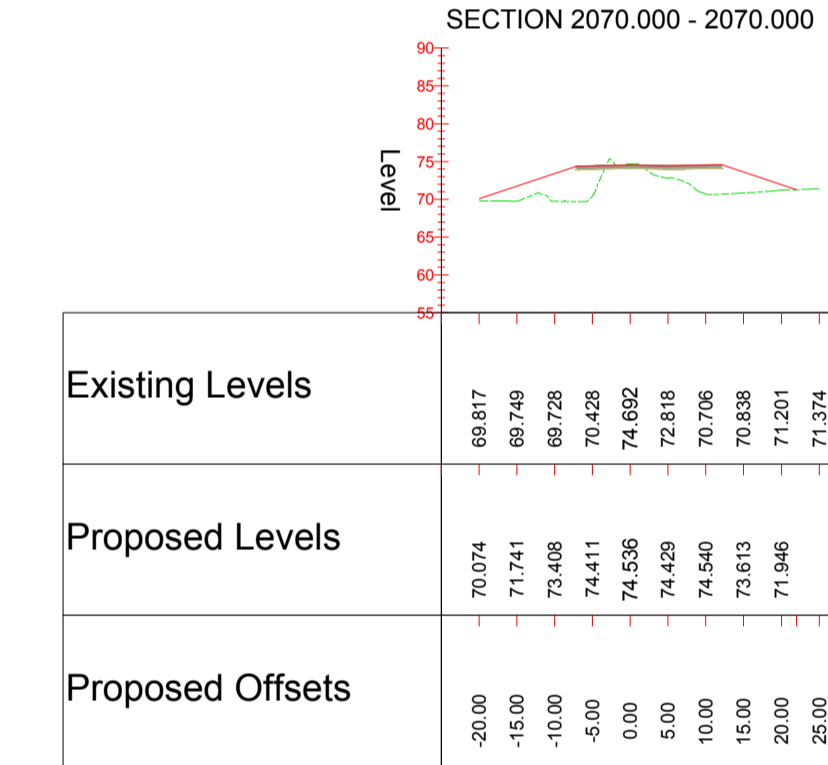
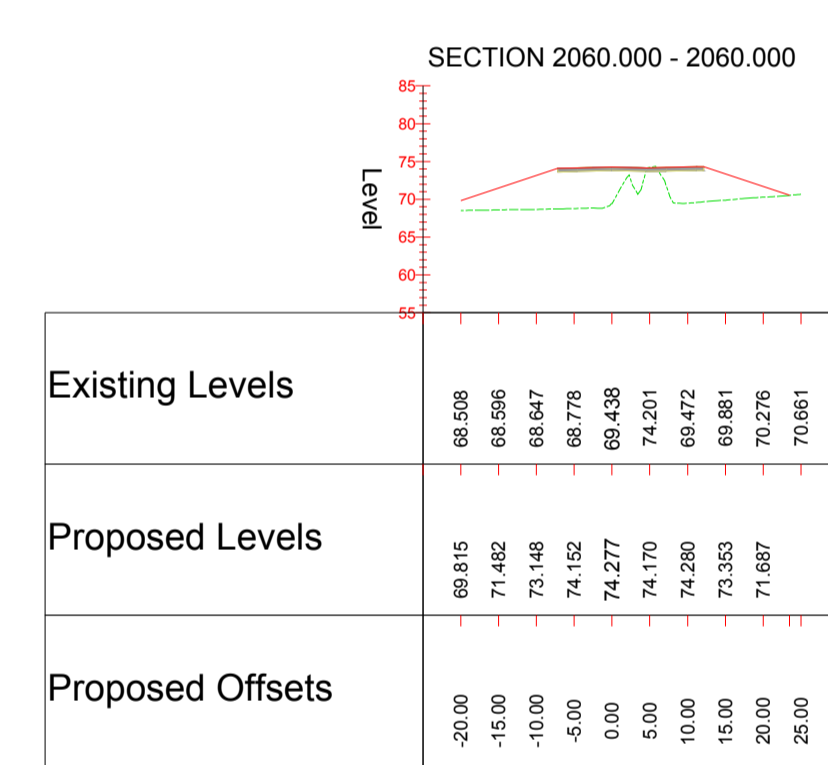
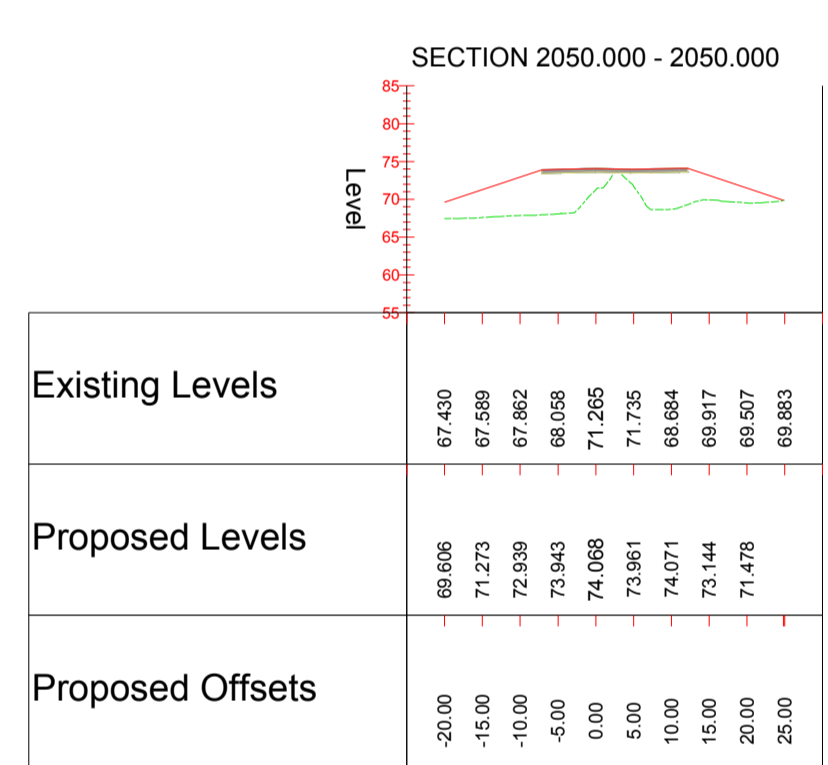
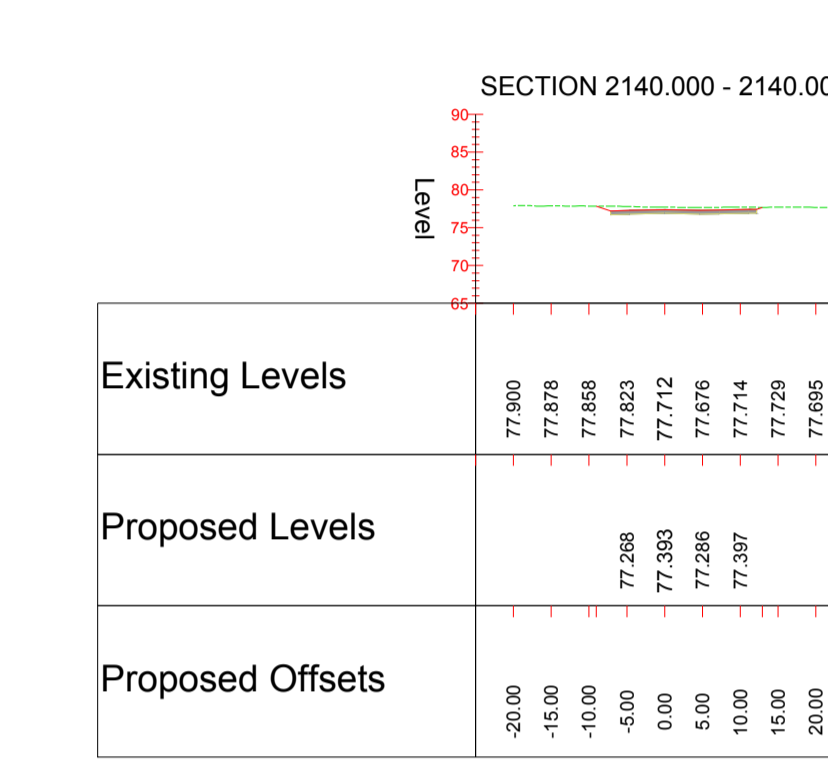
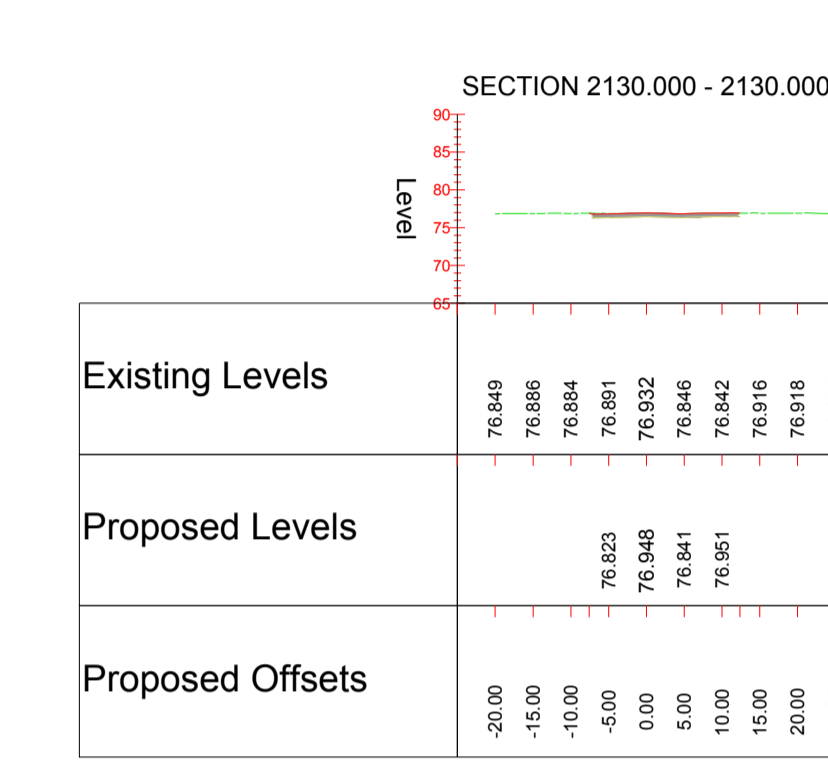
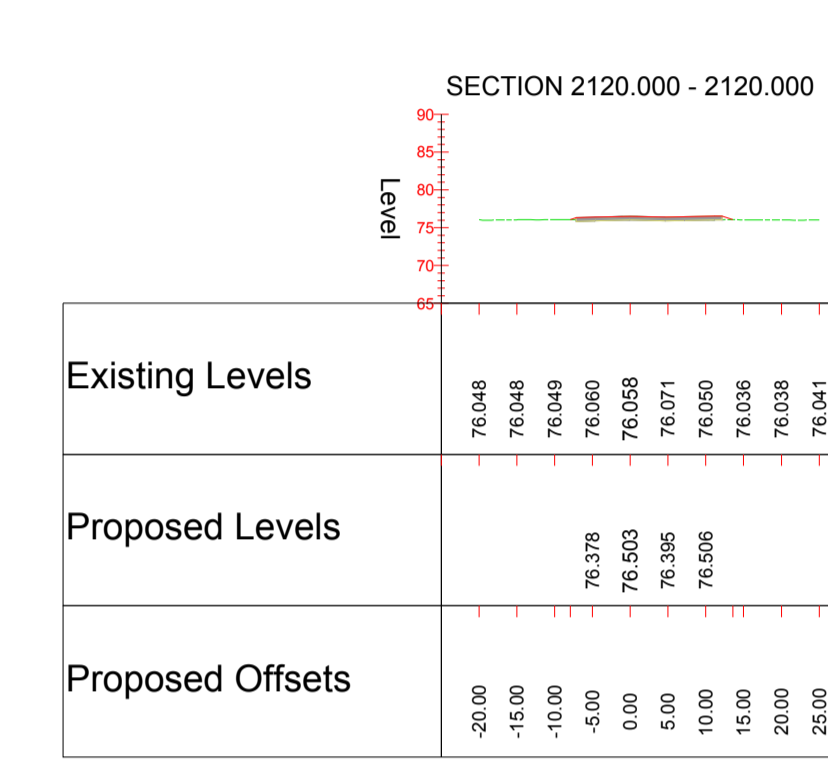
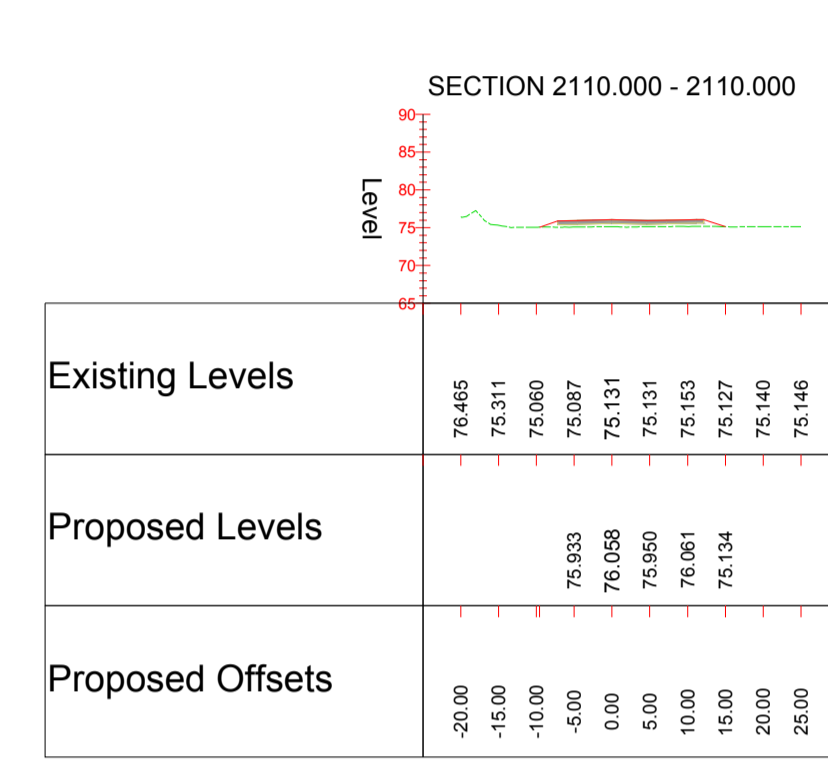
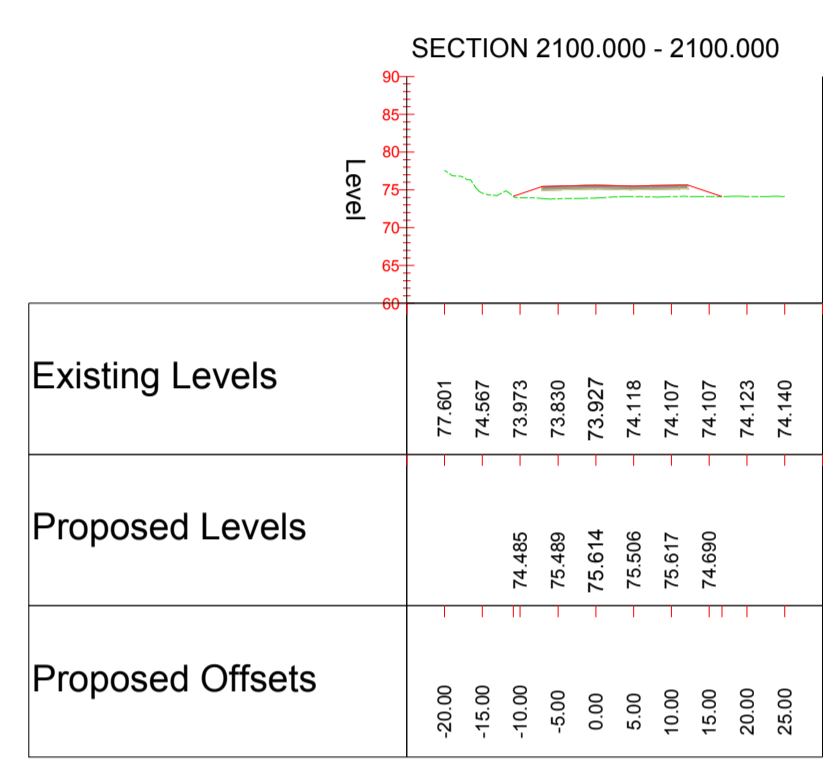
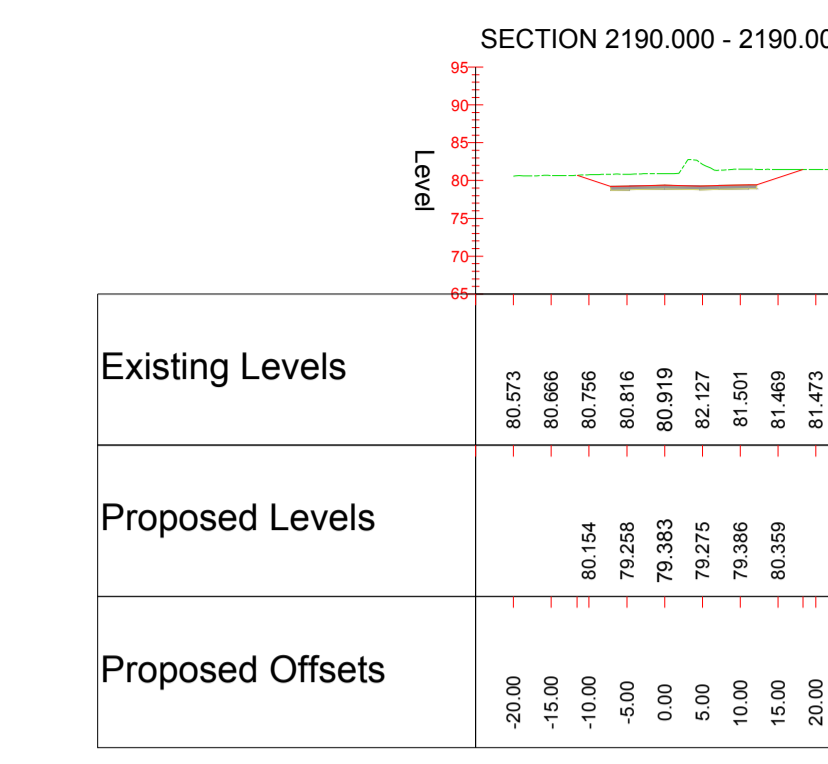
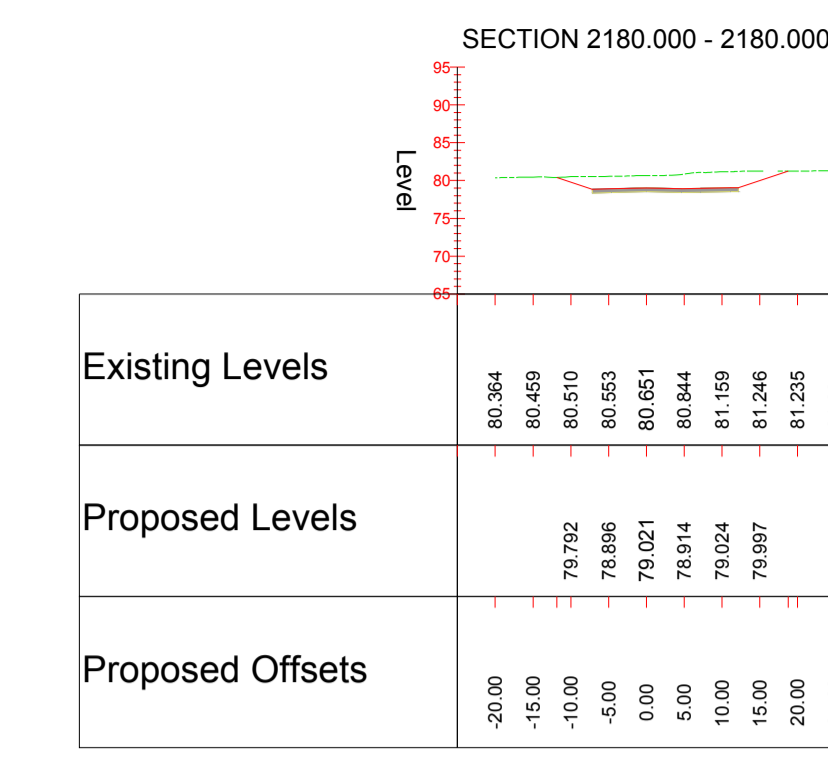
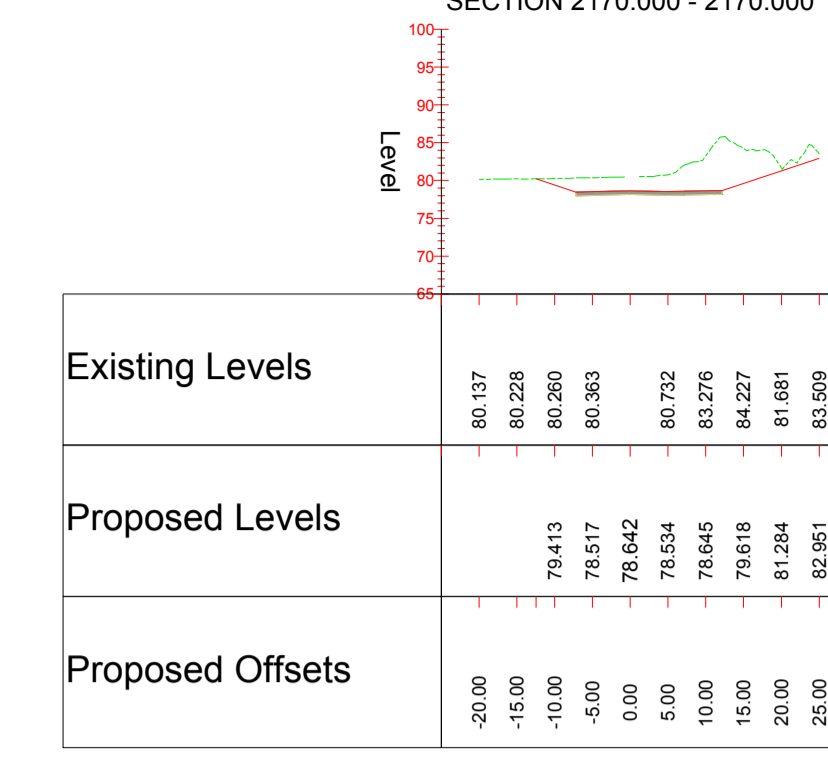
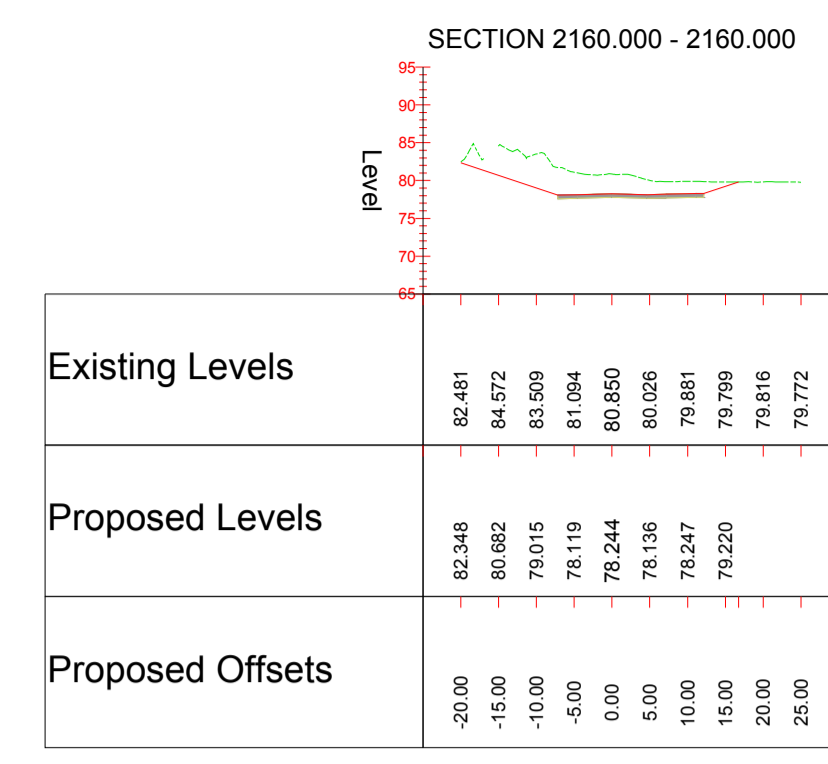
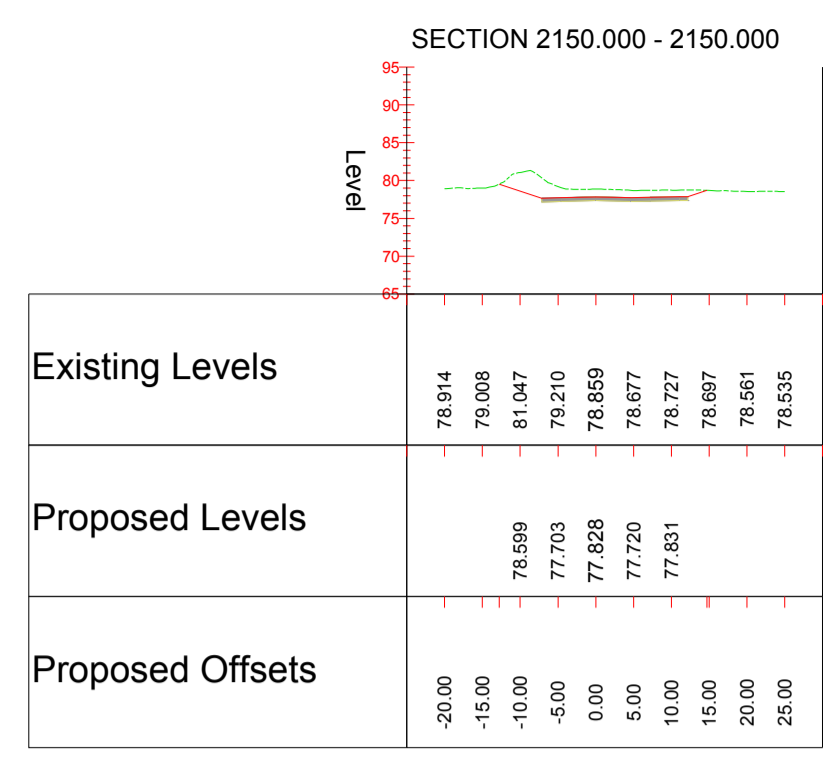
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION			
NONE			
MAINTENANCE/CLEANING			
NONE			
DECOMMISSIONING/DEMOLITION			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF

Drawing Status	FOR INFORMATION	Suitability	S2	Project Title	WEST OF ENGLAND WP1				
		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Drawing Title A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 13 19					
Copyright	© Atkins Limited (2014)	Client	WEST OF ENGLAND						
Scale	1:1000	Designed	EC	Drawn	AF	Checked	AH	Authorised	
Original Size	A1	Date	05/02/18	Date	05/02/18	Date	05/02/18	Date	
Drawing Number	HA PIN	Originator	Woe	Volume	ATK	Project Ref. No.	0000000	Revision	
Location	WP1	Type	- DR - D -	Number	6513	Revision	P1		

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0 10  
Millimetres

**CROSS SECTIONS**  
Scale 1:1000

DO NOT SCALE



Key:

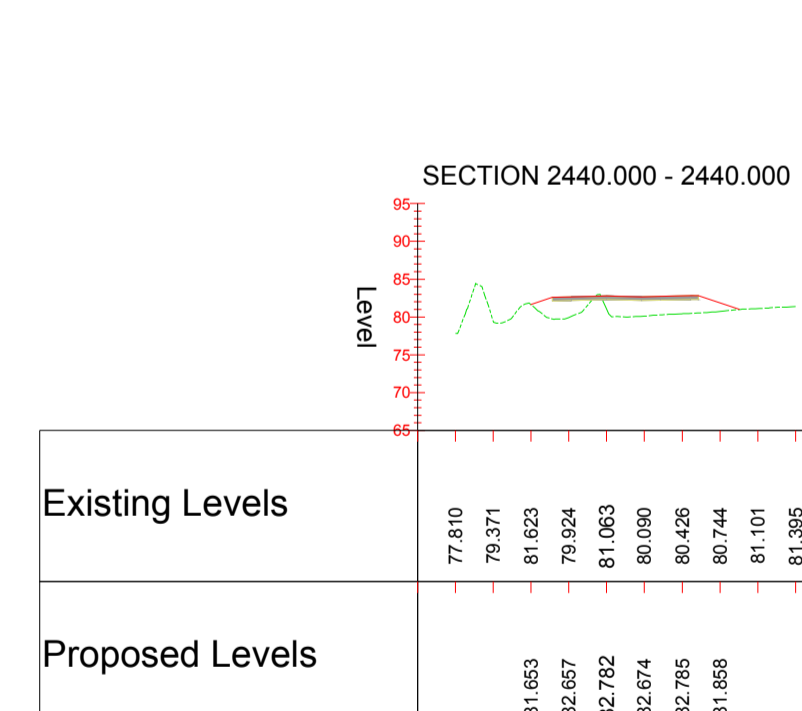
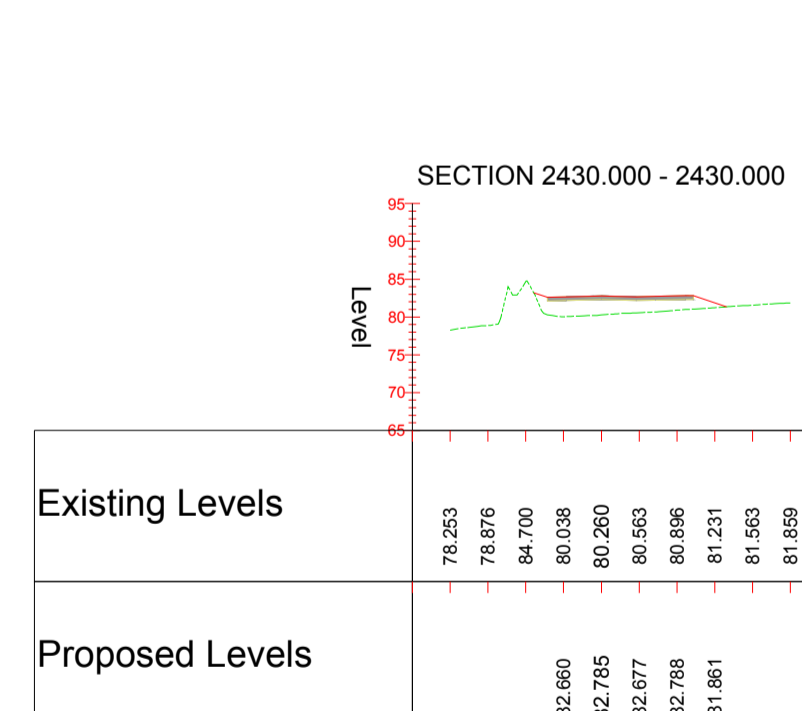
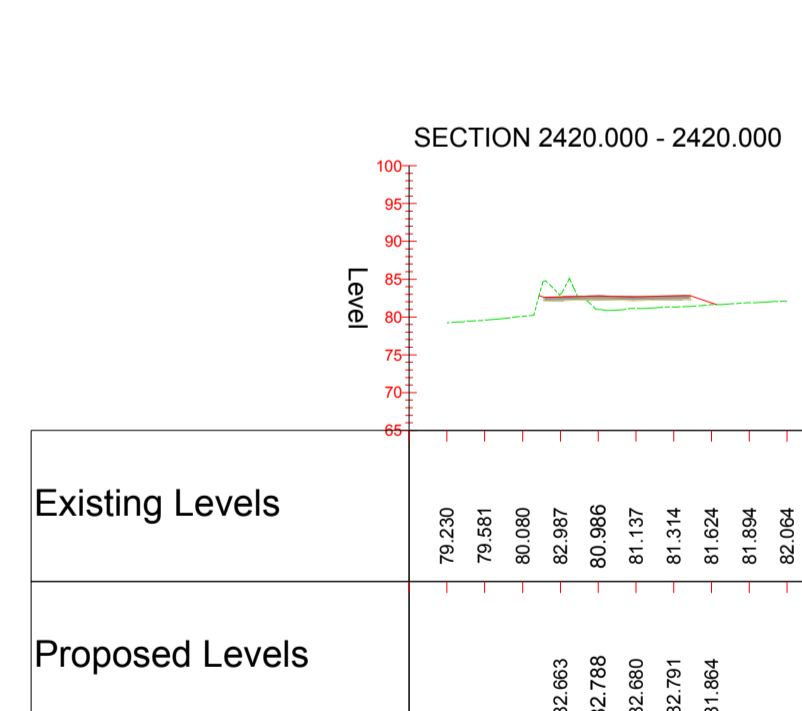
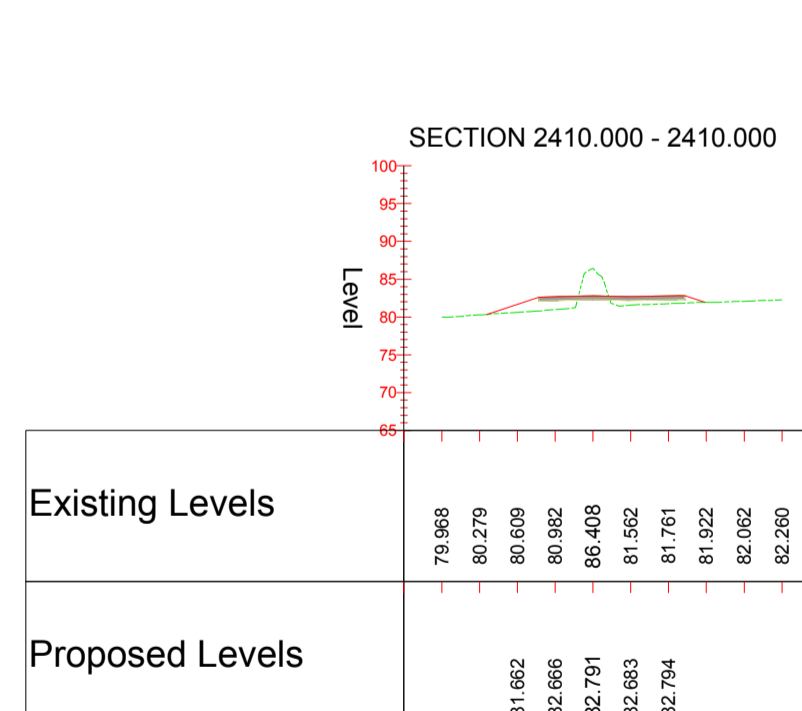
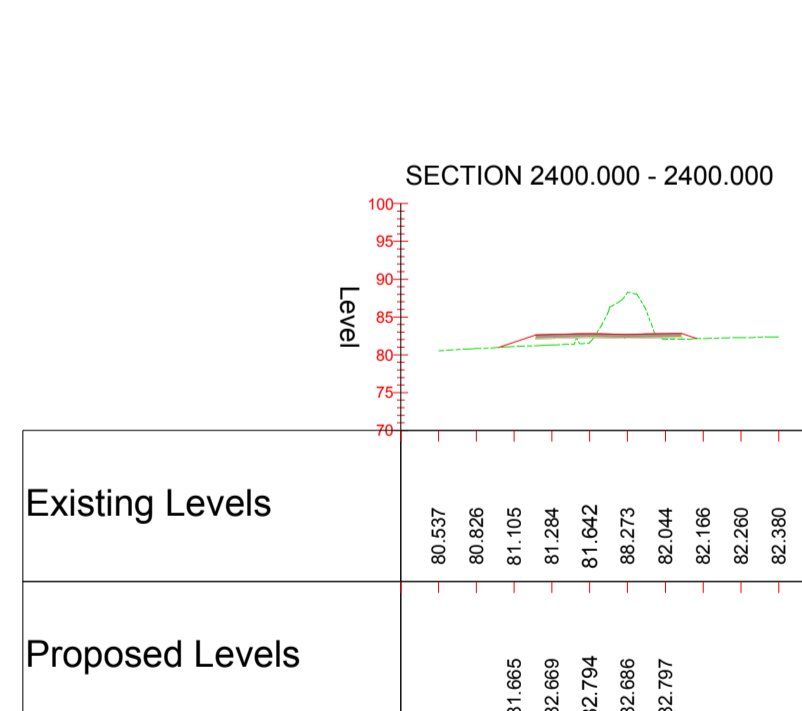
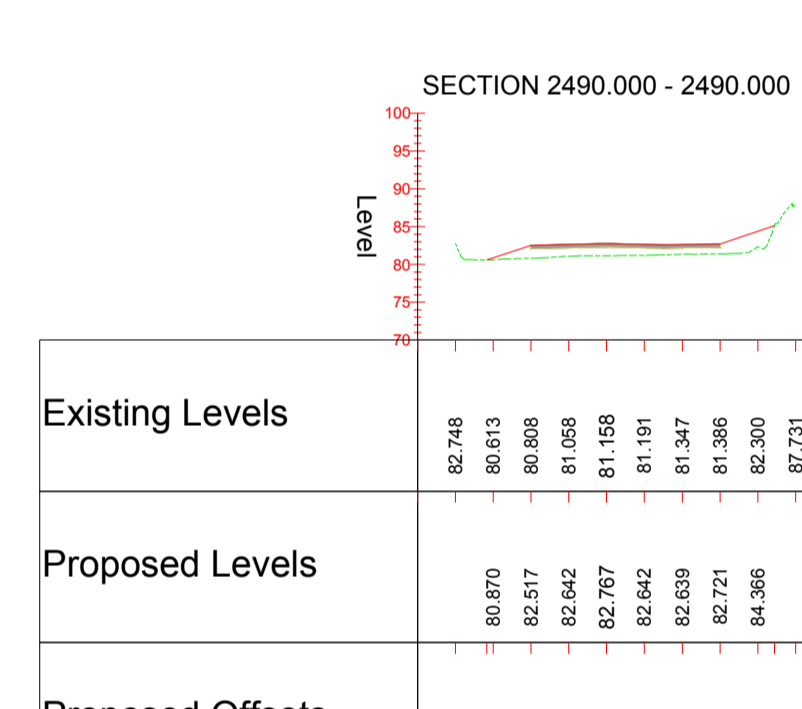
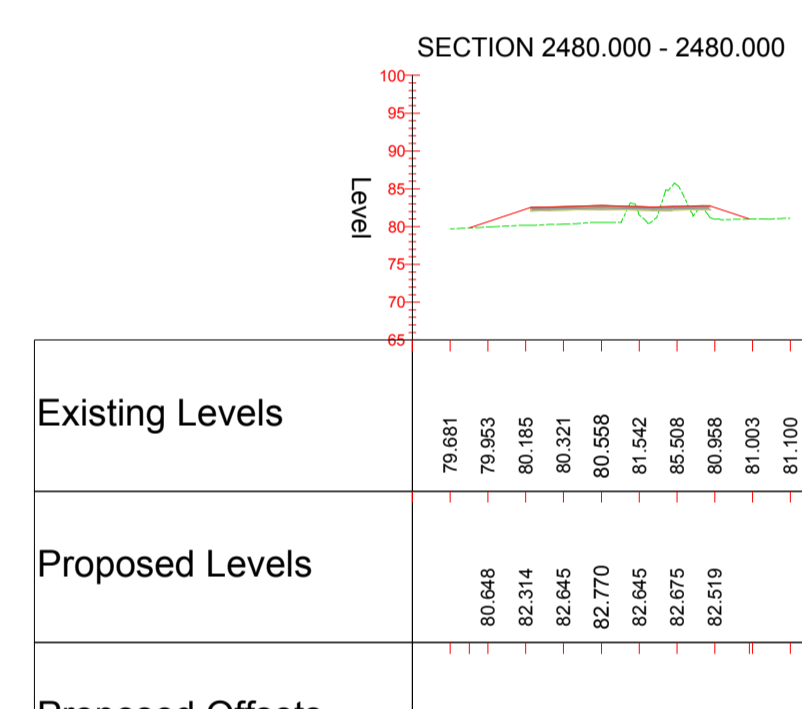
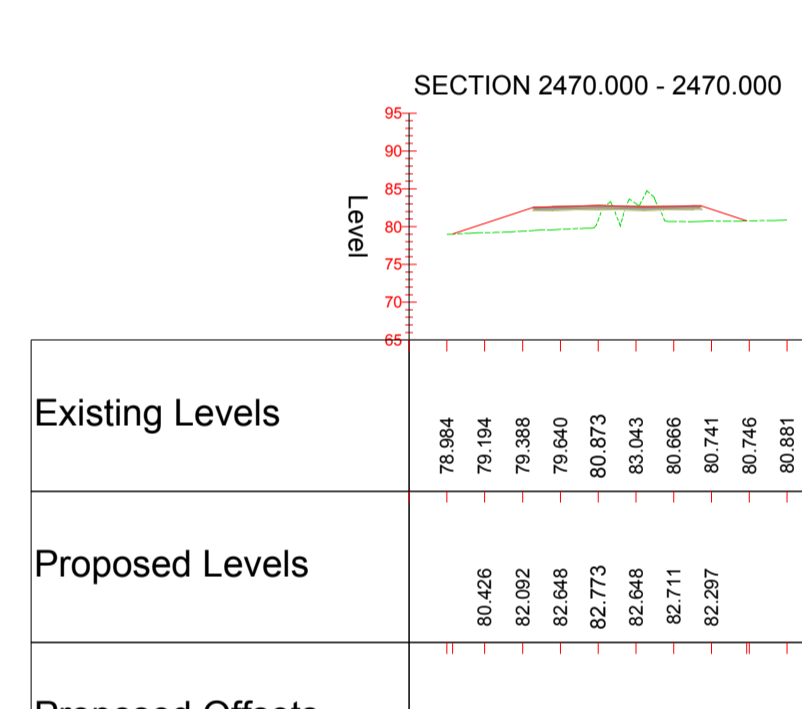
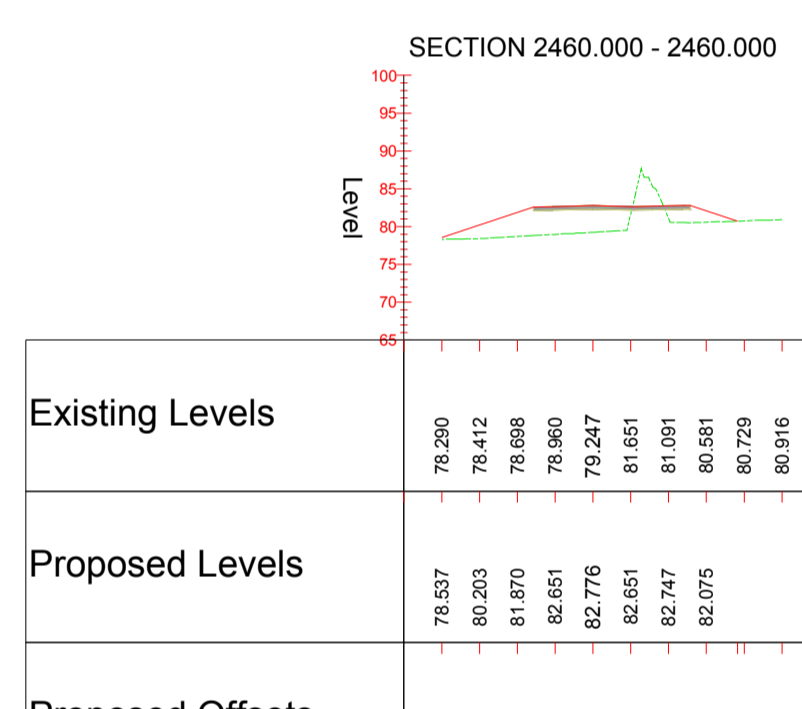
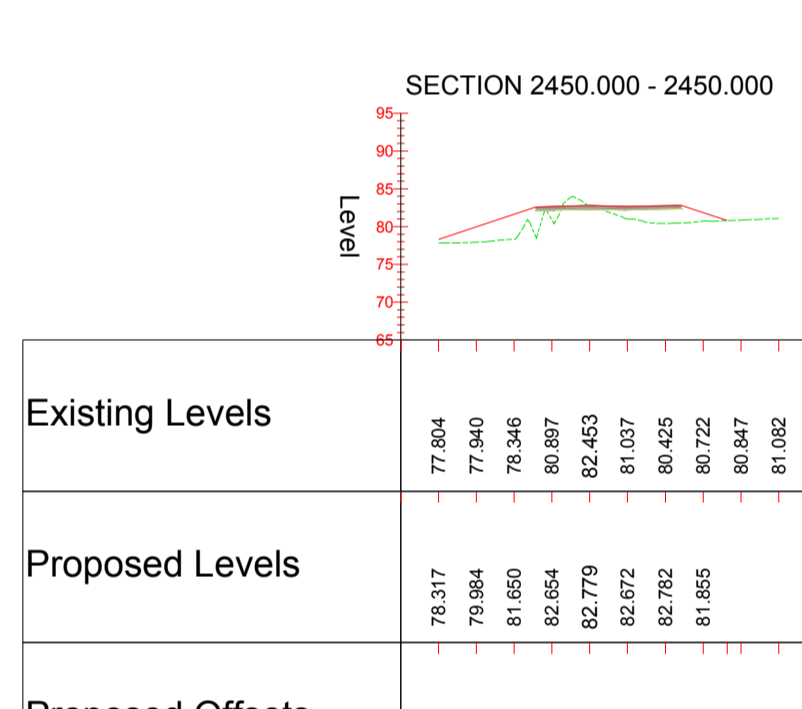
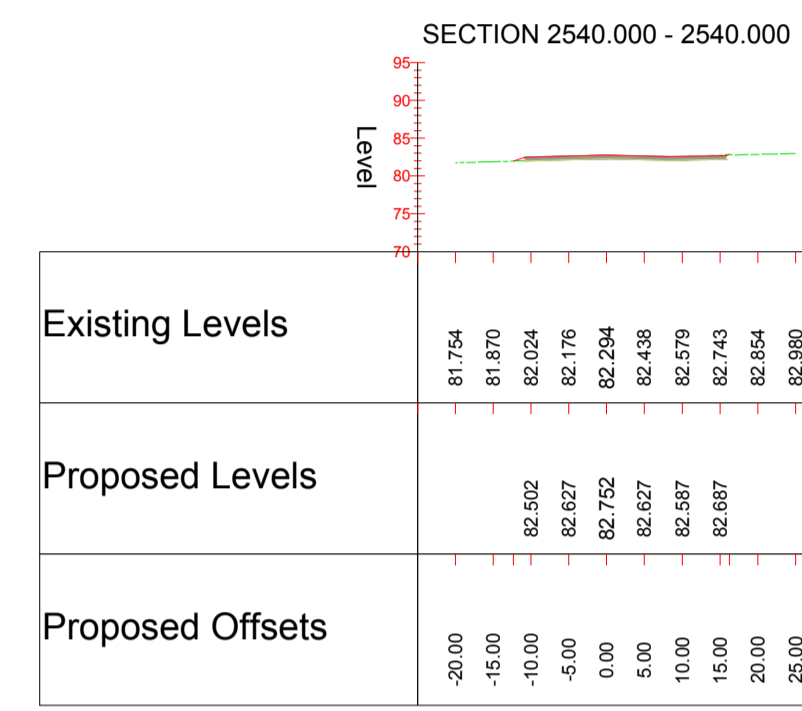
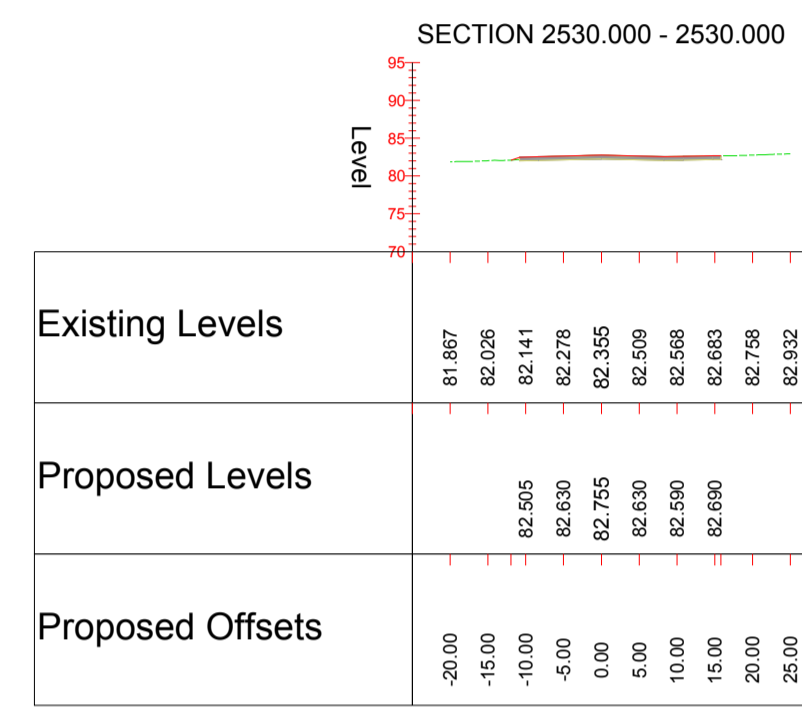
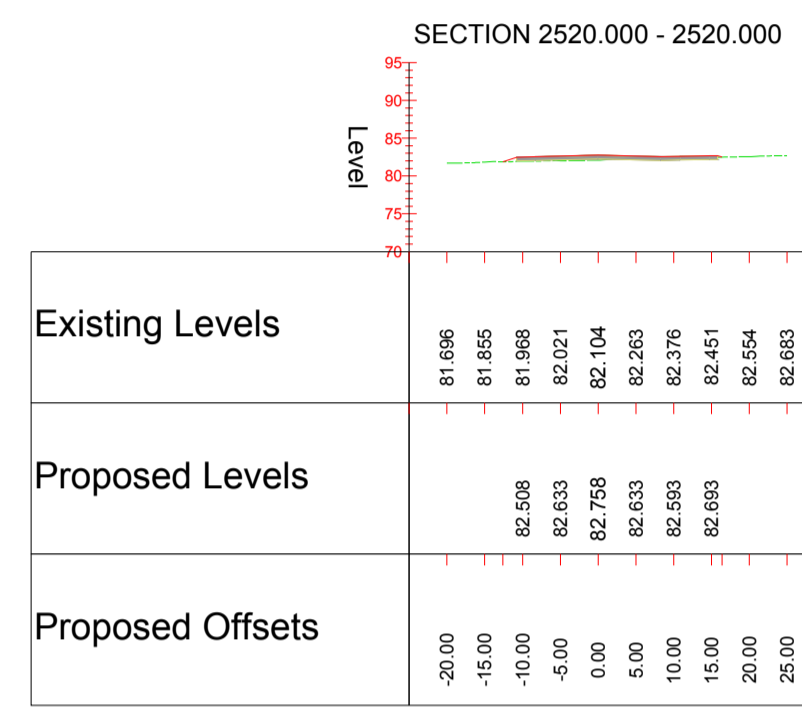
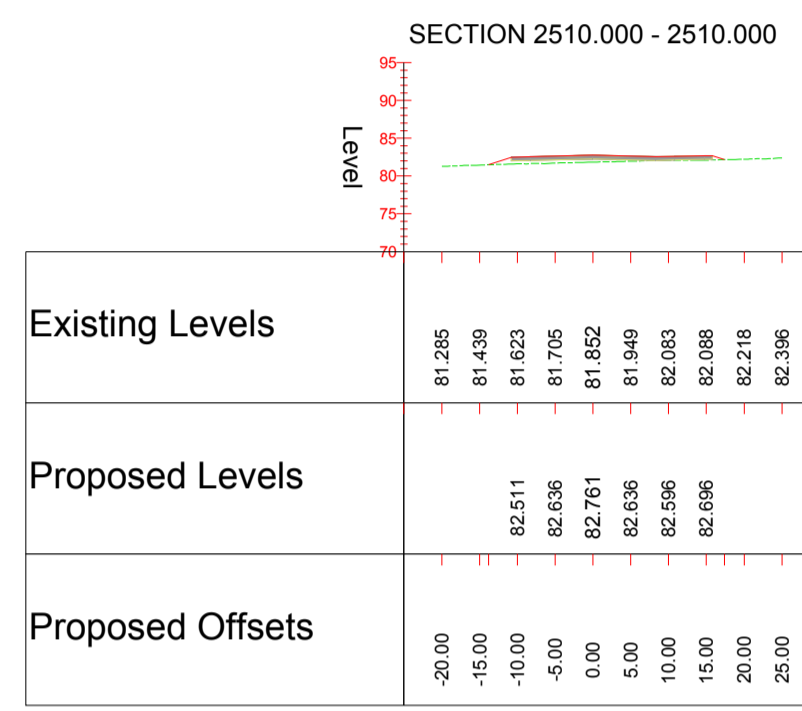
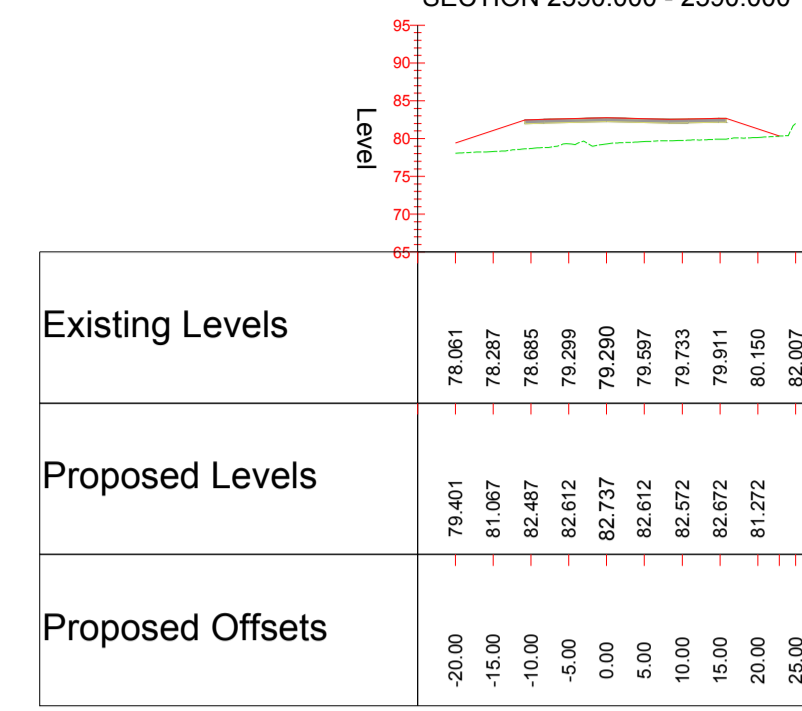
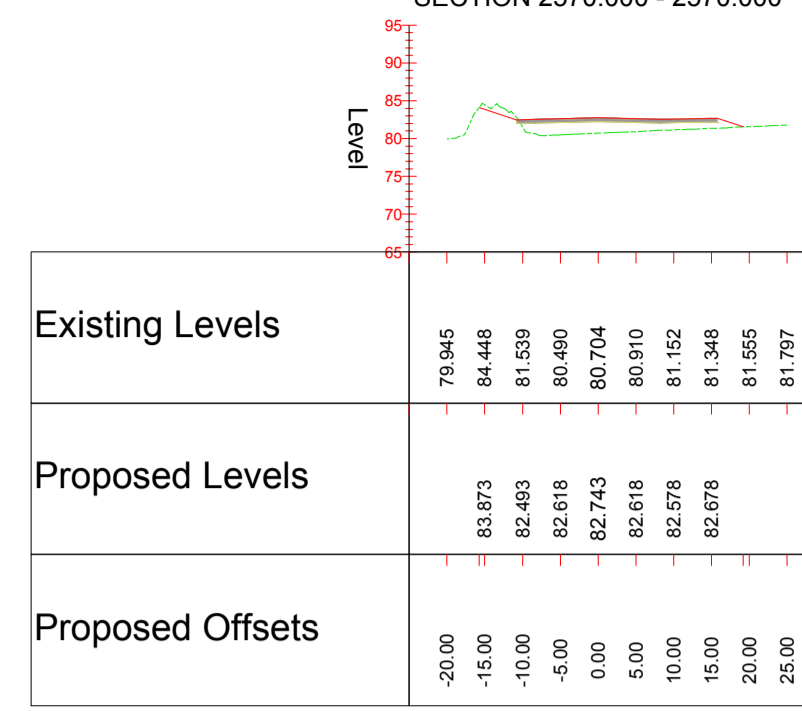
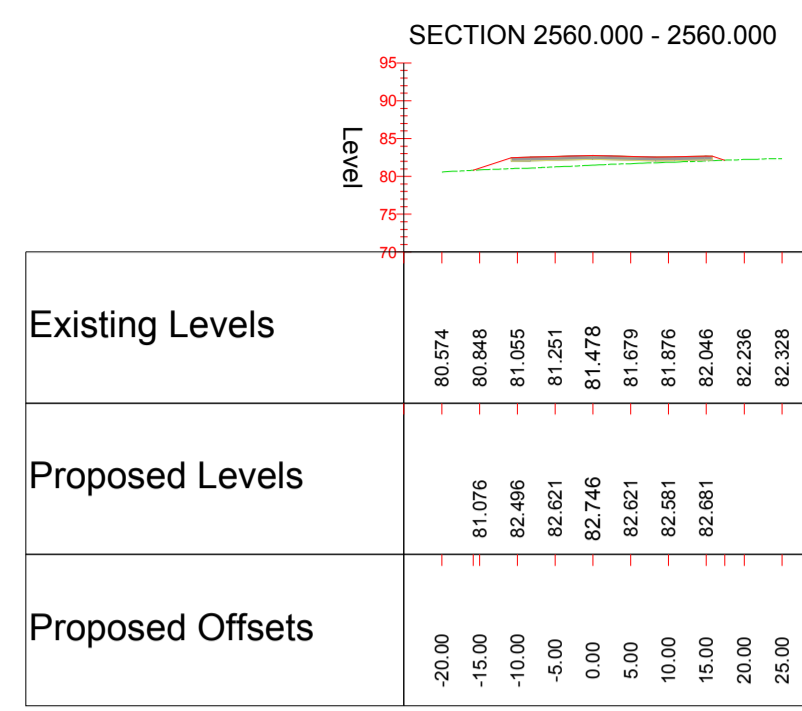
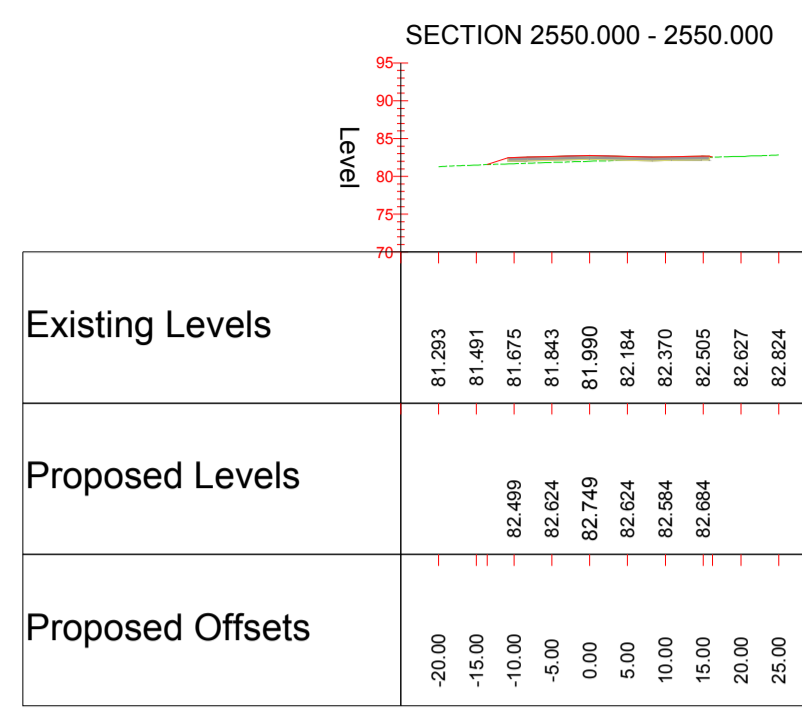
Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION				
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:				
CONSTRUCTION				
NONE				
MAINTENANCE/CLEANING				
NONE				
DECOMMISSIONING/DEMOLITION				
NONE				
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement				
Rev.	Date	Description	By	App'd
P1	05.02.18	DRAWING CREATED	AF	

Drawing Status	FOR INFORMATION	Suitability	S2	Project Title	WEST OF ENGLAND WP1				
Client	WEST OF ENGLAND			Drawing Title	A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 1 OF 19				
Scale	1:1000	Designed	EC	Drawn	AF	Checked	AH	Authorised	
Original Size	A1	Date	05/02/18	Date	05/02/18	Date	05/02/18	Date	
Drawing Number	HA PIN	Originator	Woe	Volume	ATK	Project Ref. No.	0000000	Revision	
Location	WP1	Type	- DR - D -	Number	6514	Revision			P1



CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION		
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:		
CONSTRUCTION	NONE	
MAINTENANCE/CLEANING	NONE	
DECOMMISSIONING/DEMOLITION	NONE	
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement		

HA PIN	Woe	Originator	ATK	Volume	HGN
Project Ref. No.	0000000				
Revision	P1				

FOR INFORMATION

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www.atkinsglobal.com

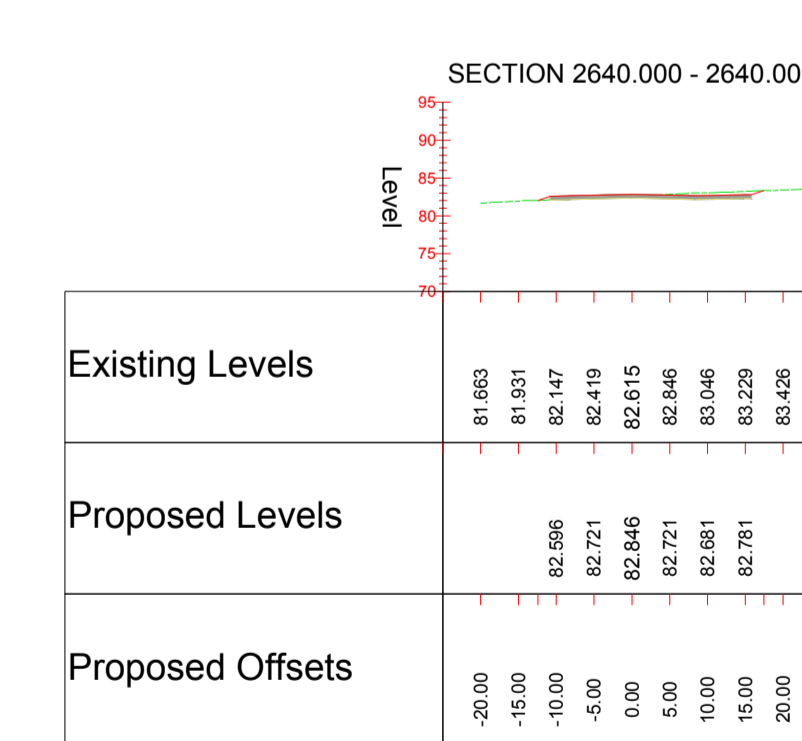
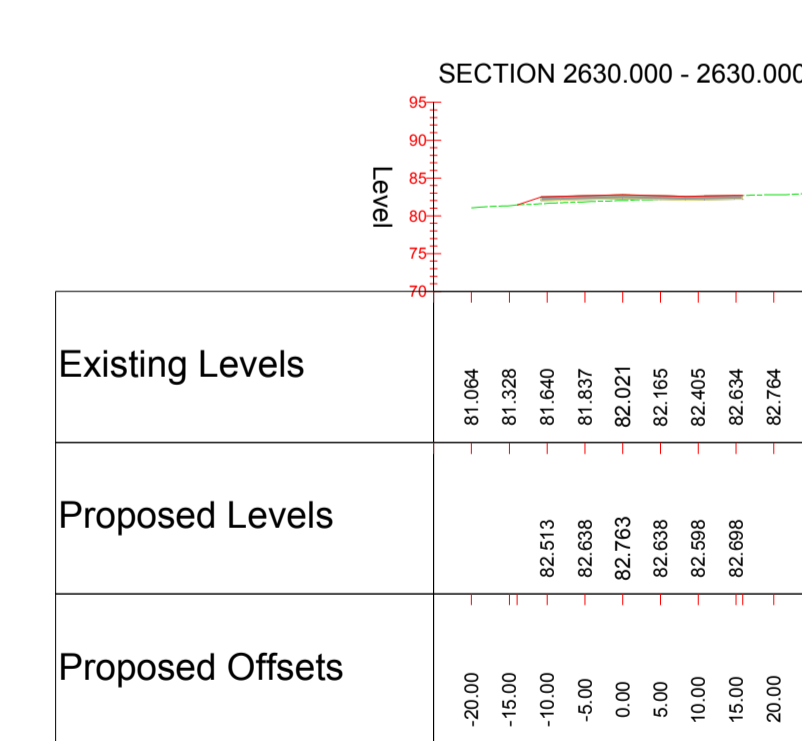
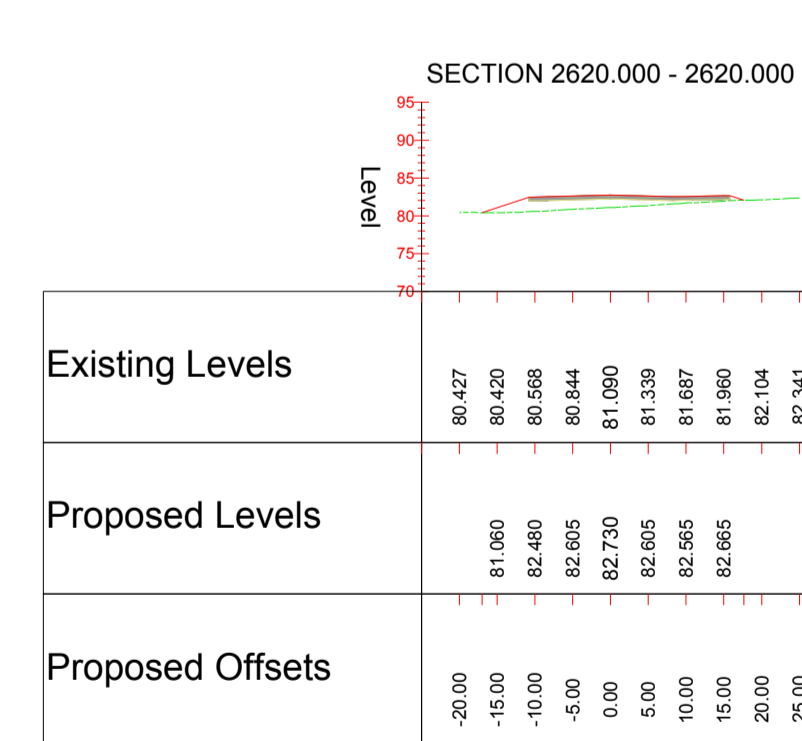
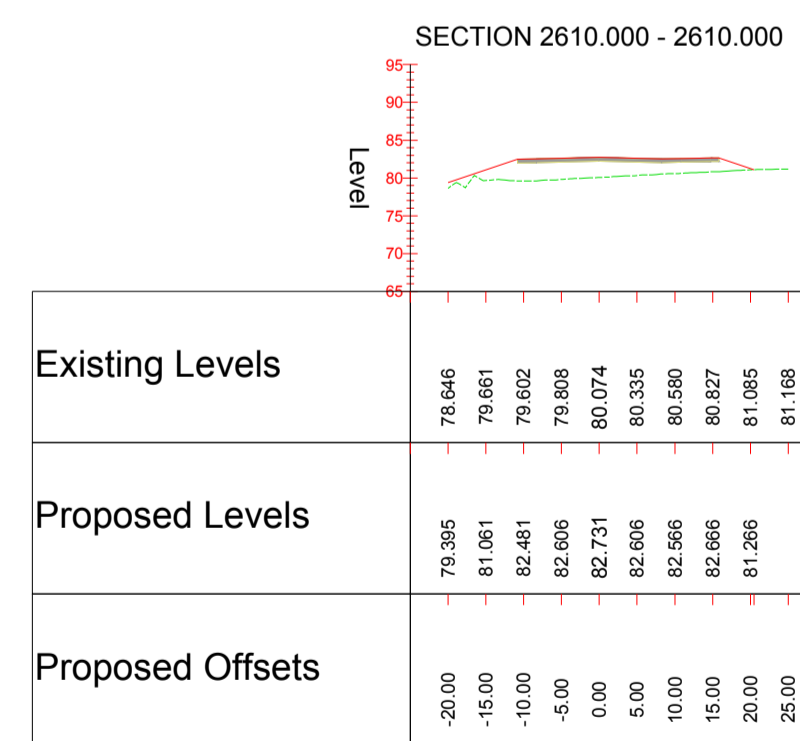
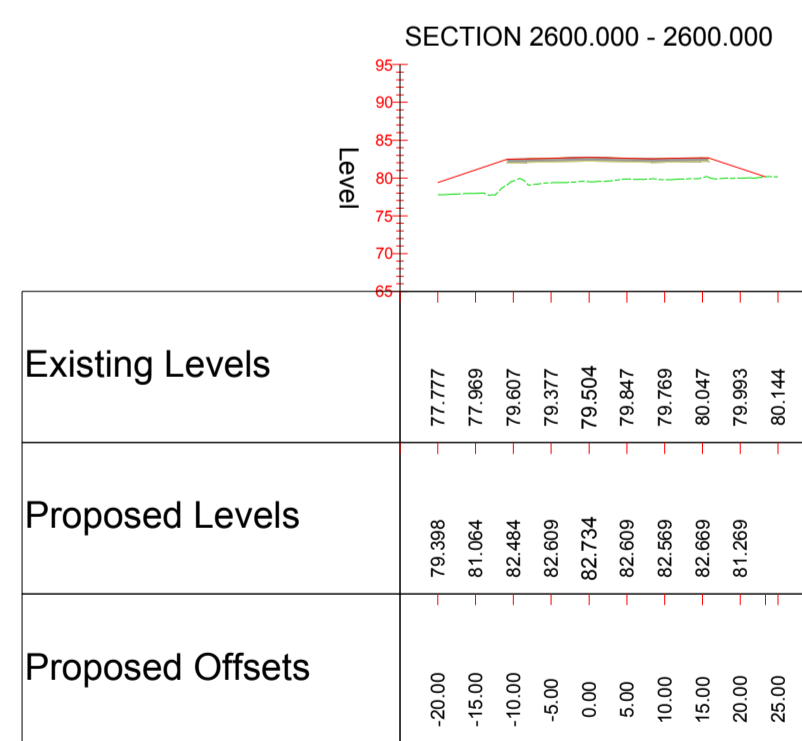
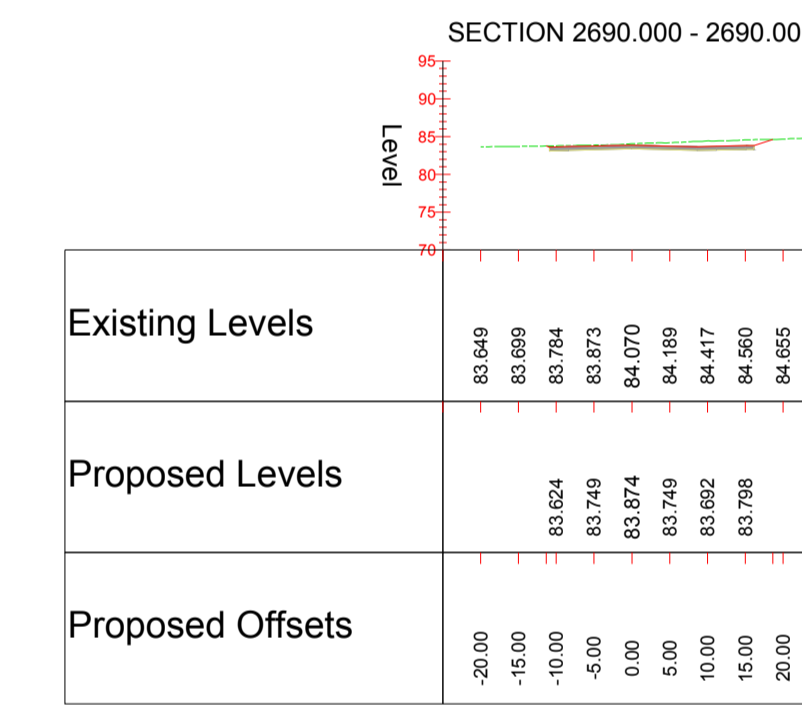
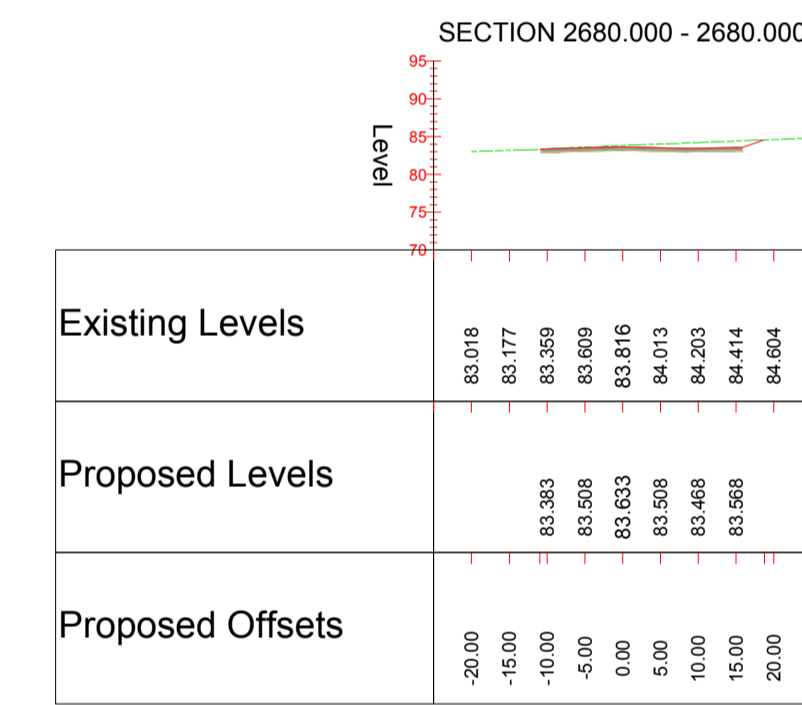
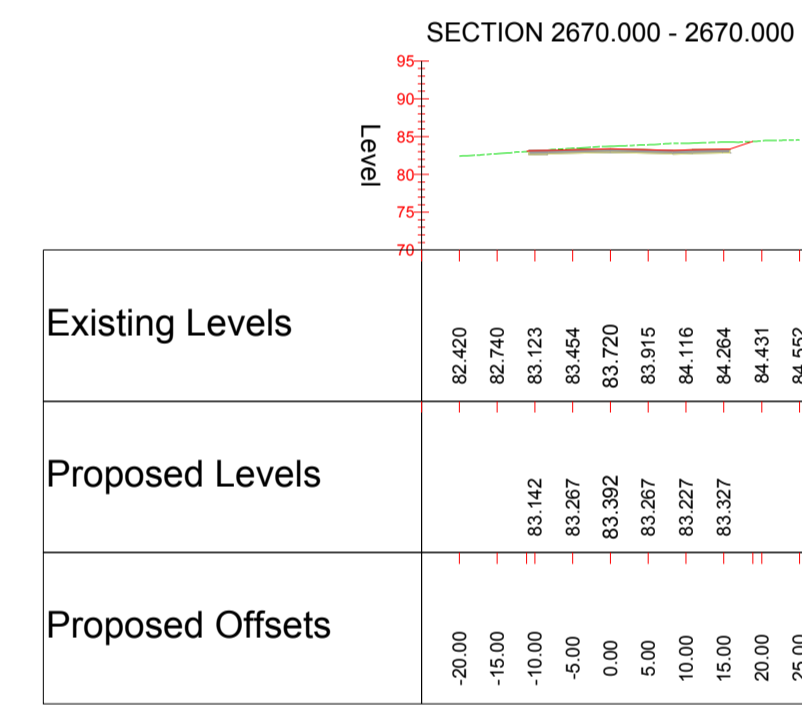
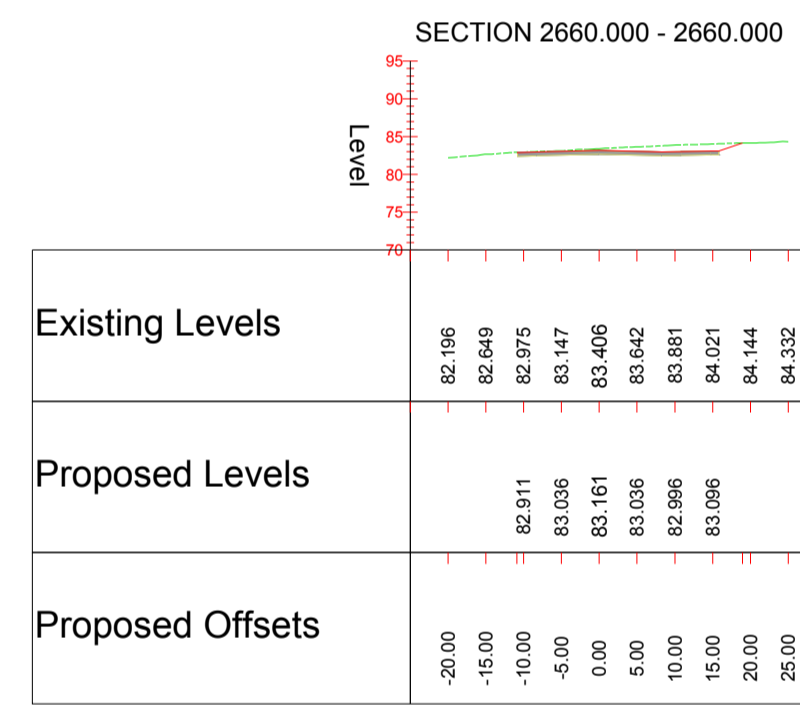
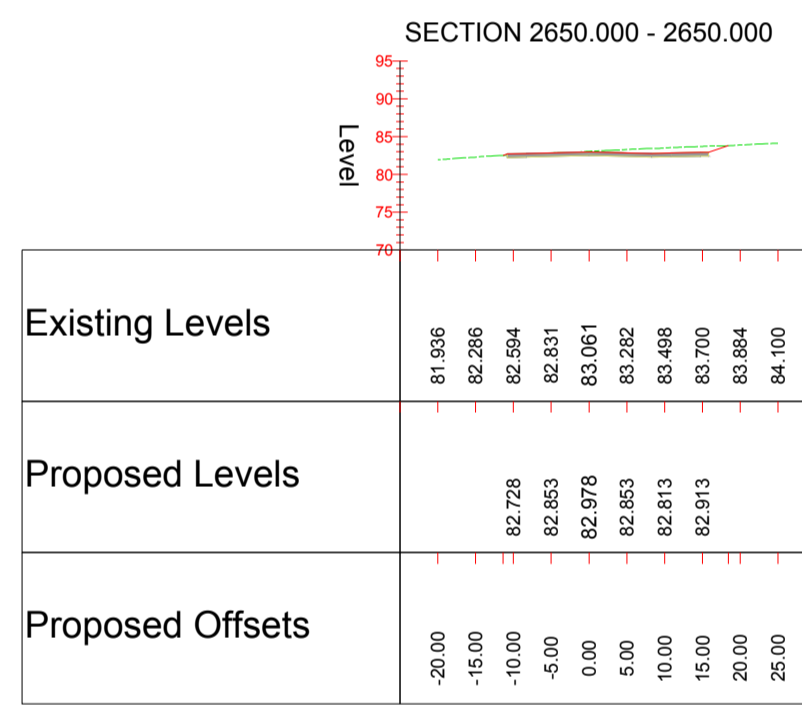
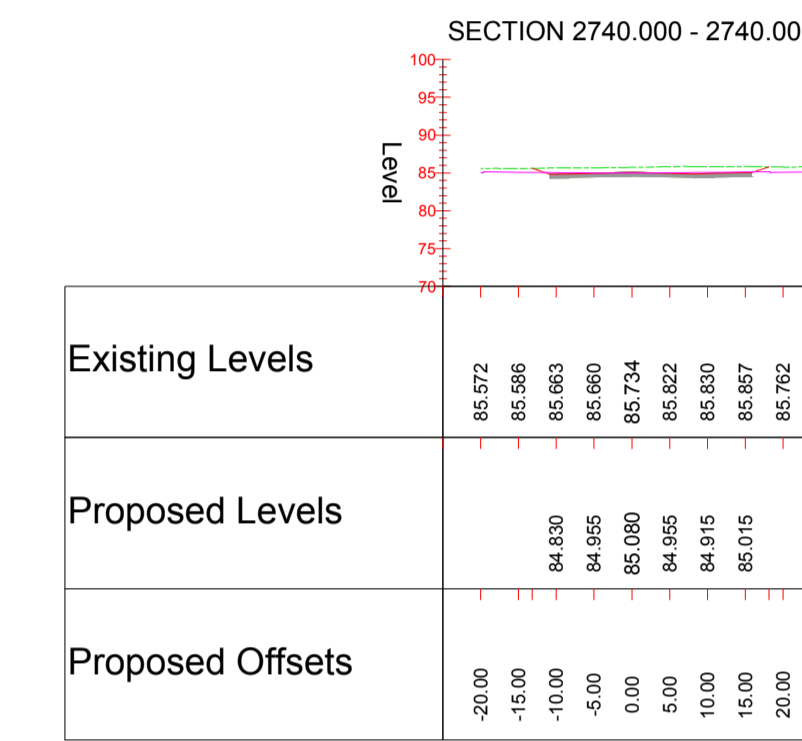
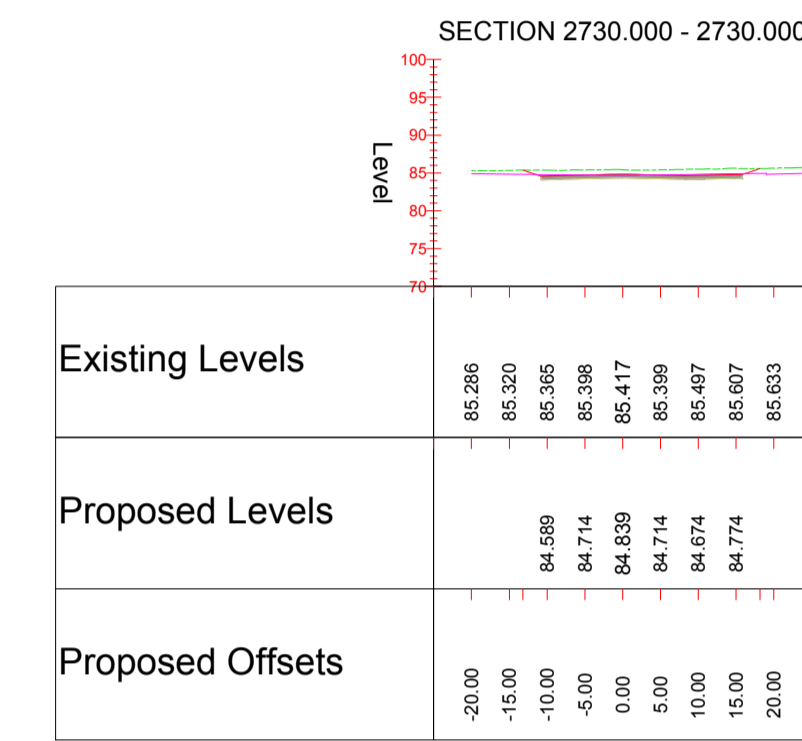
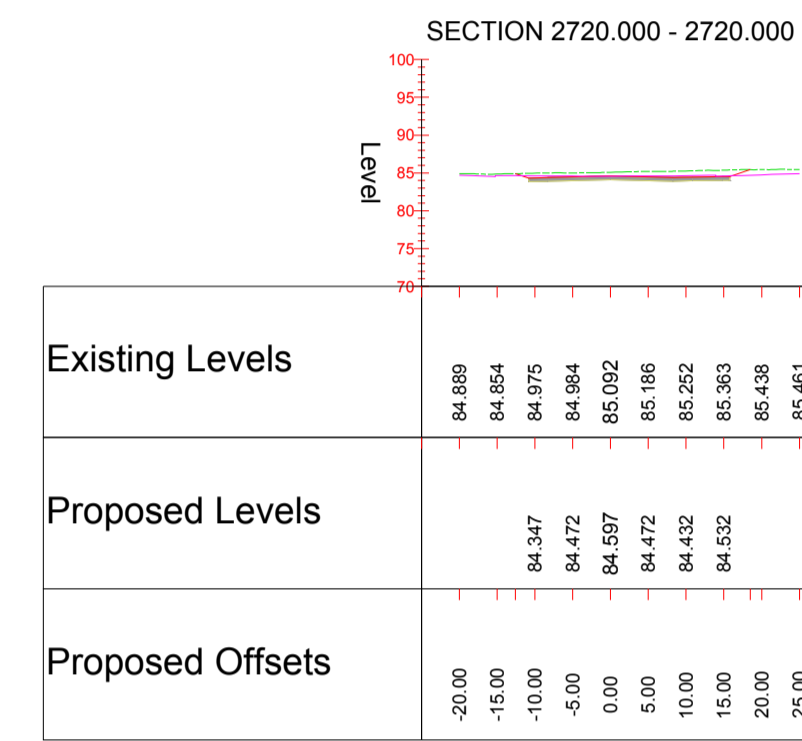
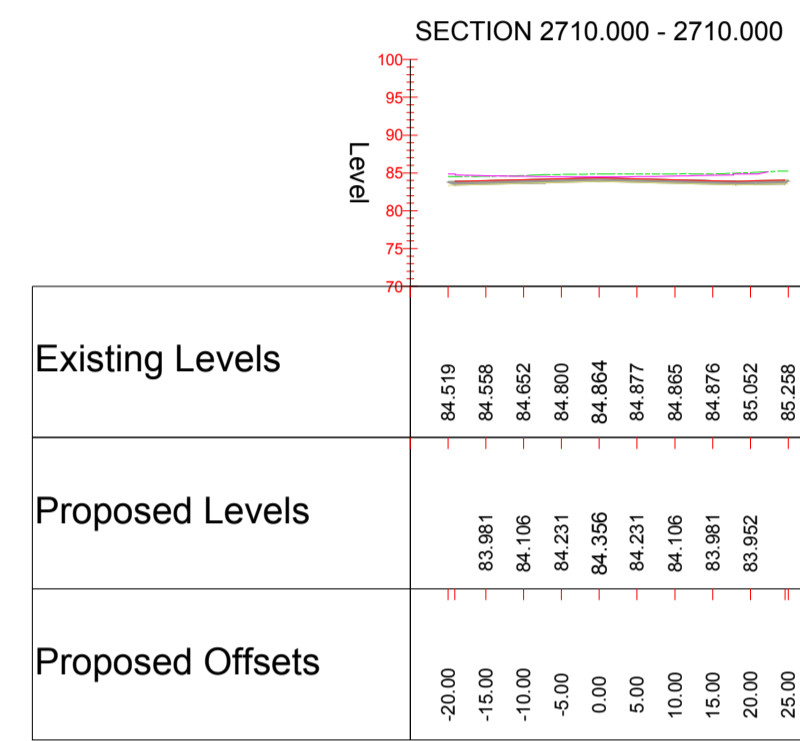
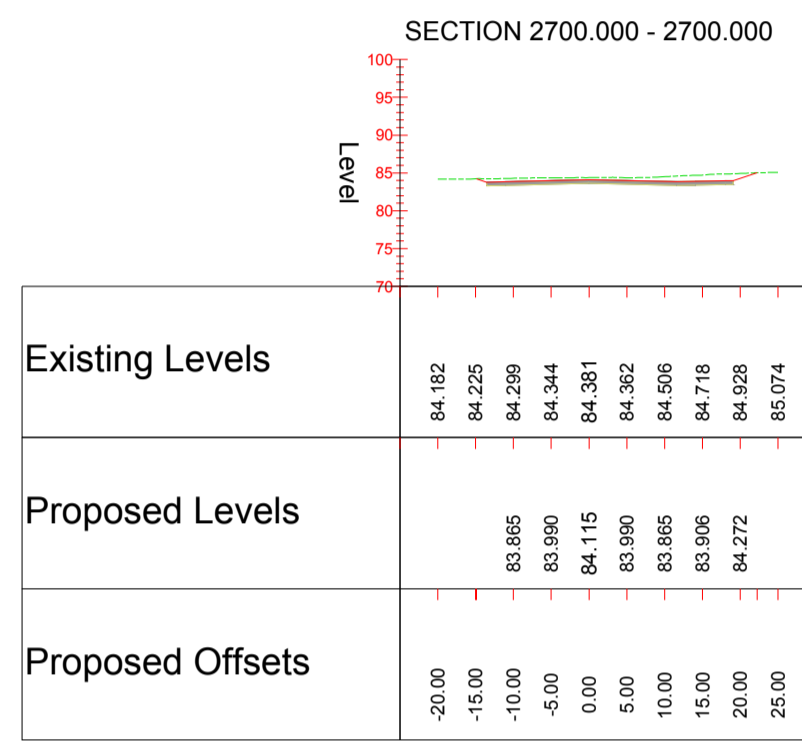
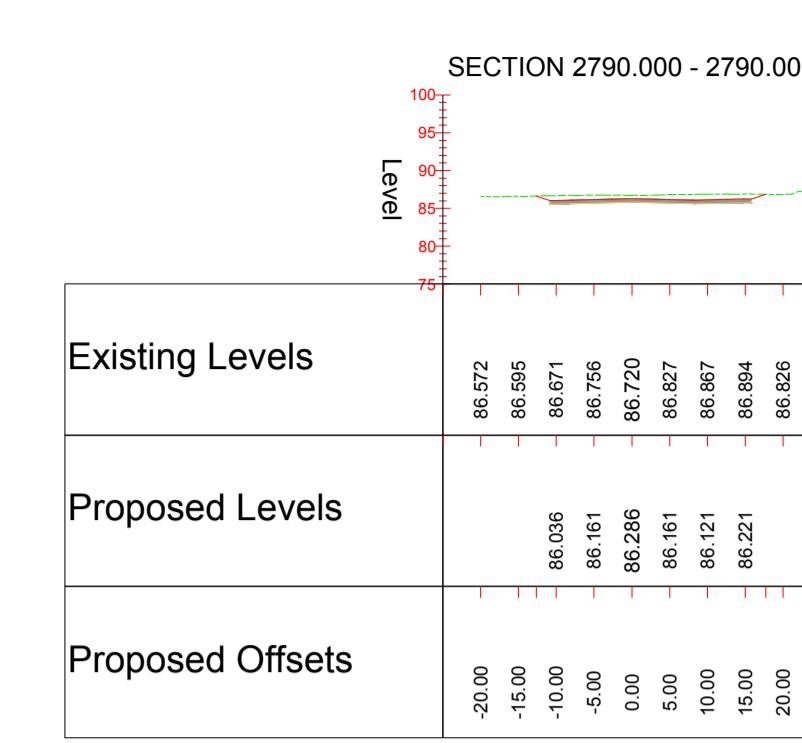
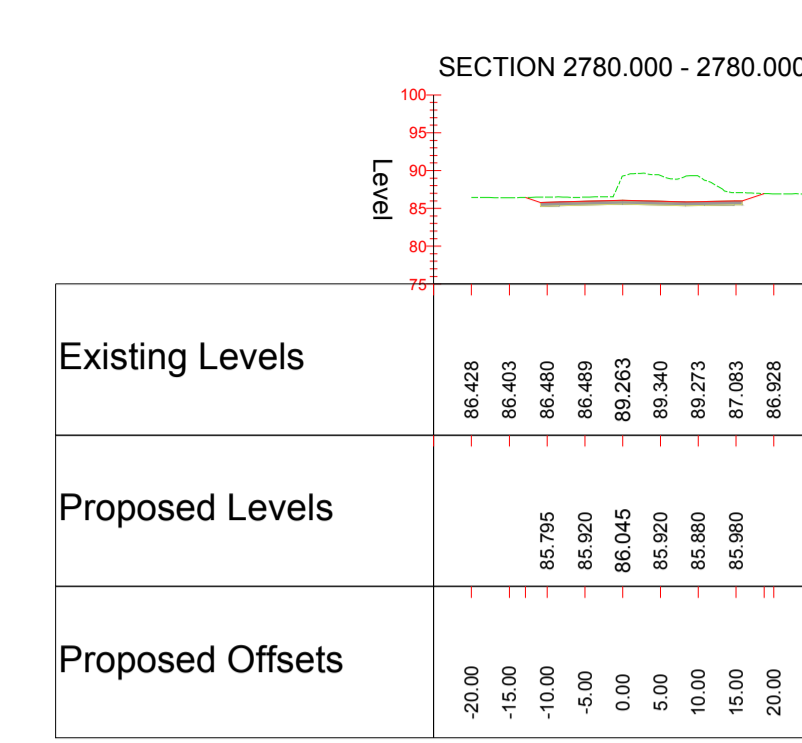
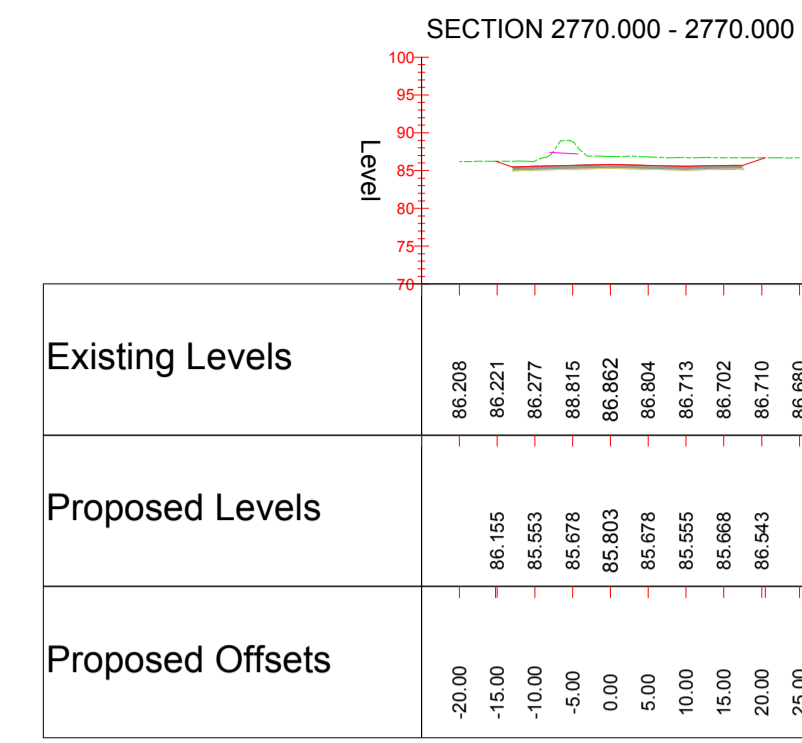
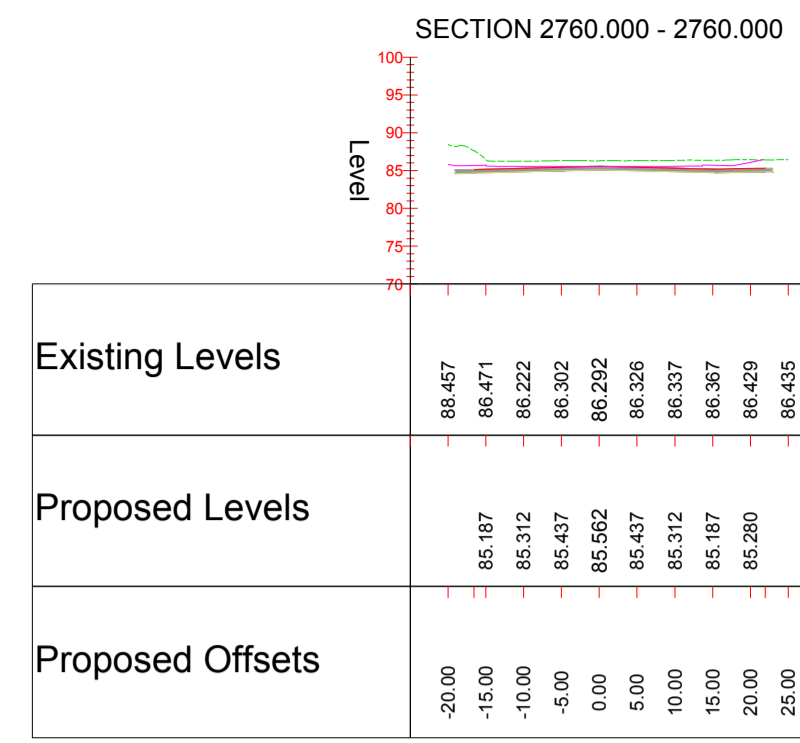
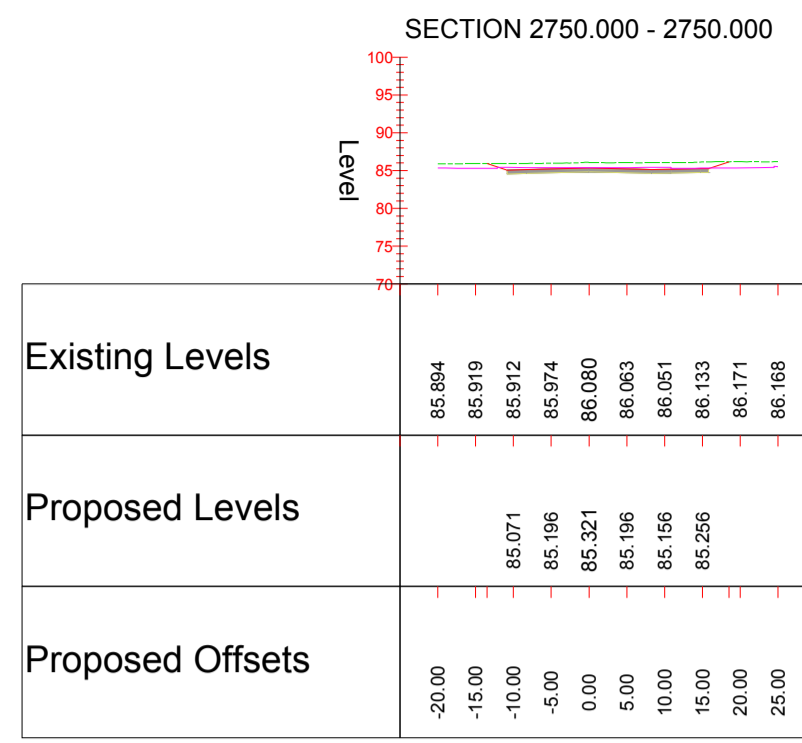
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WEST OF ENGLAND

Drawing Status	S2	Project Title	WEST OF ENGLAND WP1		
Drawing Title	A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 12 19				
Scale	1:1000	Designed	EC	Drawn	Checked
Original Size	A1	Date	05/02/18	Date	05/02/18
Drawing Number	Woe	Originator	ATK	Volume	HGN
HA PIN	WP1	Type	- DR - D -	Number	6516
Authorised	AH				

CROSS SECTIONS  
Scale 1:1000

100  
0 10  
Millimetres



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION					
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:					
CONSTRUCTION	NONE				
MAINTENANCE/CLEANING	NONE				
DECOMMISSIONING/DEMOLITION	NONE				
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement					
Rev.	Date	Description	By	Chk'd	App'd
P1	05.02.18	DRAWING CREATED	AF		

Drawing Status		FOR INFORMATION		S2		Project Title		WEST OF ENGLAND WP1	
Client		WEST OF ENGLAND				Drawing Title		A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 1 of 19	
Originator		Woe		ATK		Volume		0000000	
Date		05/02/18		05/02/18		Date		05/02/18	
Type		DR		D		Number		6517	
Role		DR		D		Revision		P1	

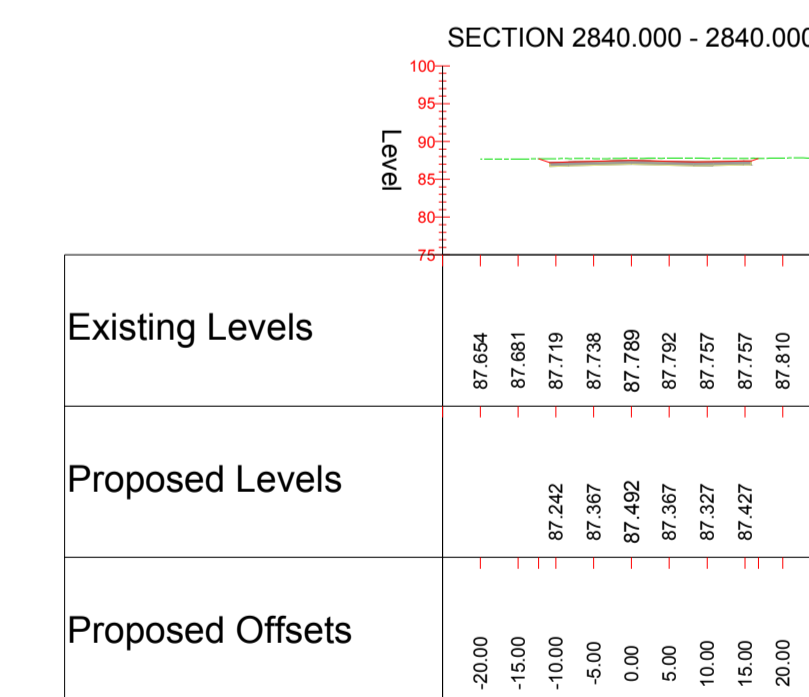
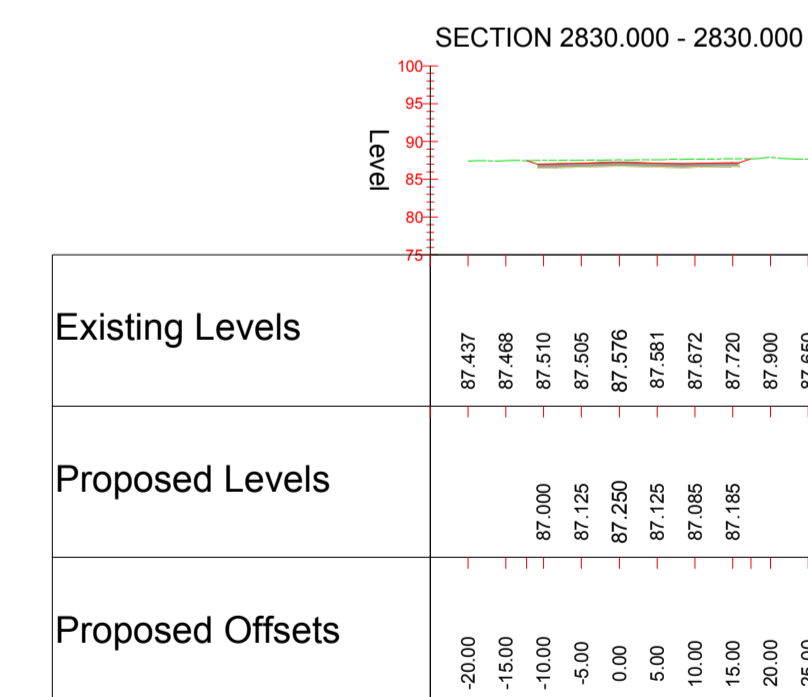
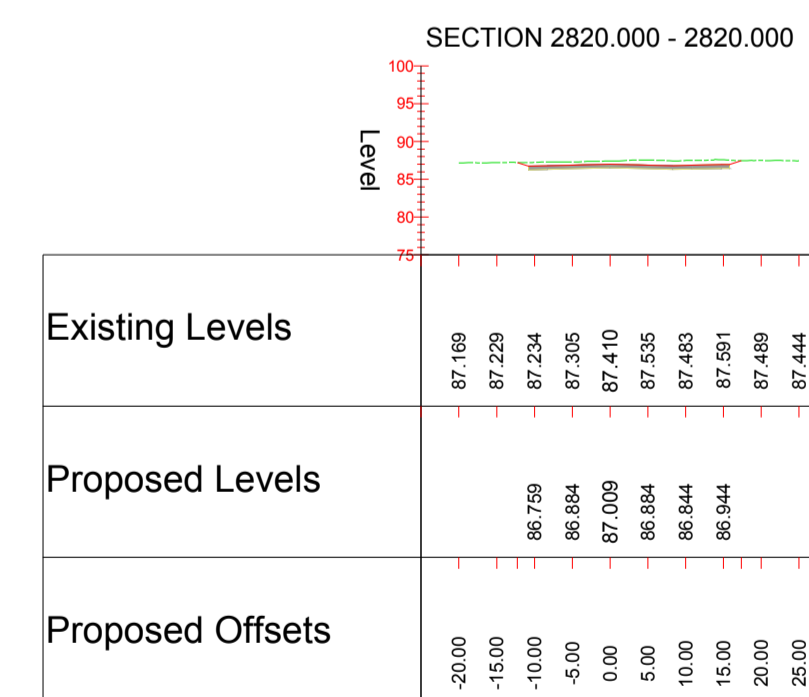
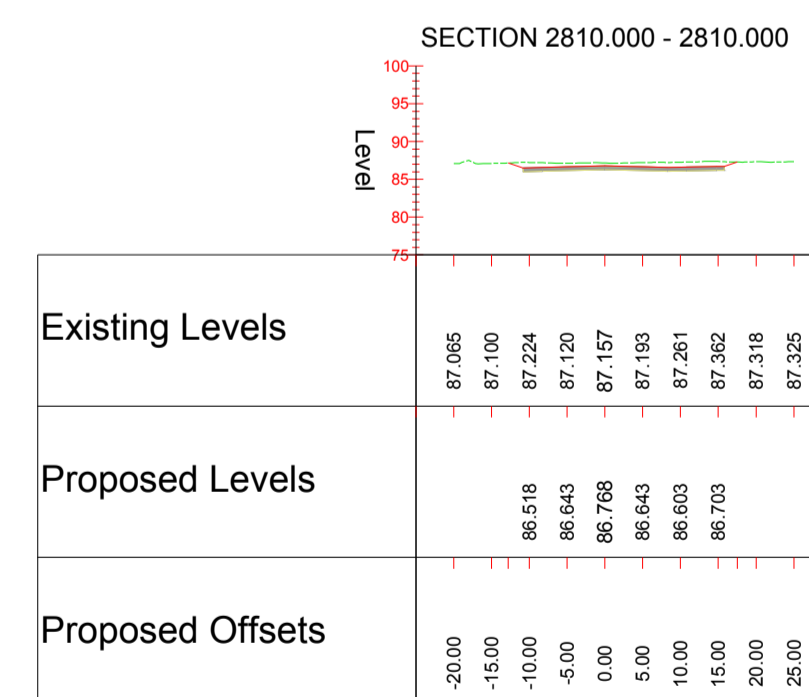
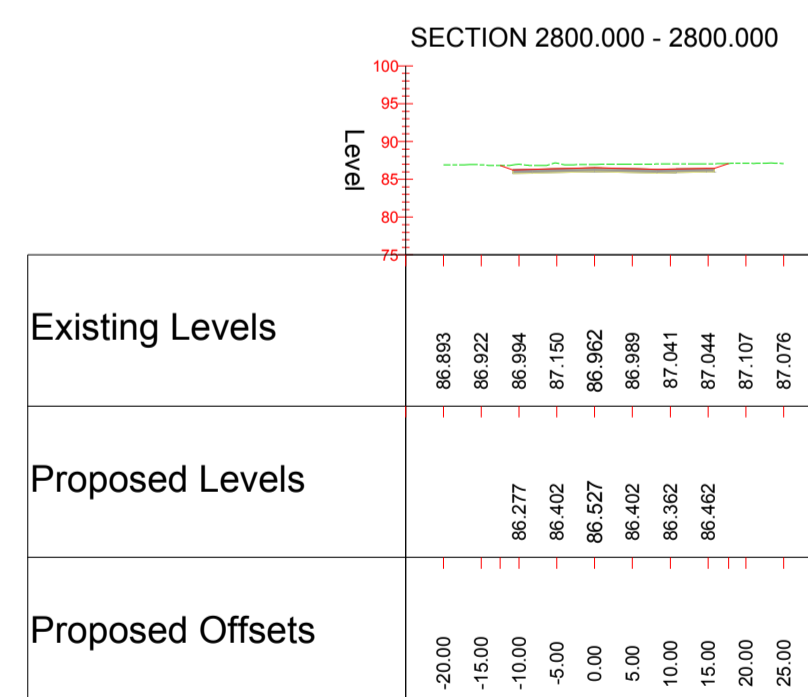
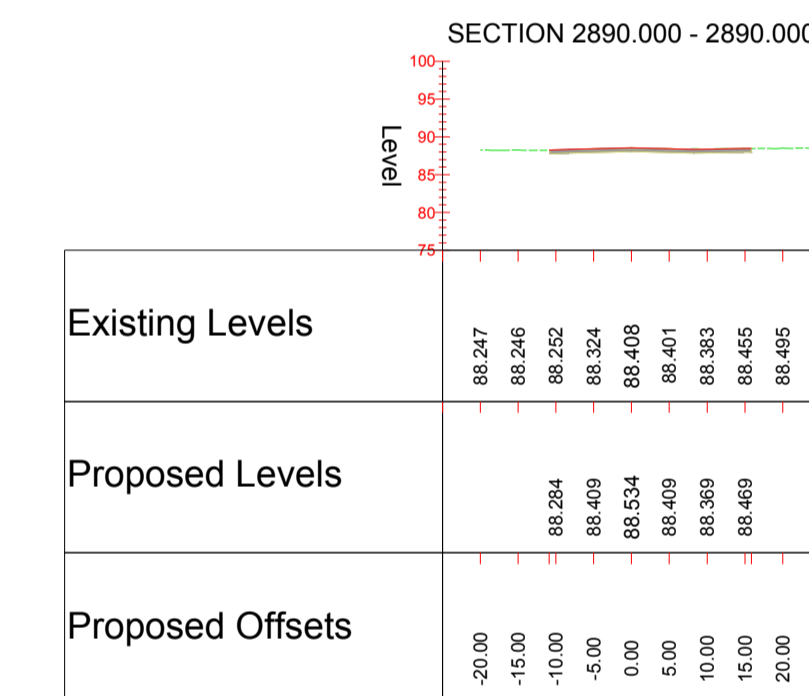
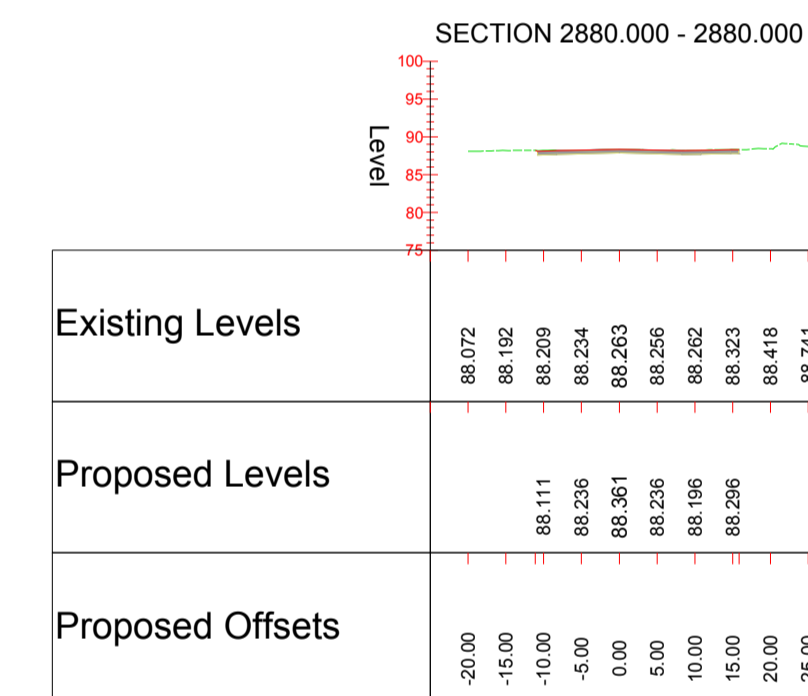
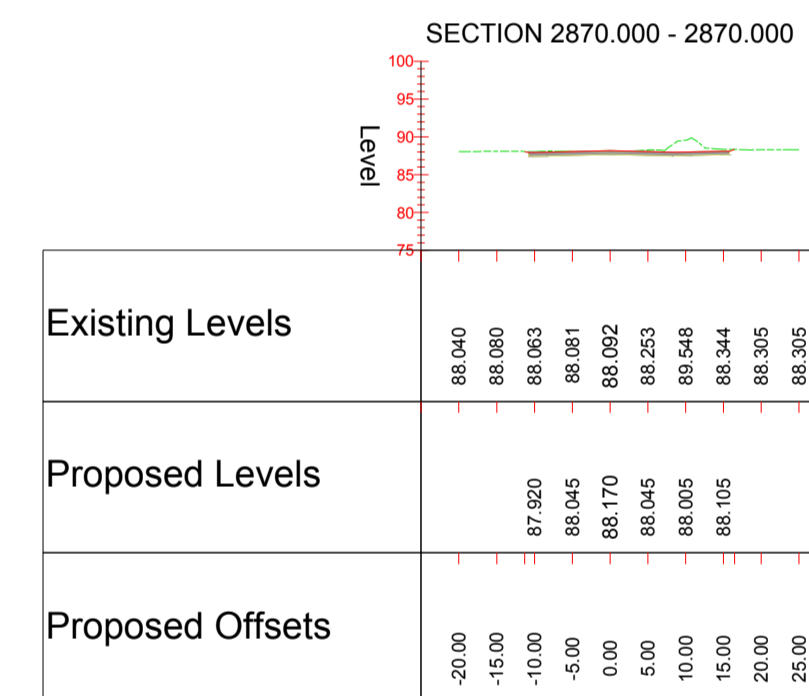
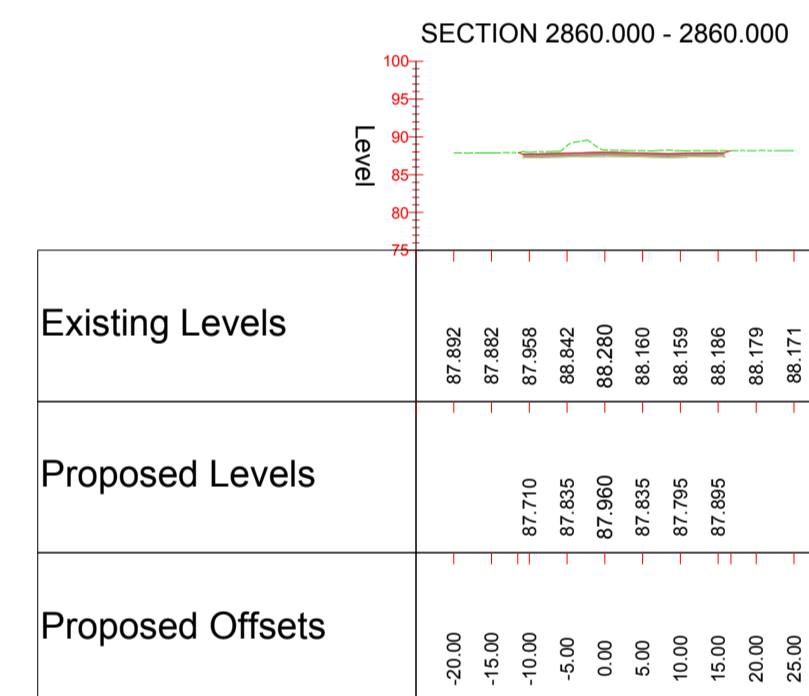
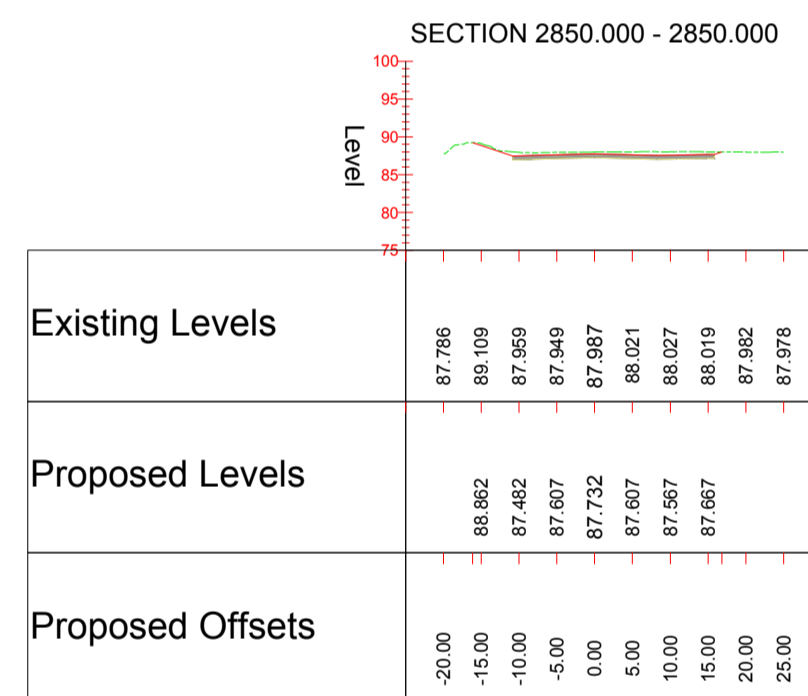
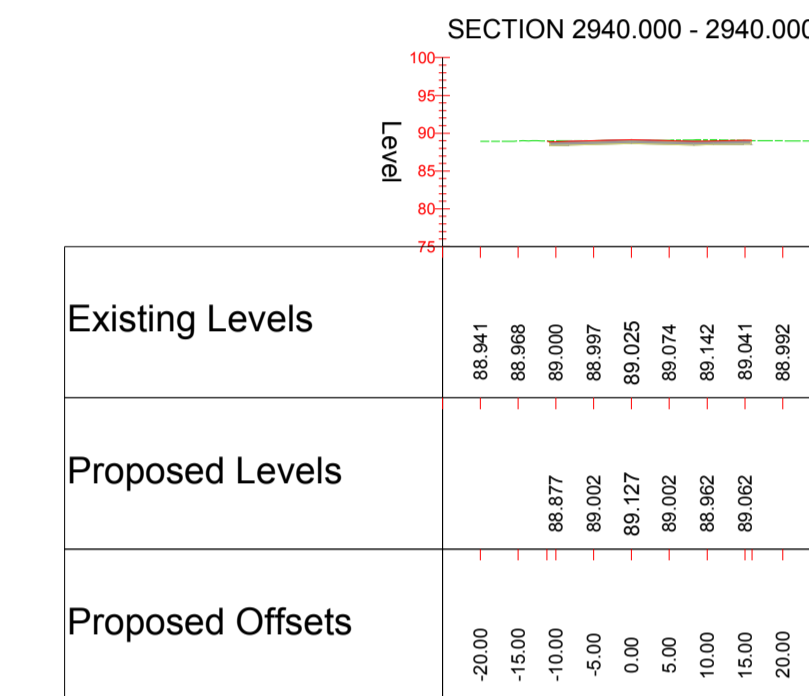
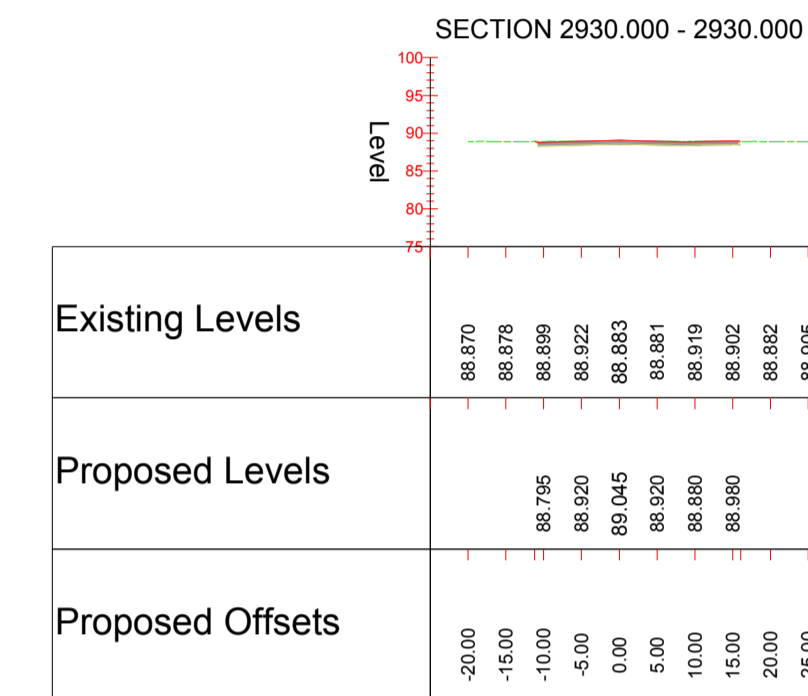
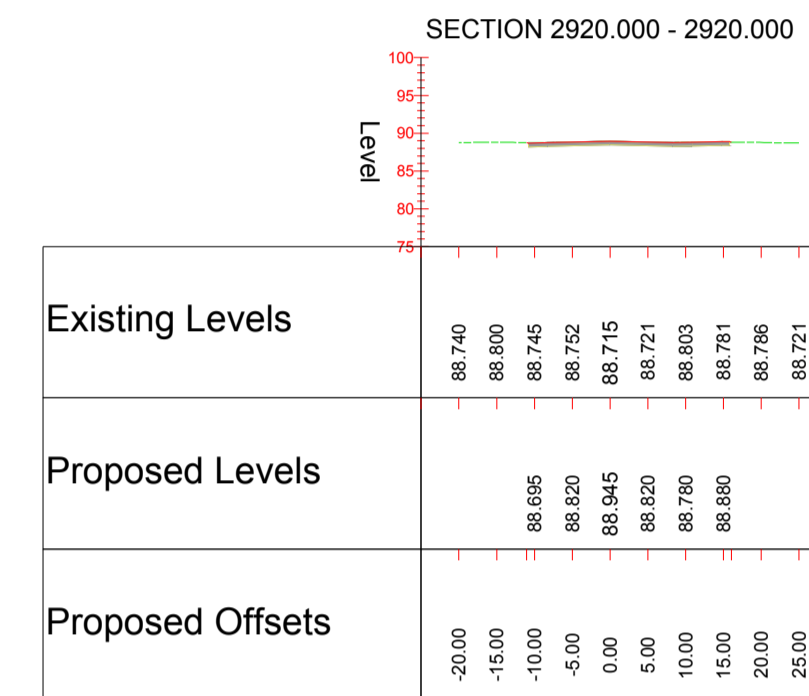
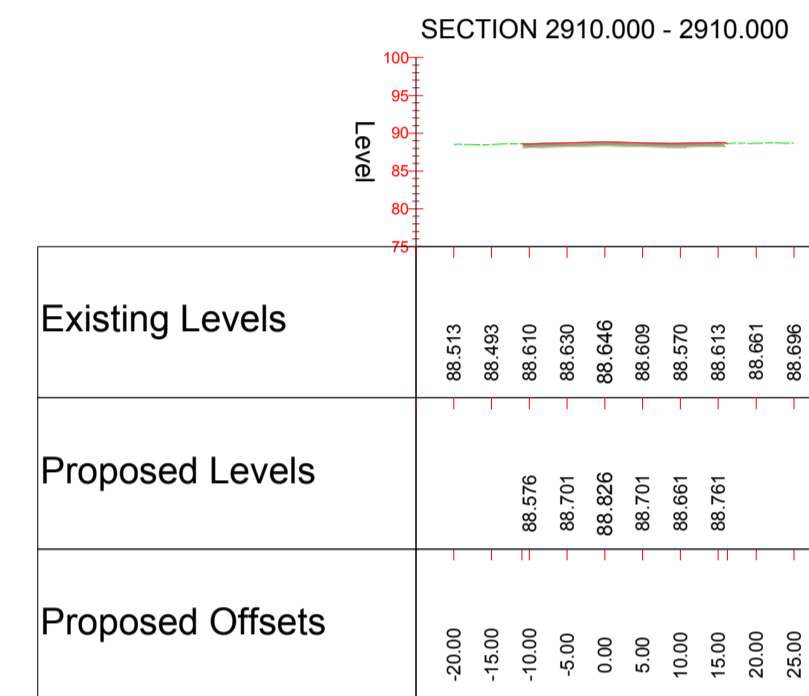
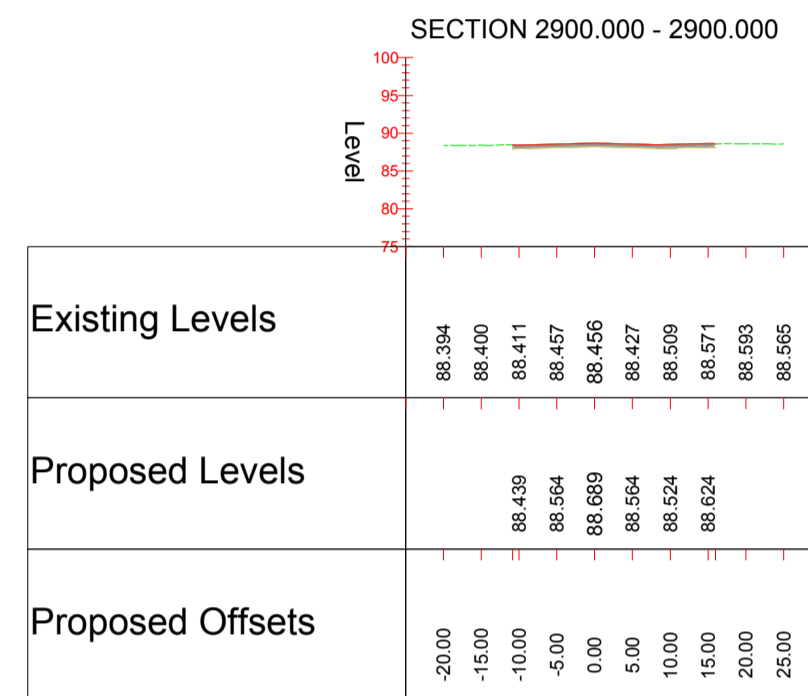
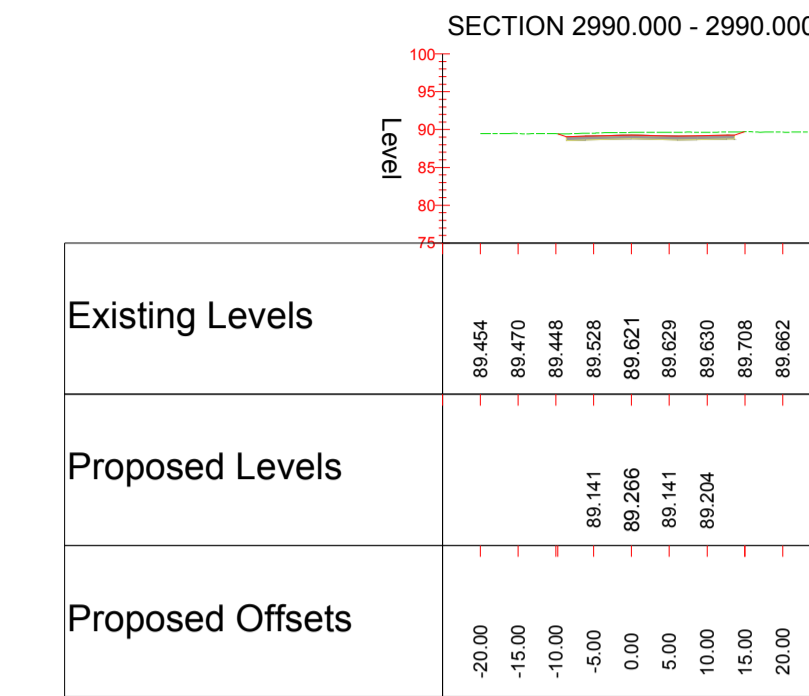
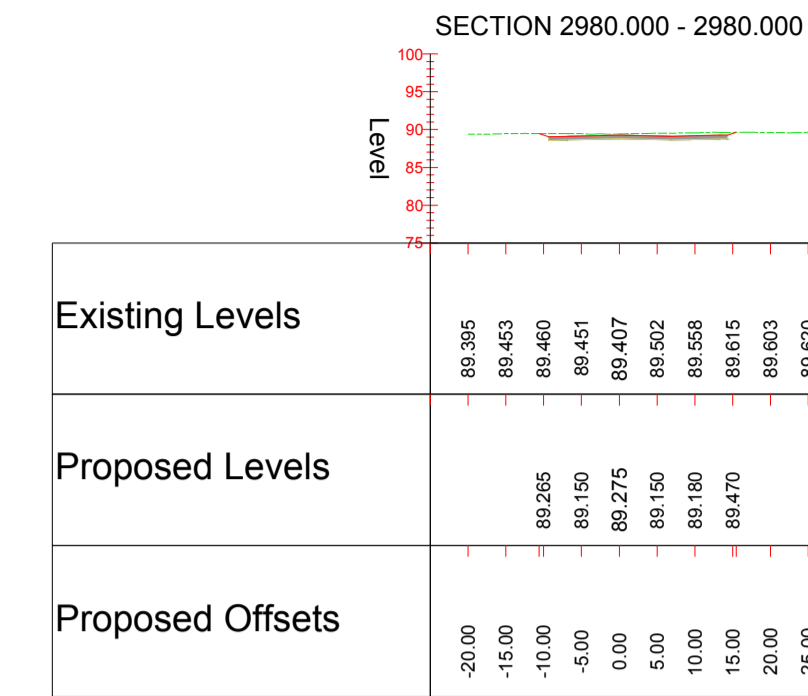
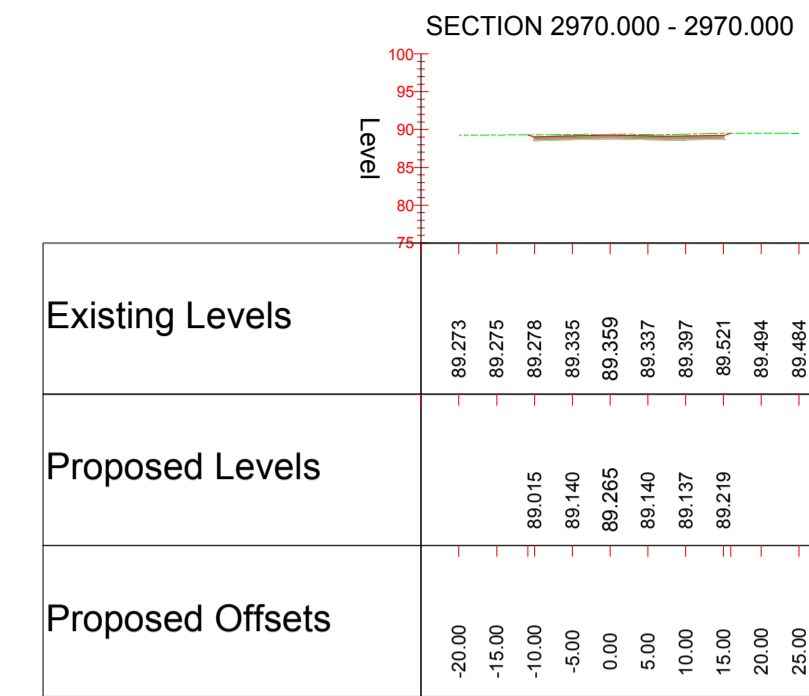
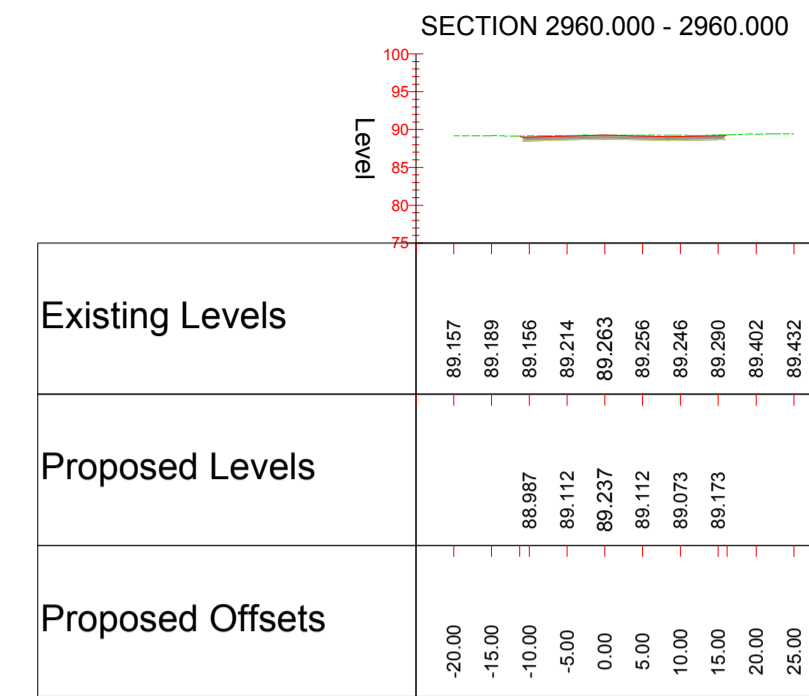
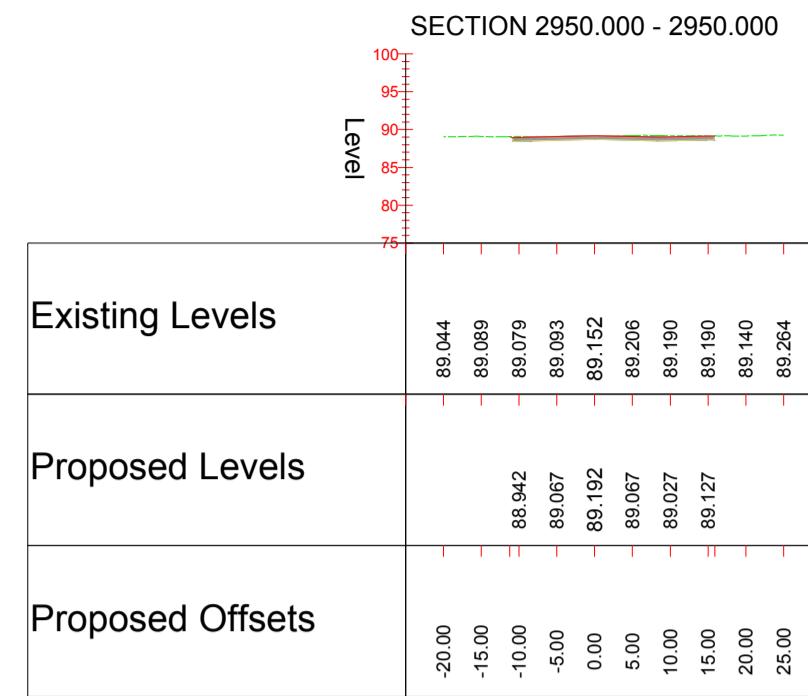
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www.atkinsglobal.com

Scale: 1:1000  
Designed: EC  
Date: 05/02/18  
Checked: AH  
Authorised: AH

Project Ref. No.: 0000000  
Revision: P1

CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

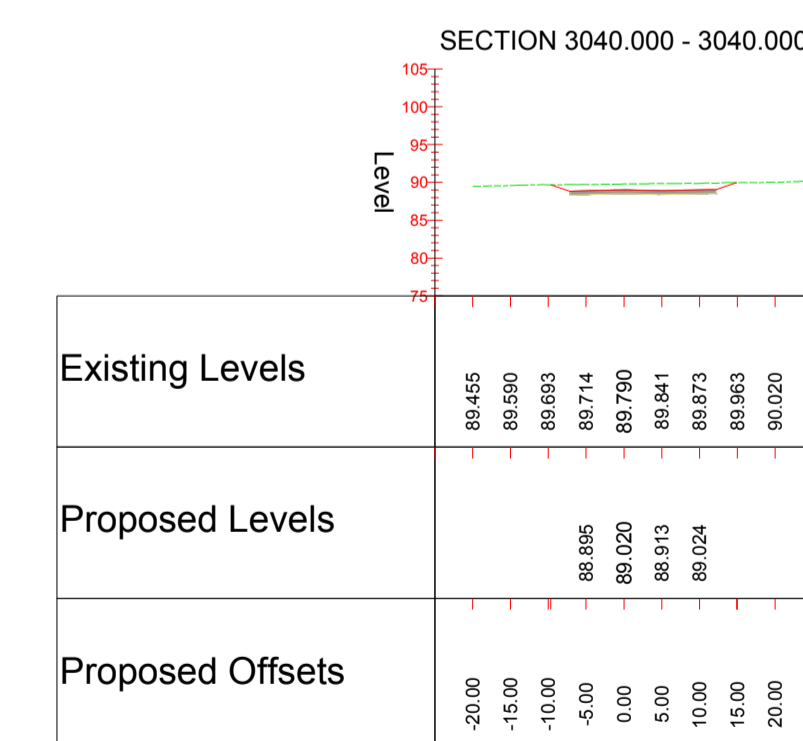
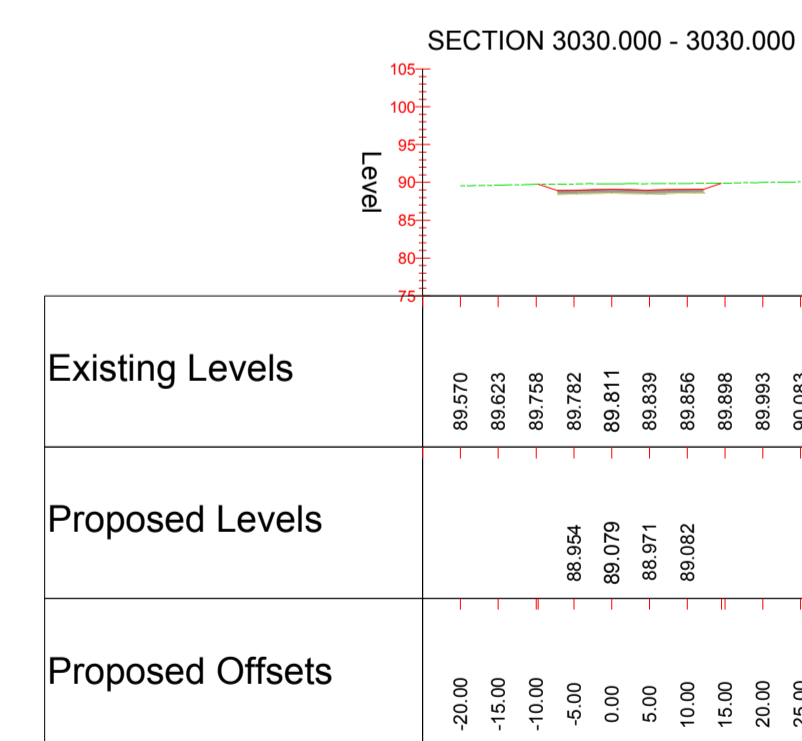
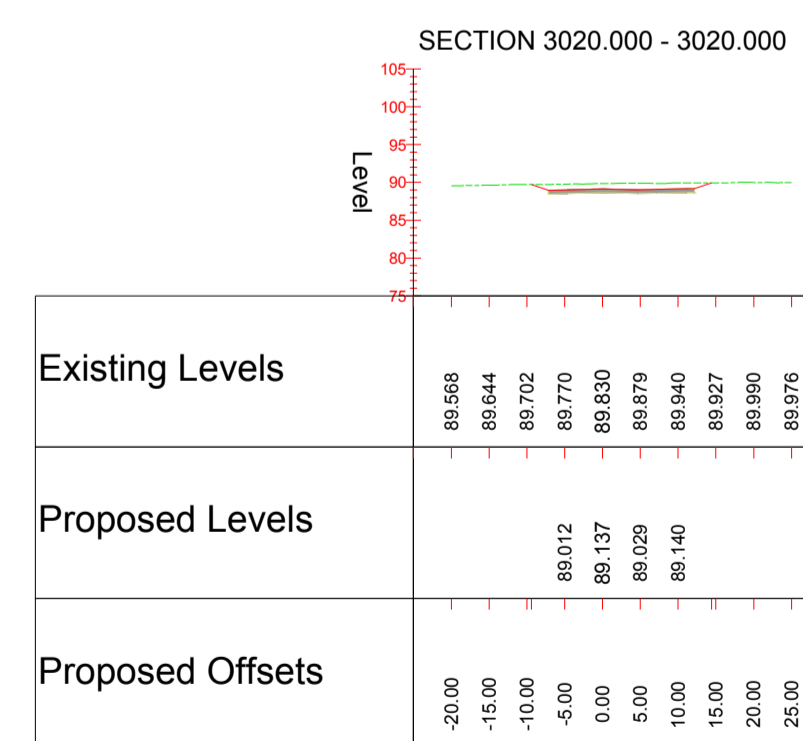
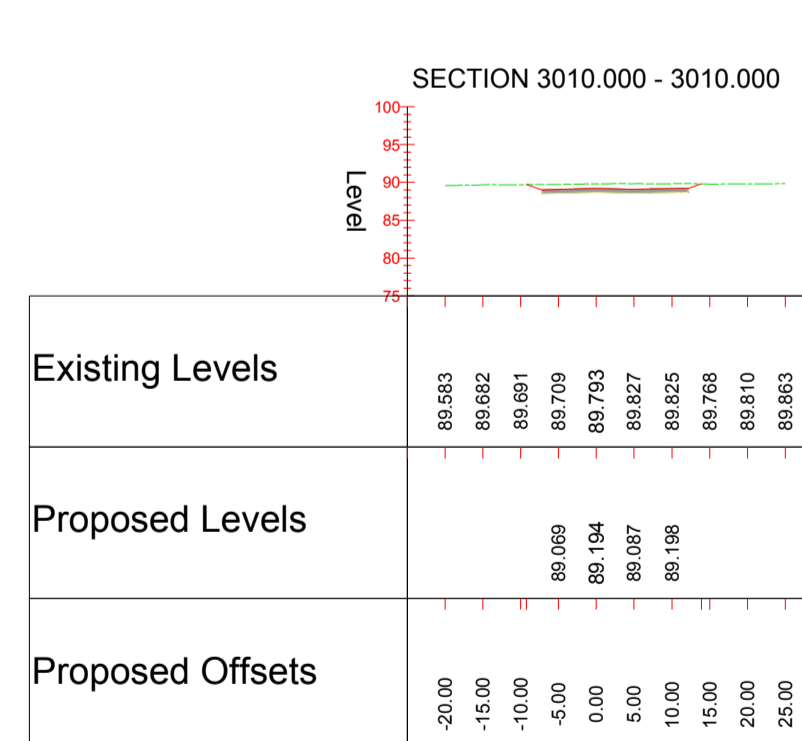
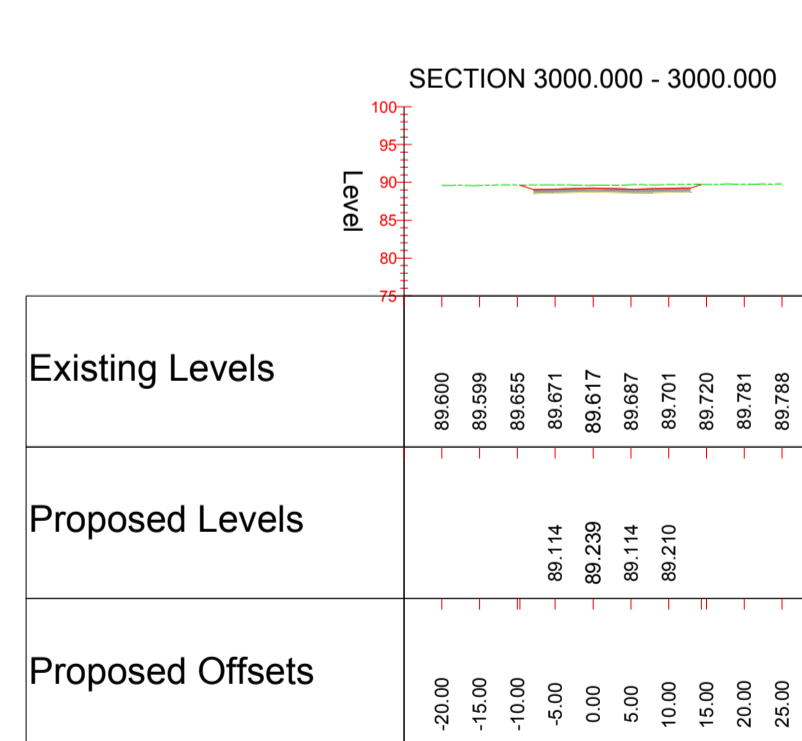
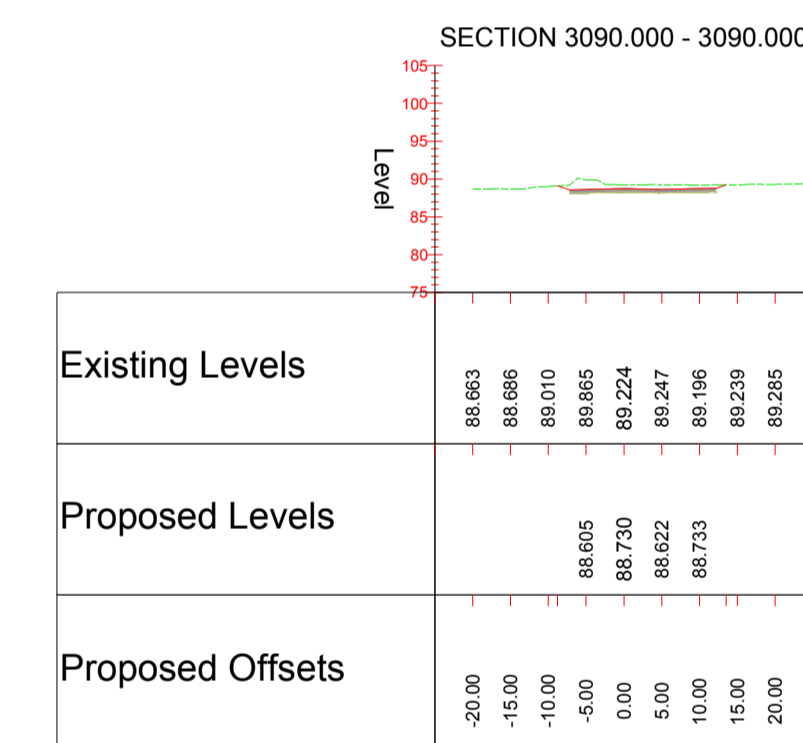
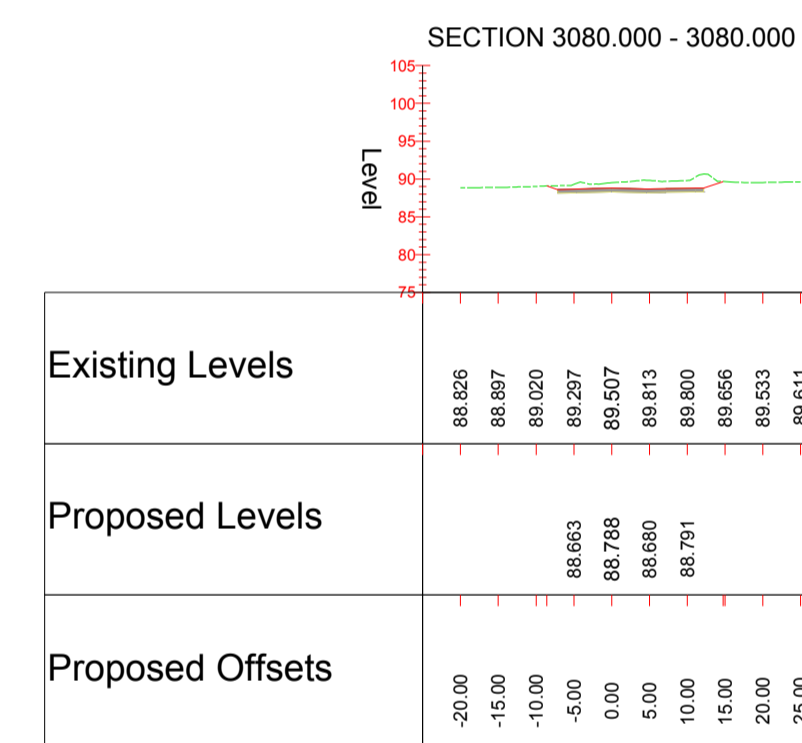
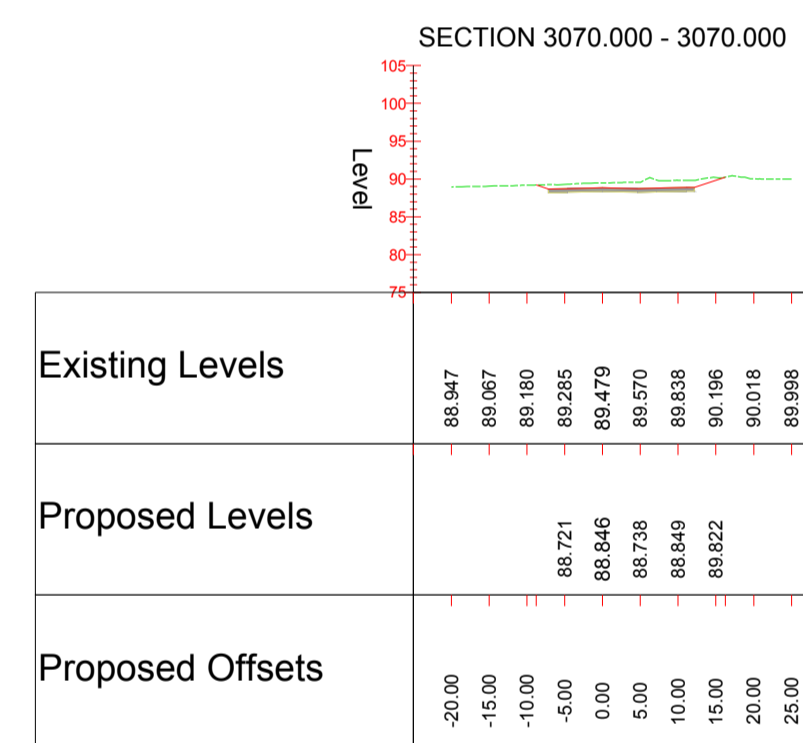
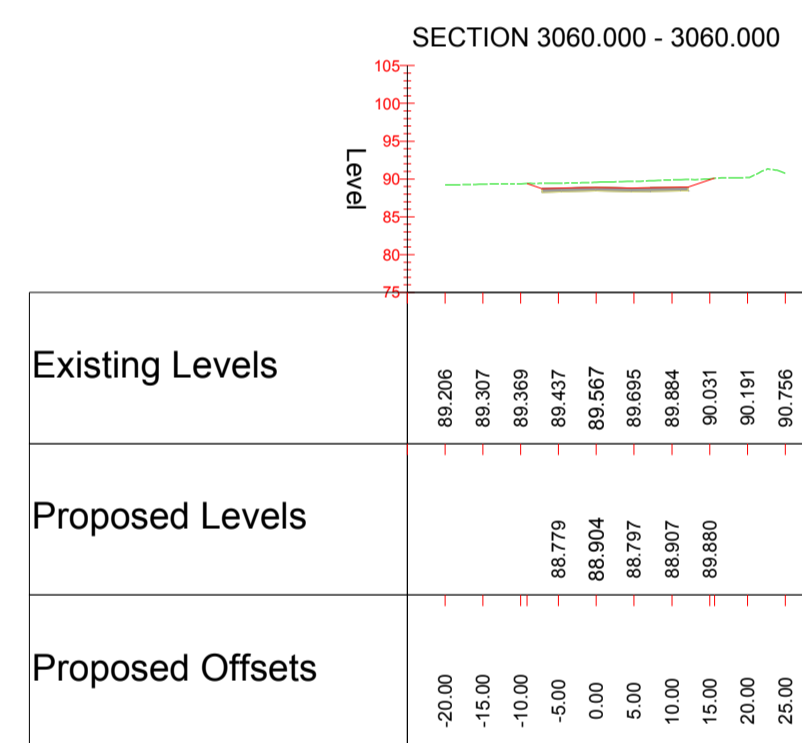
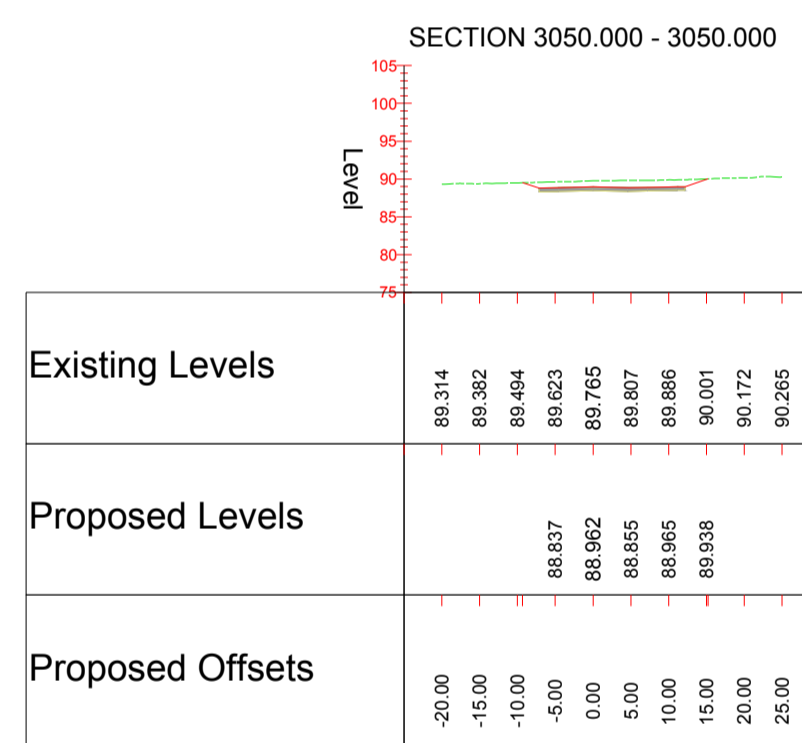
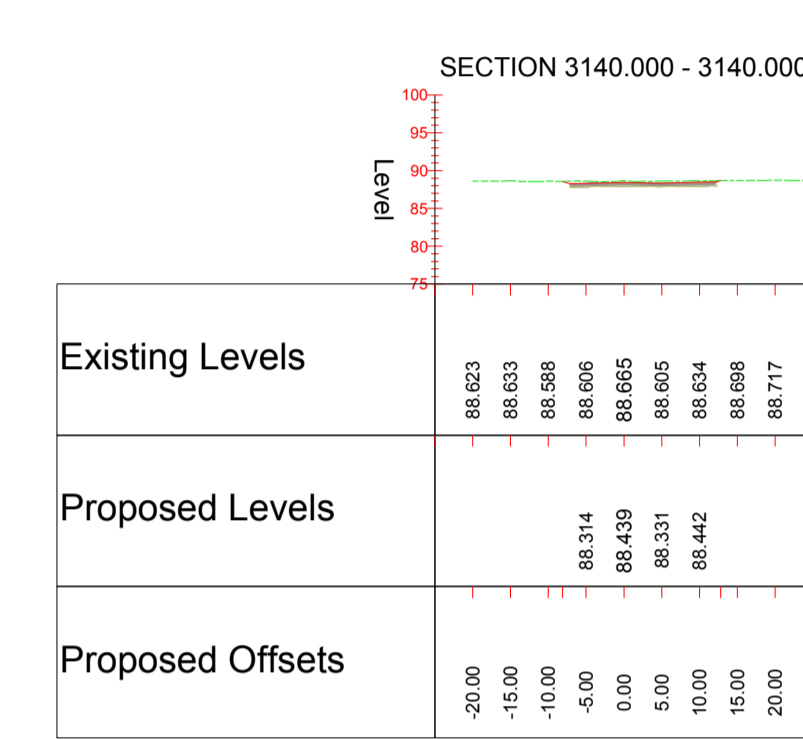
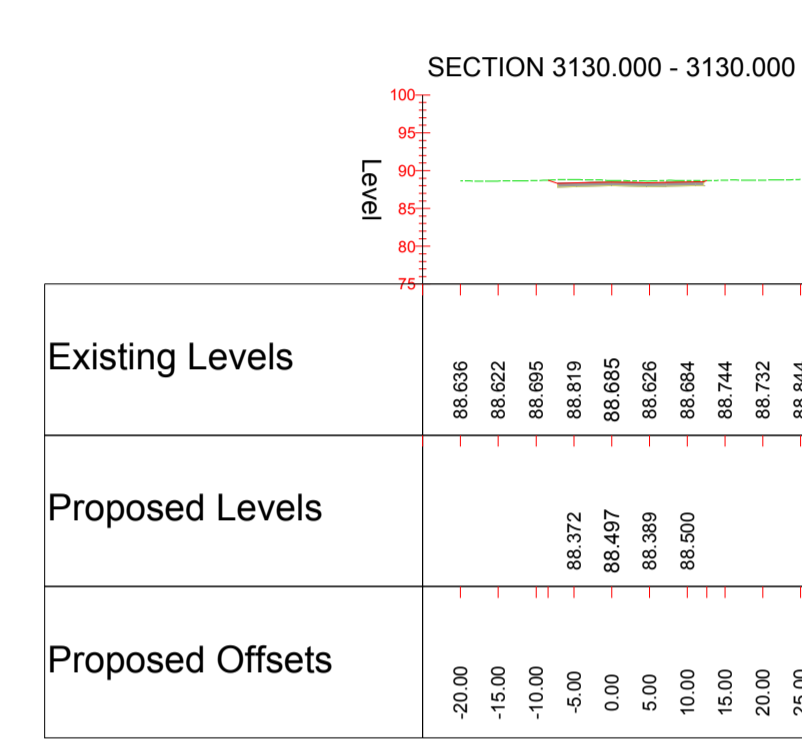
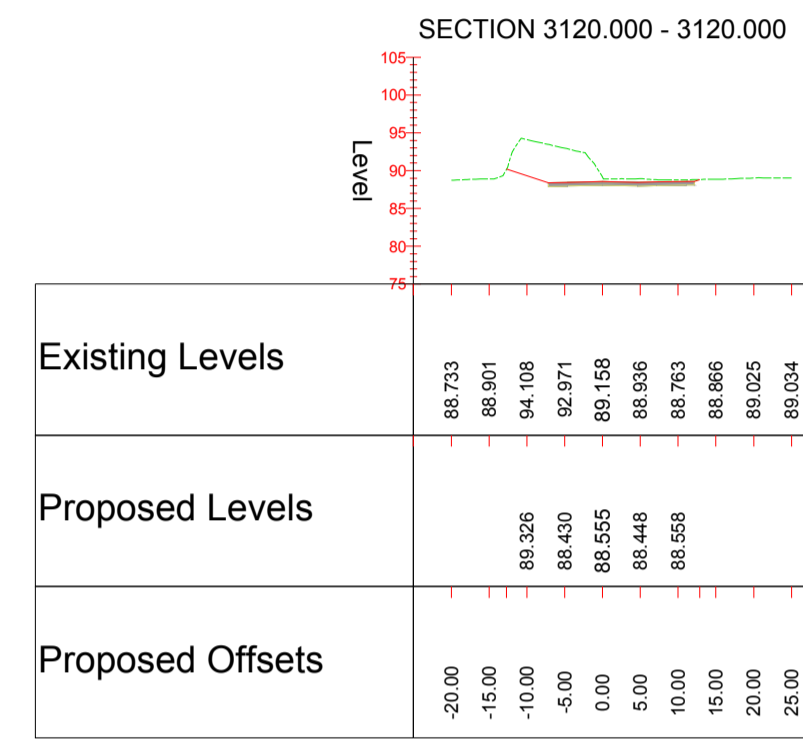
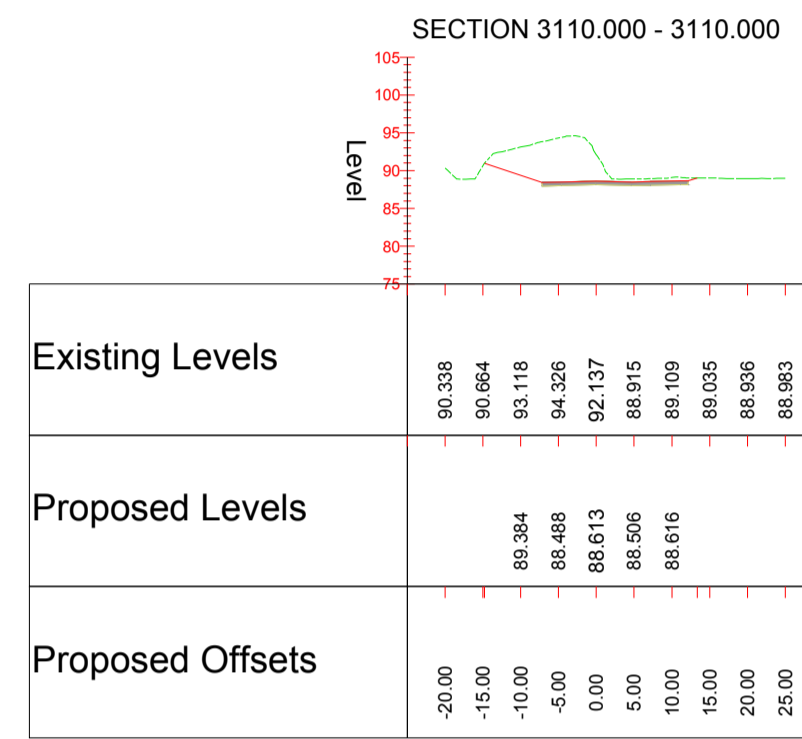
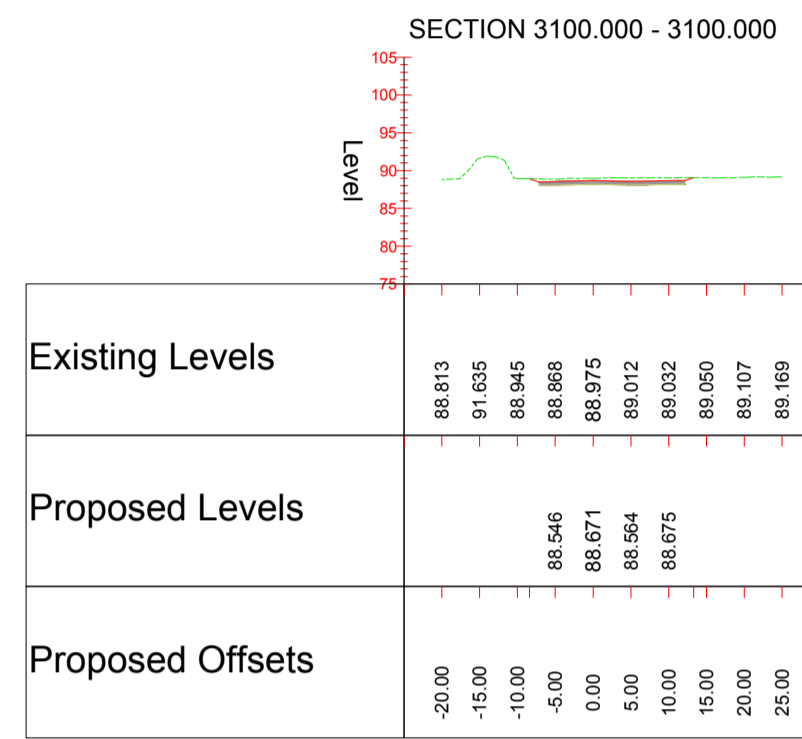
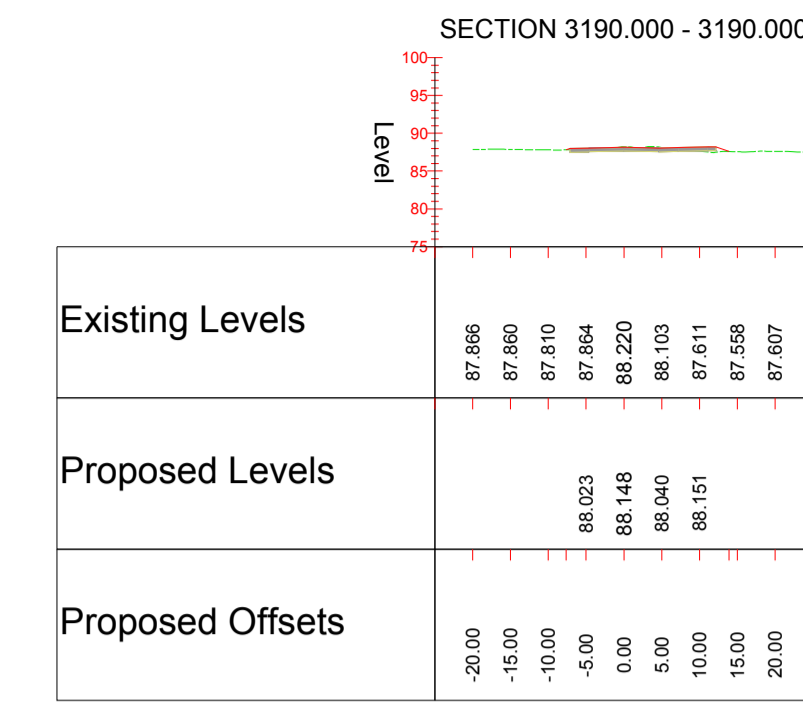
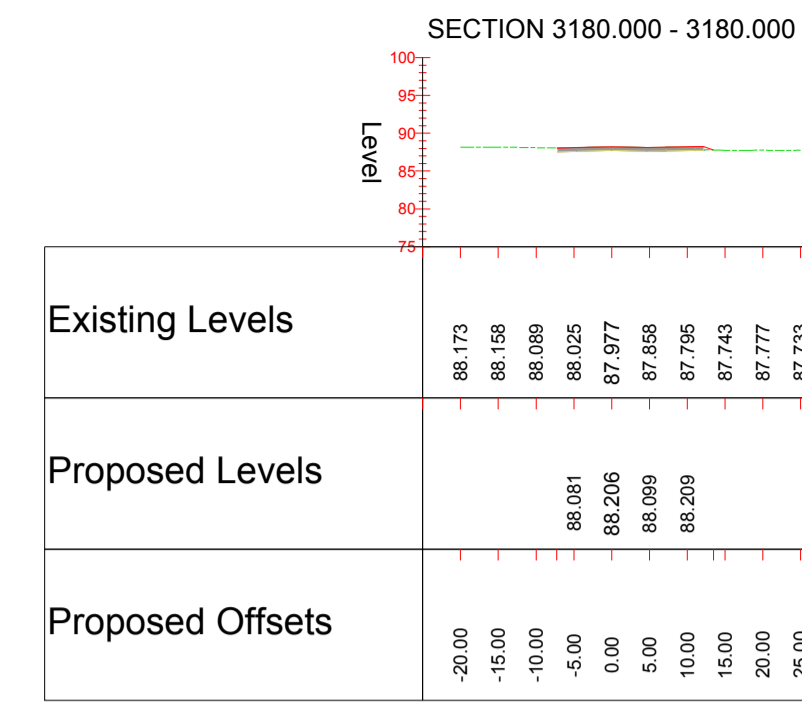
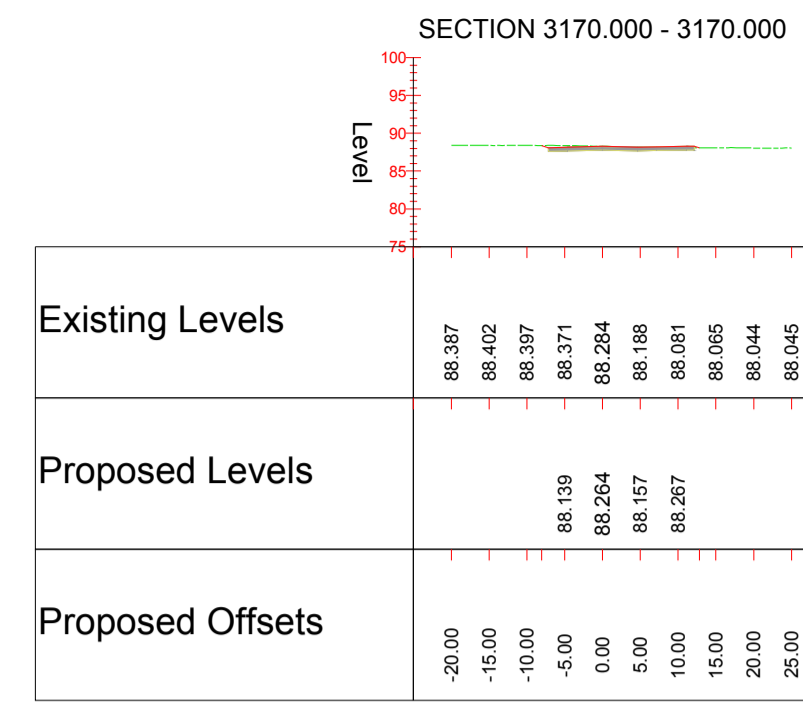
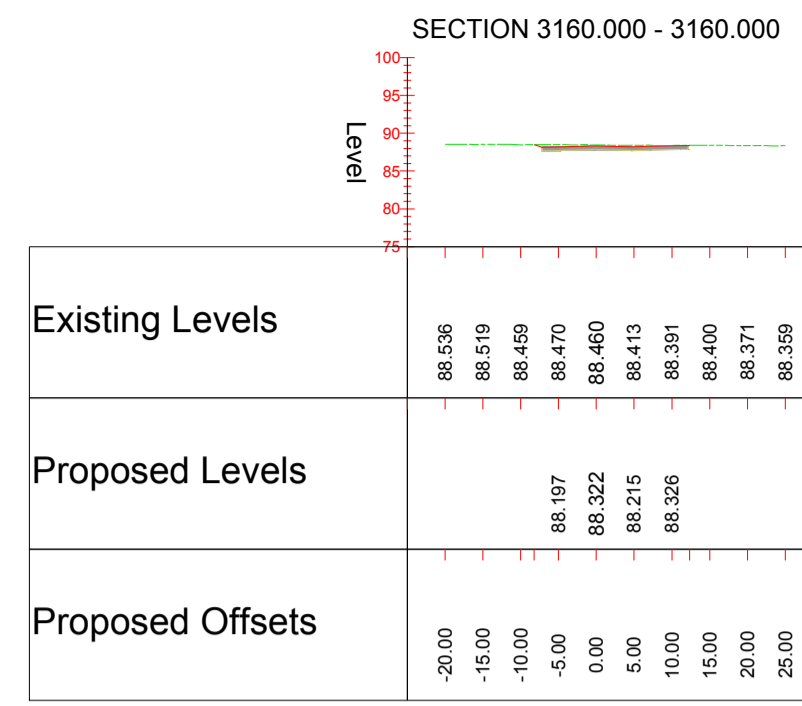
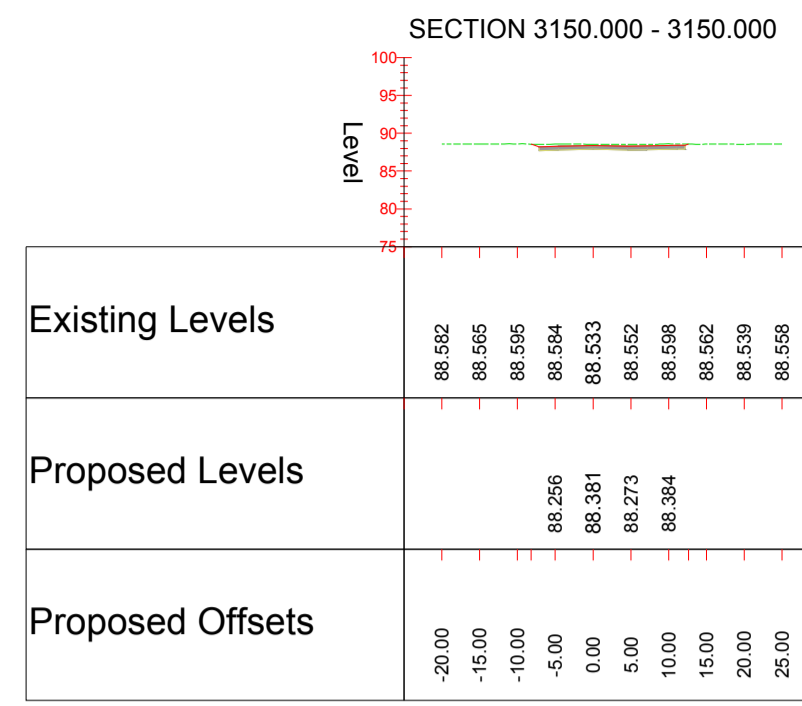
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
<b>CONSTRUCTION</b>			
NONE			
<b>MAINTENANCE/CLEANING</b>			
NONE			
<b>DECOMMISSIONING/DEMOLITION</b>			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			

P1	05.02.18	DRAWING CREATED	AF
Rev.	Date	Description	By
			Chk'd
			App'd

Drawing Status <b>FOR INFORMATION</b>		Suitability <b>S2</b>	Project Title <b>WEST OF ENGLAND WP1</b>			
Client <b>WEST OF ENGLAND</b>		Drawing Title <b>A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 1 OF 19</b>		Originator <b>Woe</b>		
Copyright © Atkins Limited (2014)		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Volume <b>ATK - HGN -</b>		
Scale <b>1:1000</b>		Designed <b>EC</b>	Drawn <b>AF</b>	Checked <b>AH</b>	Authorised	
Original Size <b>A1</b>		Date <b>05/02/18</b>	Date <b>05/02/18</b>	Date <b>05/02/18</b>	Date	
Drawing Number <b>Woe</b>		Project Ref. No. <b>0000000</b>		Revision <b>P1</b>		
HA PIN <b>WP1</b>		- DR - D - 6518		Type <b>P1</b>		
Location		Role		Number		



CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

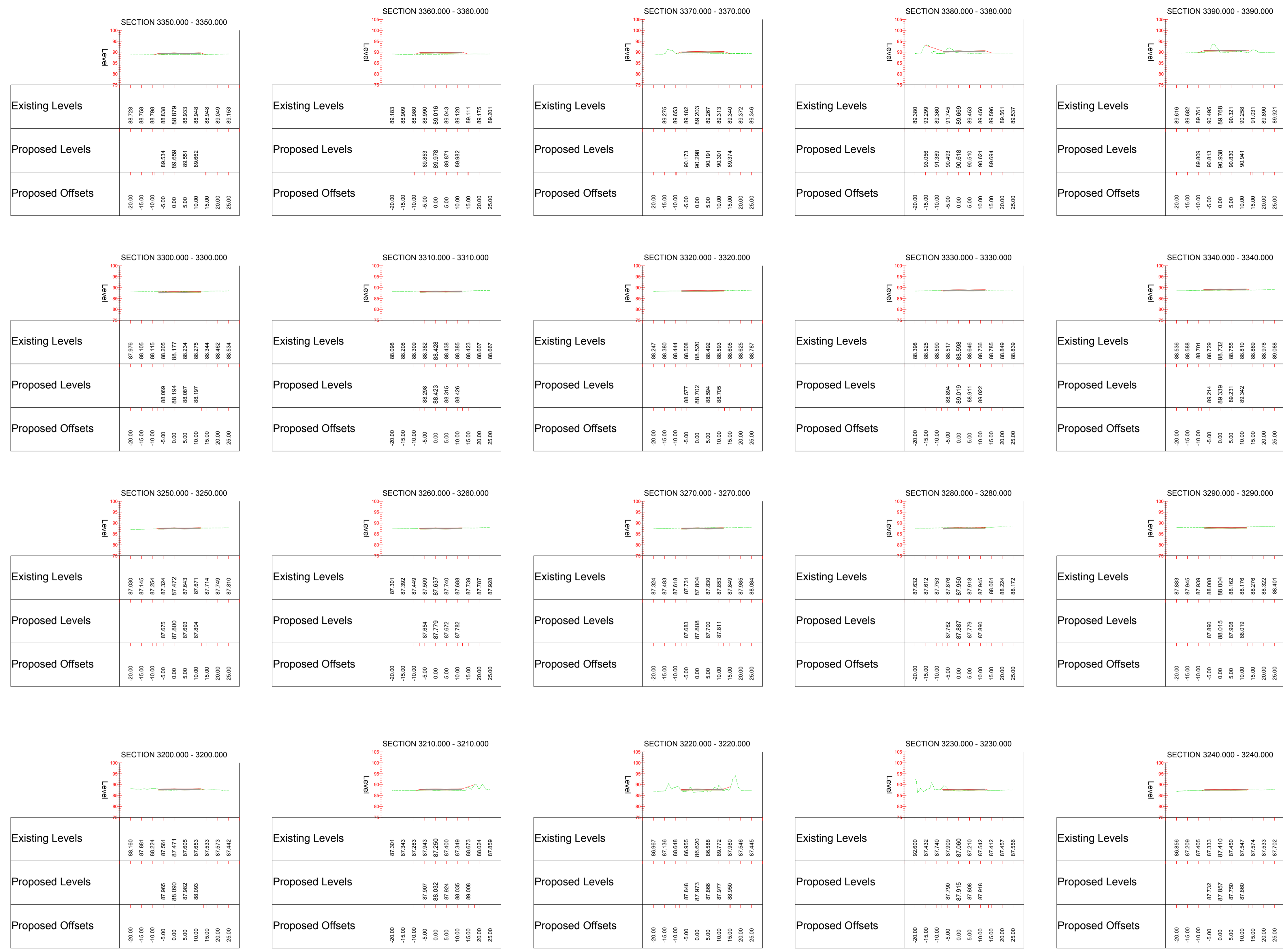
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION		
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:		
CONSTRUCTION	NONE	
MAINTENANCE/CLEANING	NONE	
DECOMMISSIONING/DEMOLITION	NONE	
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement		
Rev.	Date	Description
P1	05.02.18	DRAWING CREATED
		By: AF
		Chk'd: App'd:

Drawing Status		FOR INFORMATION	
Sustainability		S2	
Project Title		WEST OF ENGLAND WP1	
Drawing Title		A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 13 19	
Scale	1:1000	Designed	EC
Original Size	A1	Date	05/02/18
Drawing Number	HA PIN	Originator	Woe
Volume	WP1	Volume	ATK - DR - D - 6519
Project Ref. No.	0000000	Revision	P1
Client	WEST OF ENGLAND		

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Client	WEST OF ENGLAND		
Project Ref. No.	0000000	Revision	P1



CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

Rev.	Date	Description	By	Chk'd	App'd
P1	05.02.18	DRAWING CREATED			AF

**SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION**

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

**CONSTRUCTION**  
NONE

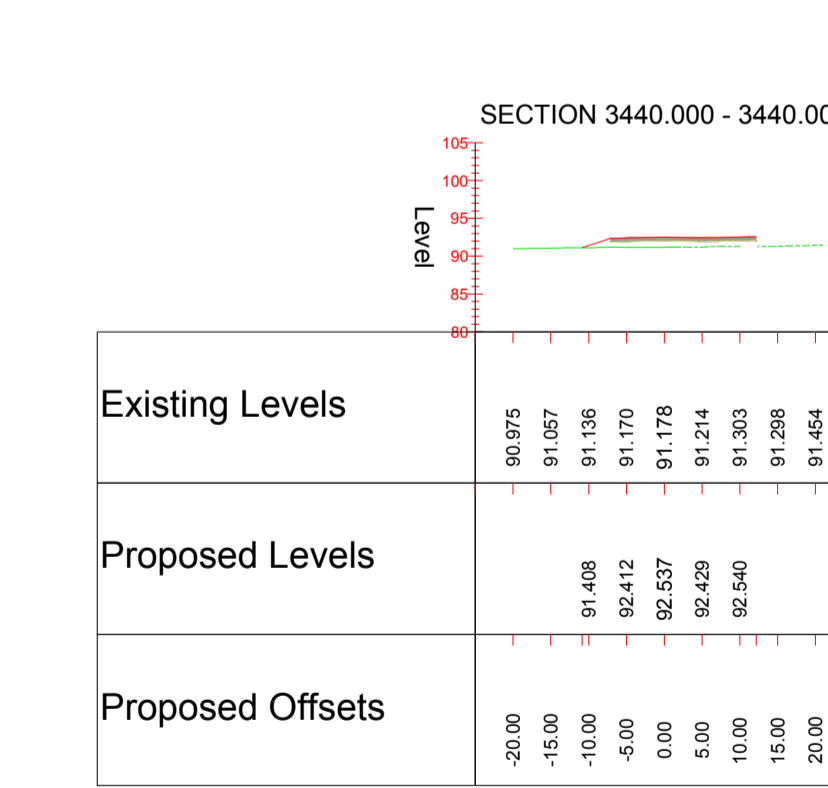
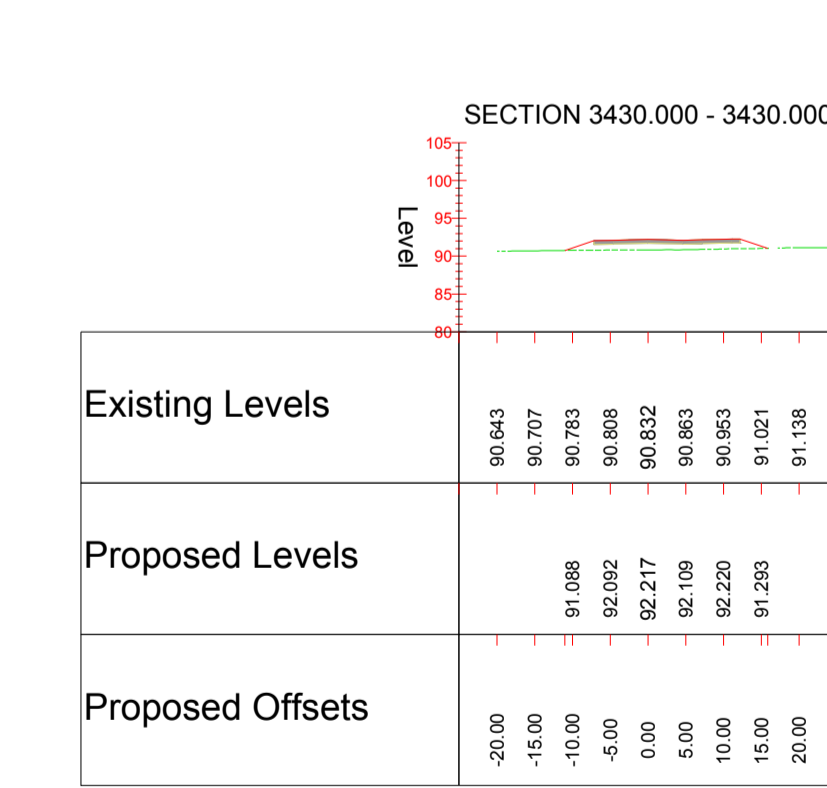
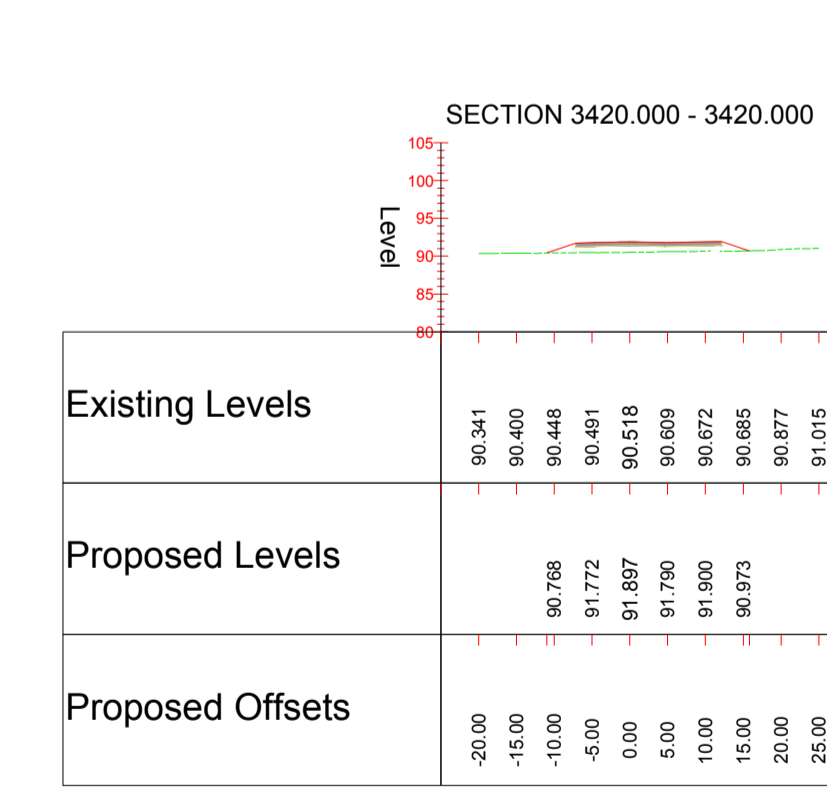
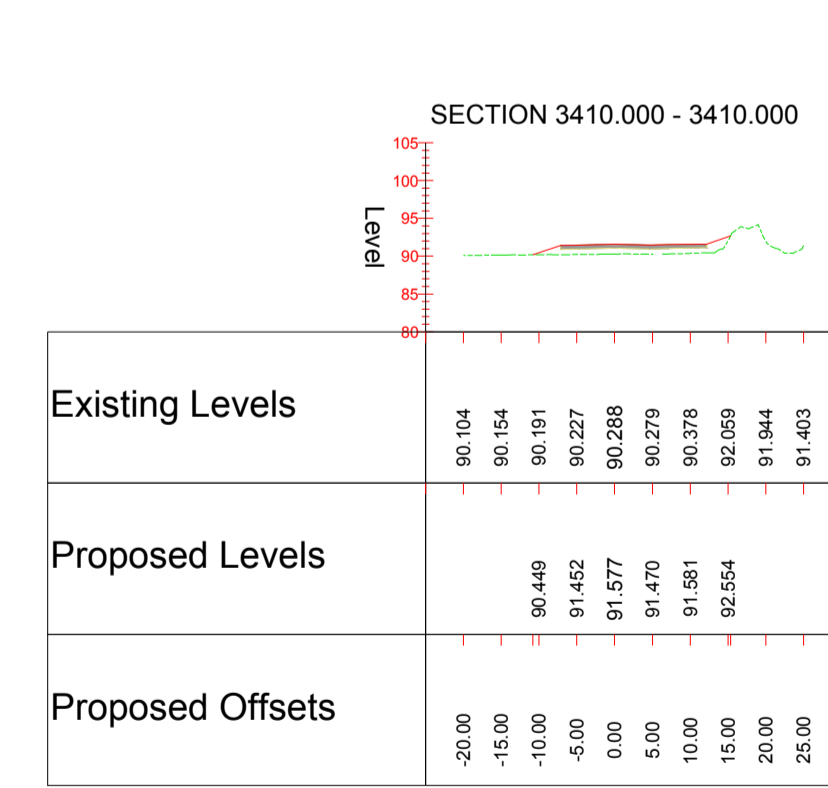
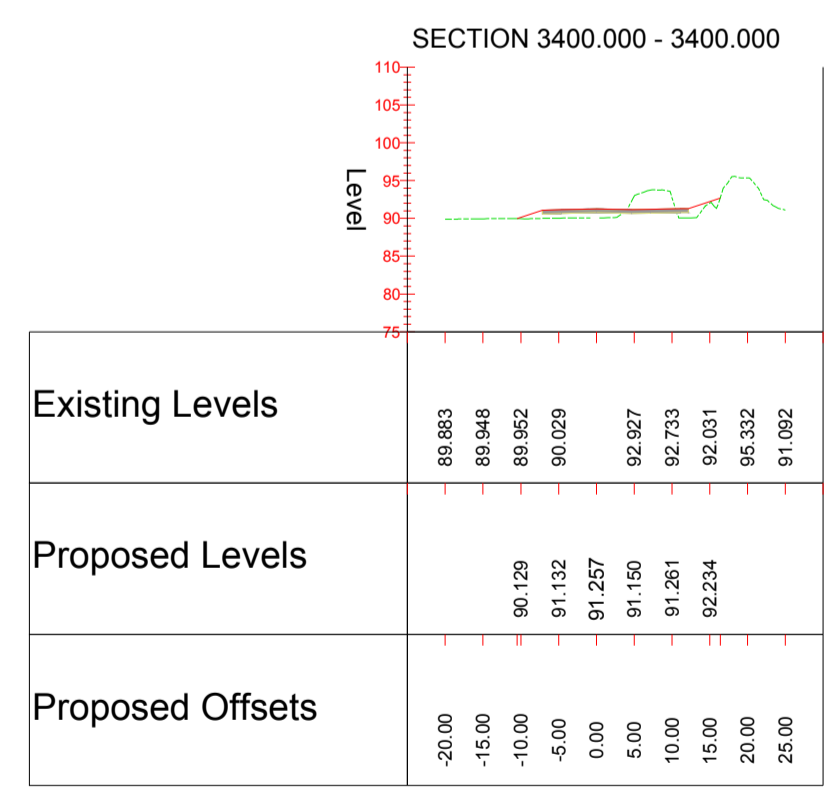
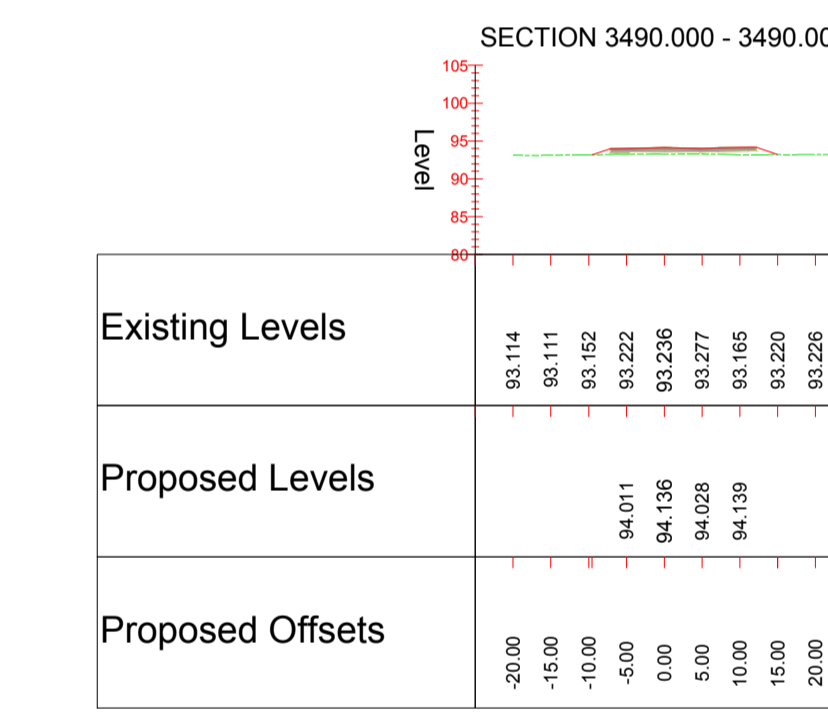
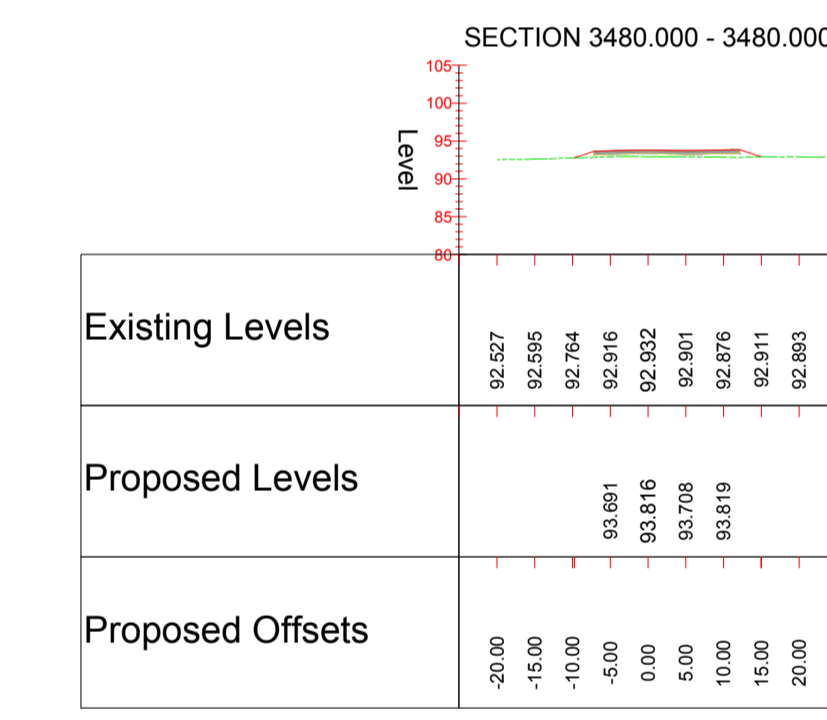
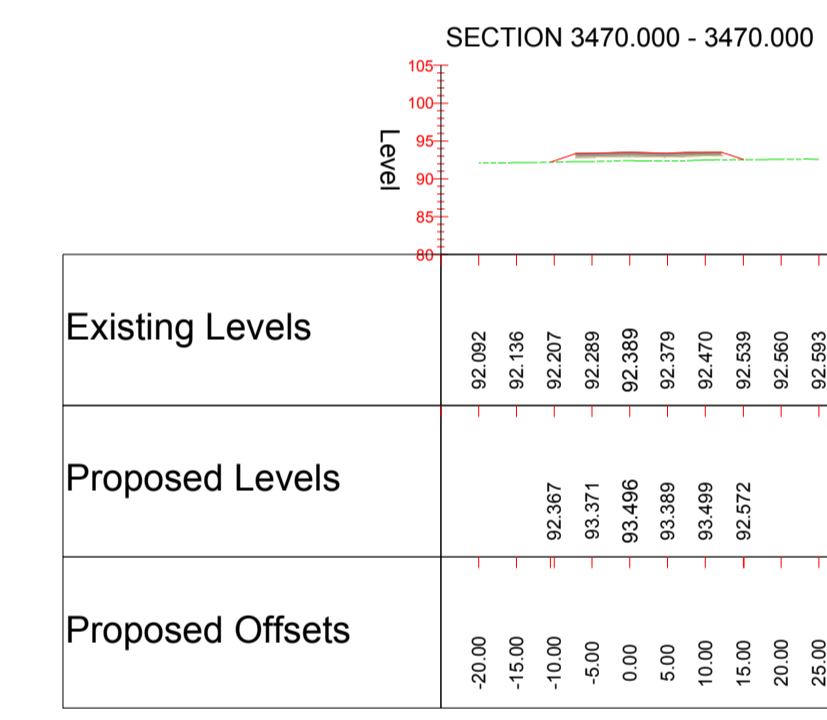
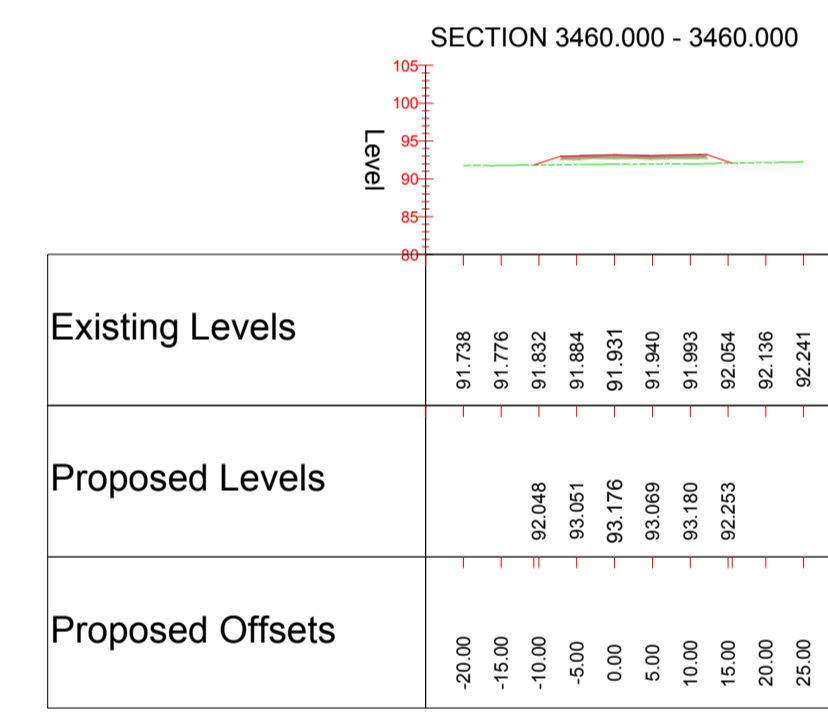
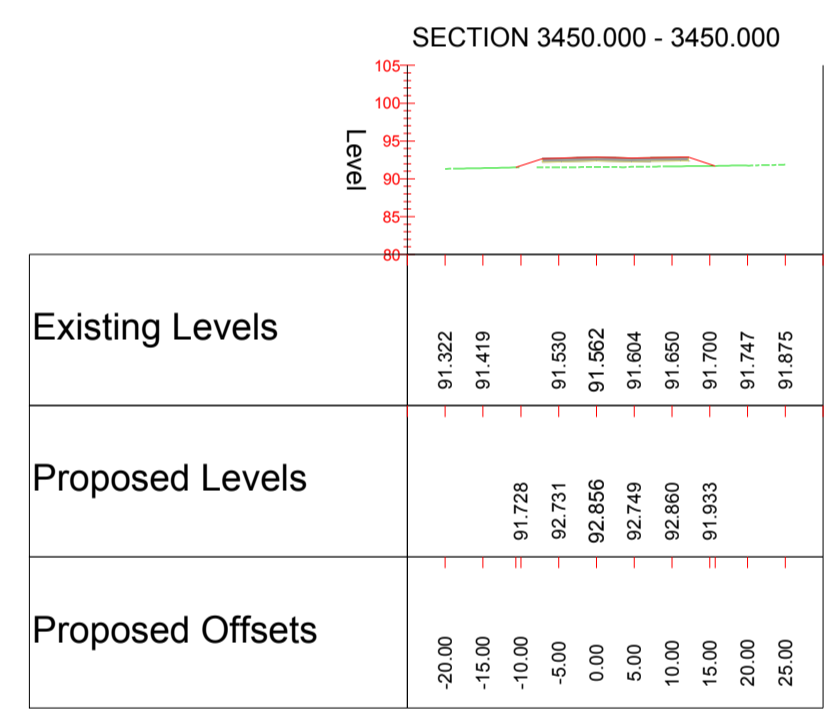
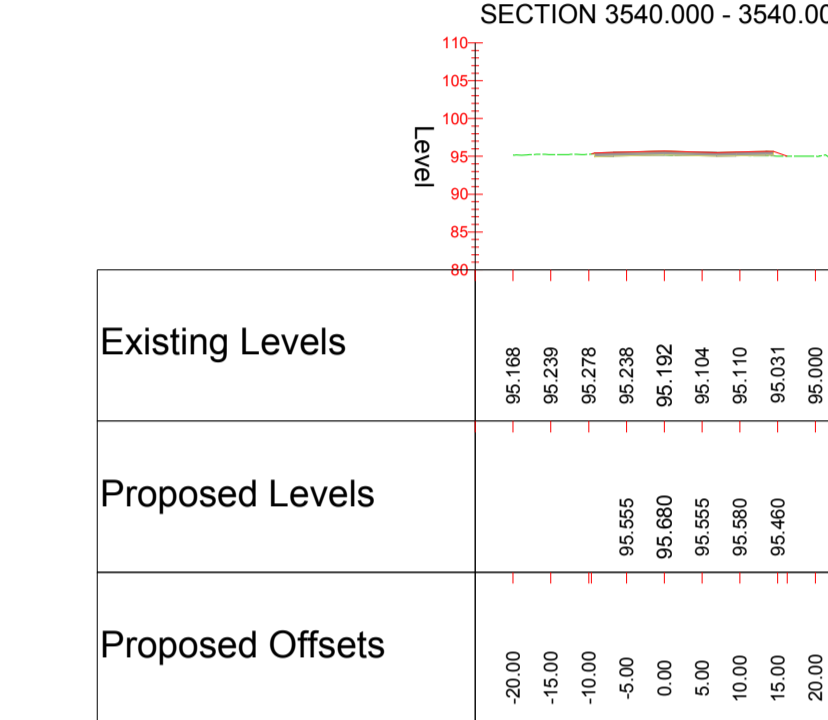
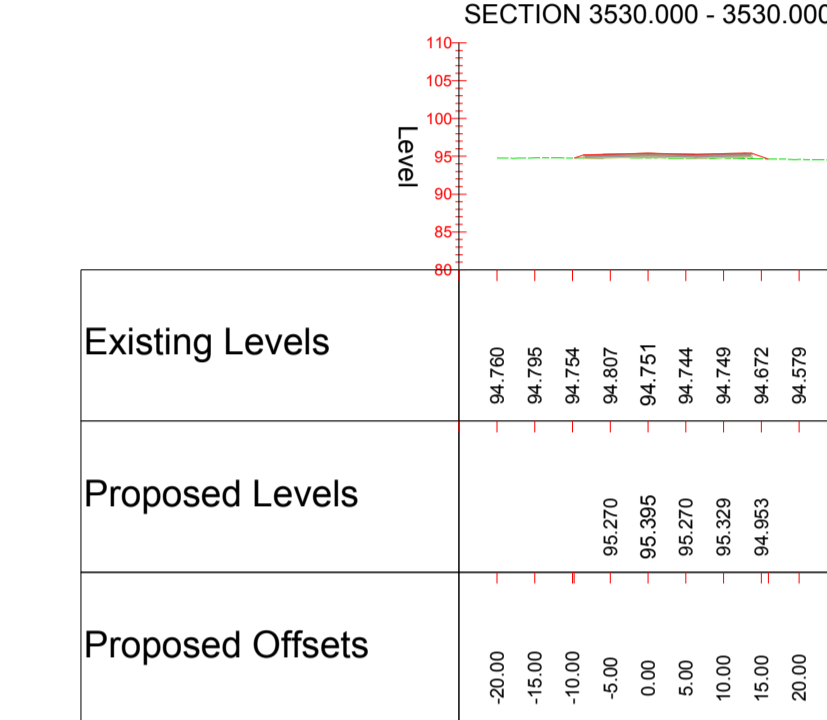
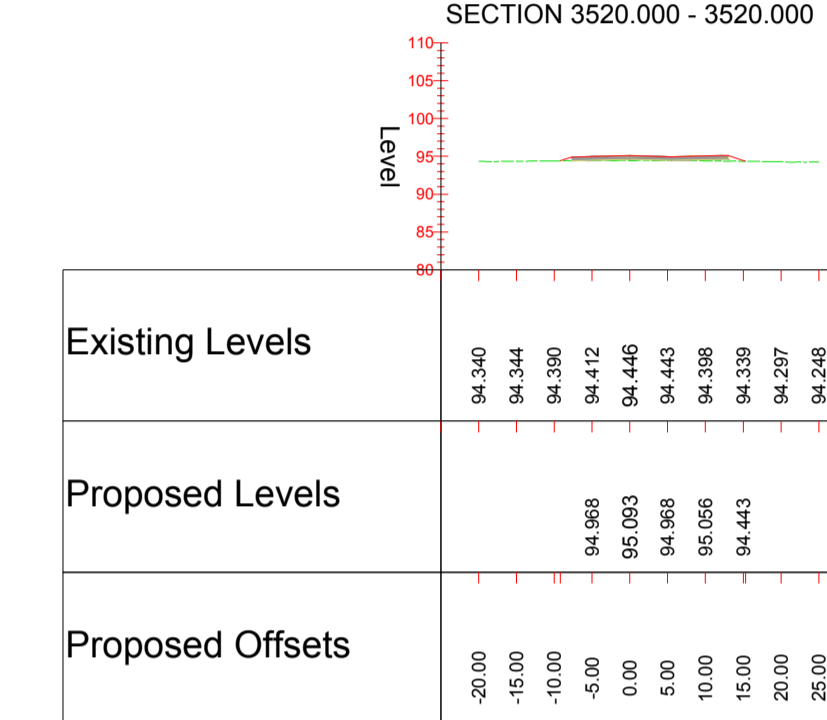
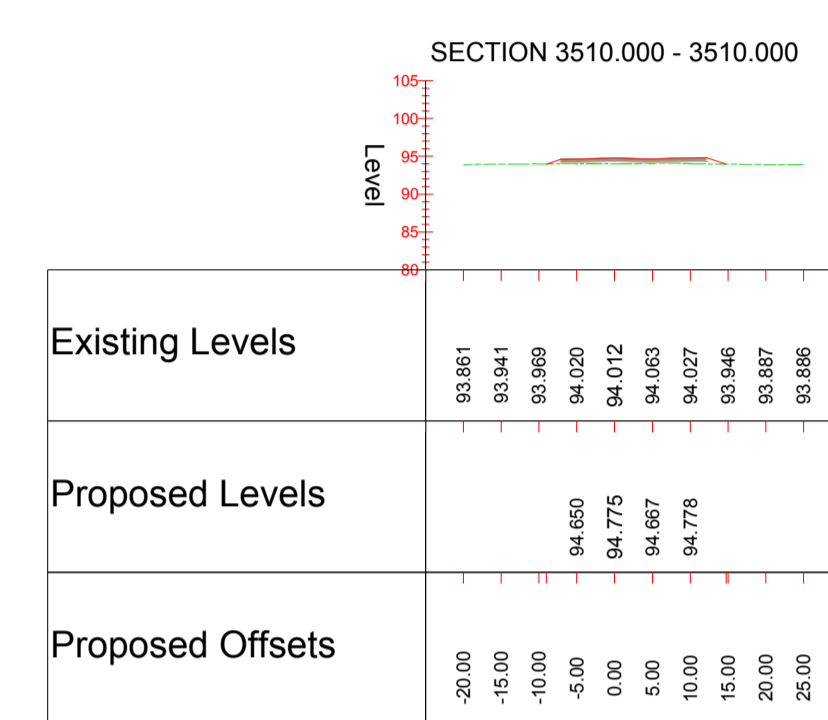
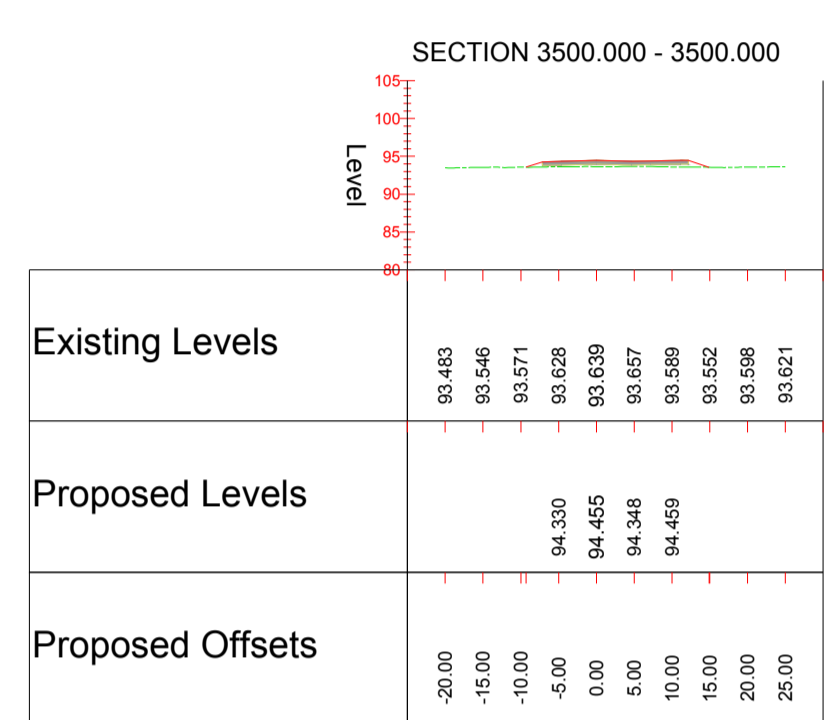
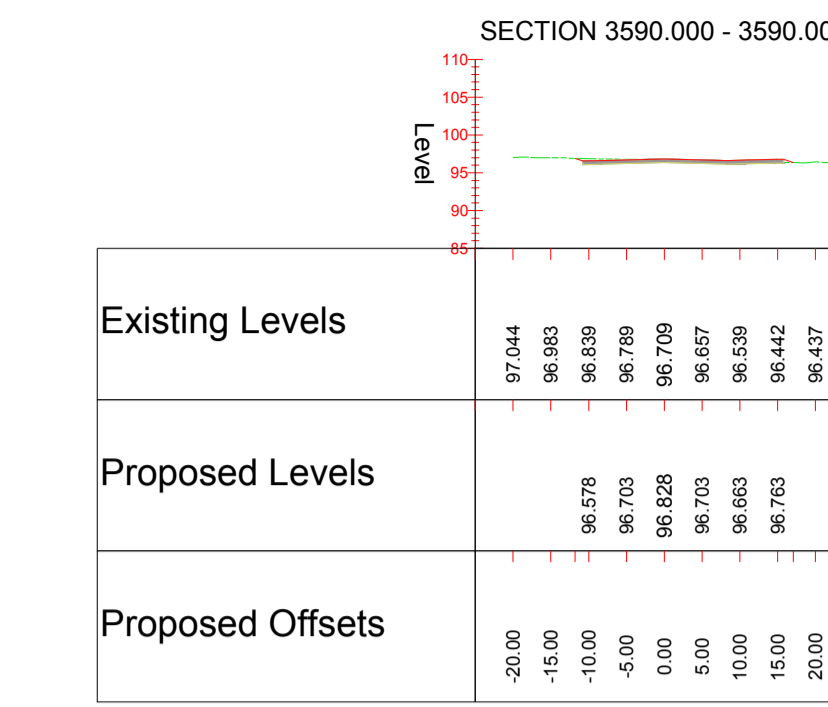
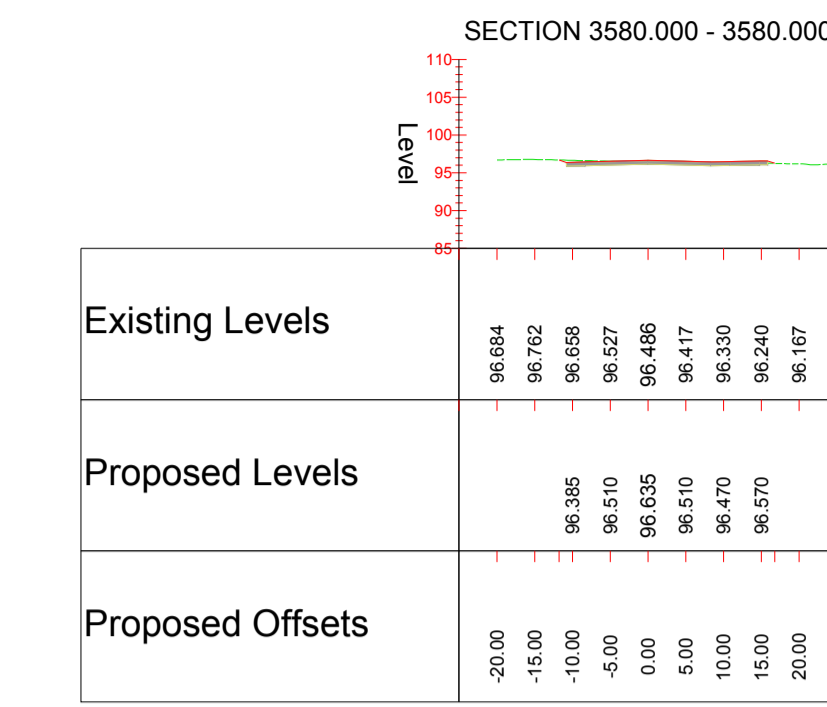
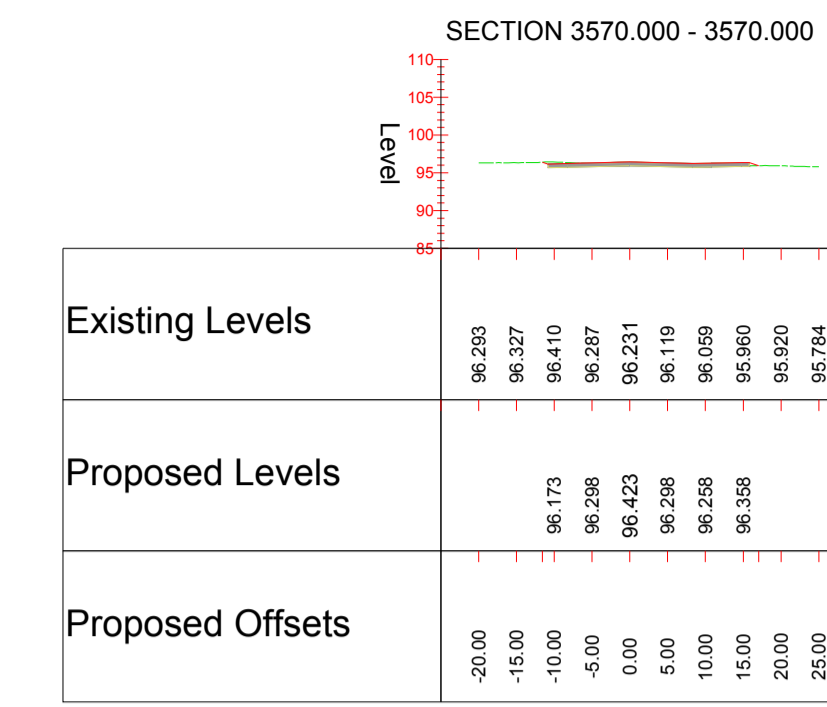
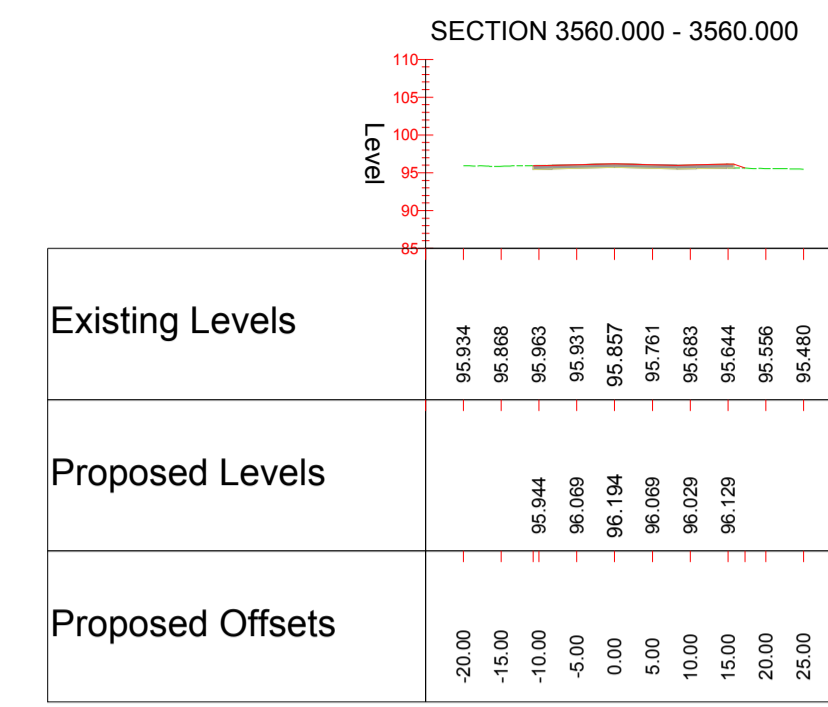
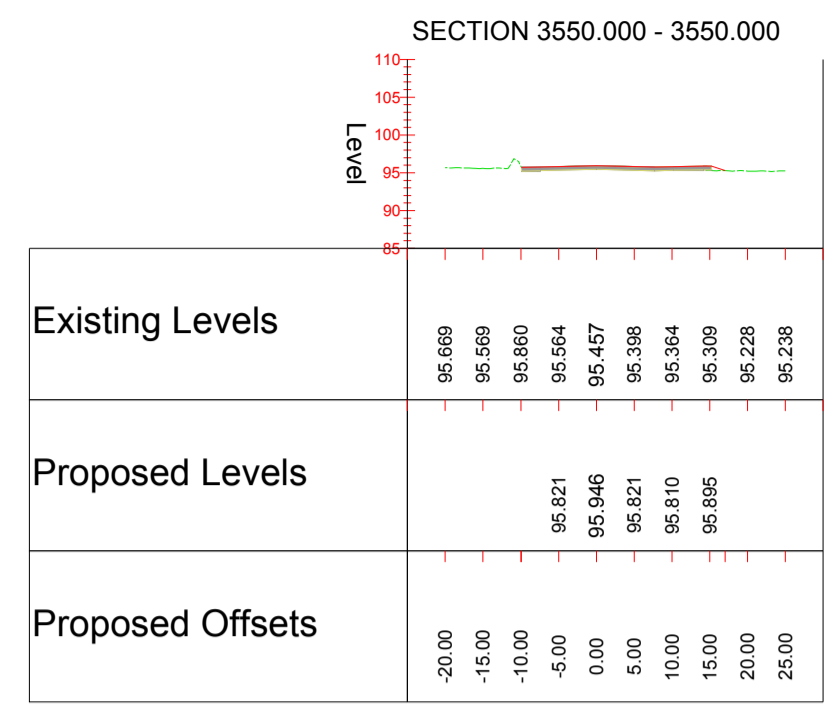
**MAINTENANCE/CLEANING**  
NONE

**DECOMMISSIONING/DEMOLITION**  
NONE

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

Drawing Status <b>FOR INFORMATION</b>	Suitability <b>S2</b>	Project Title <b>WEST OF ENGLAND WP1</b>
<b>ATKINS</b>	The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com	Drawing Title <b>A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 17 19</b>
Copyright © Atkins Limited (2014)	Client <b>WEST OF ENGLAND</b>	Scale: 1:1000 Designed: EC Original Size: A1 Date: 05/02/18 Drawing Number: Woe HA PIN: WP1
		Checked: AH Authorised: Date: 05/02/18 Project Ref. No.: 0000000 Revision: P1

CROSS SECTIONS  
Scale 1:1000



Key:

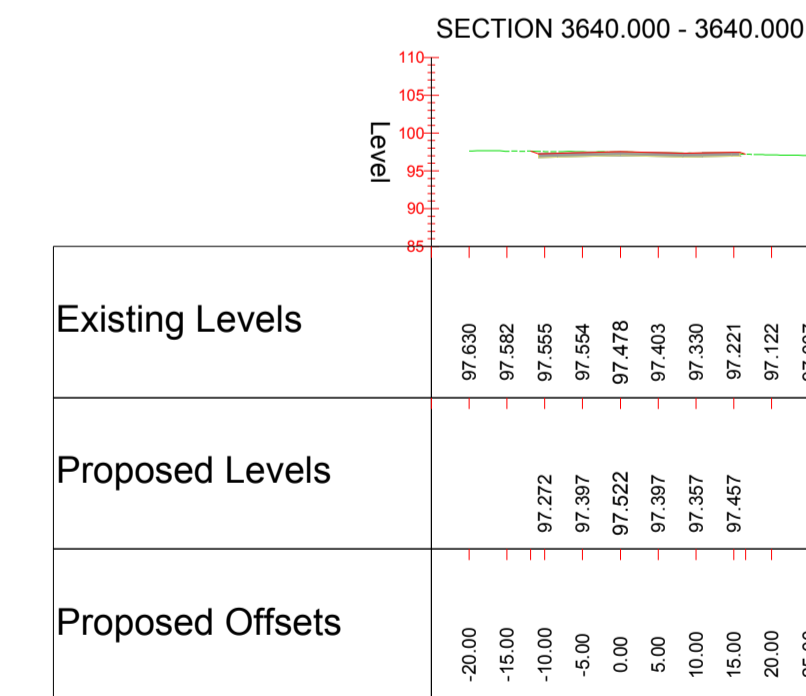
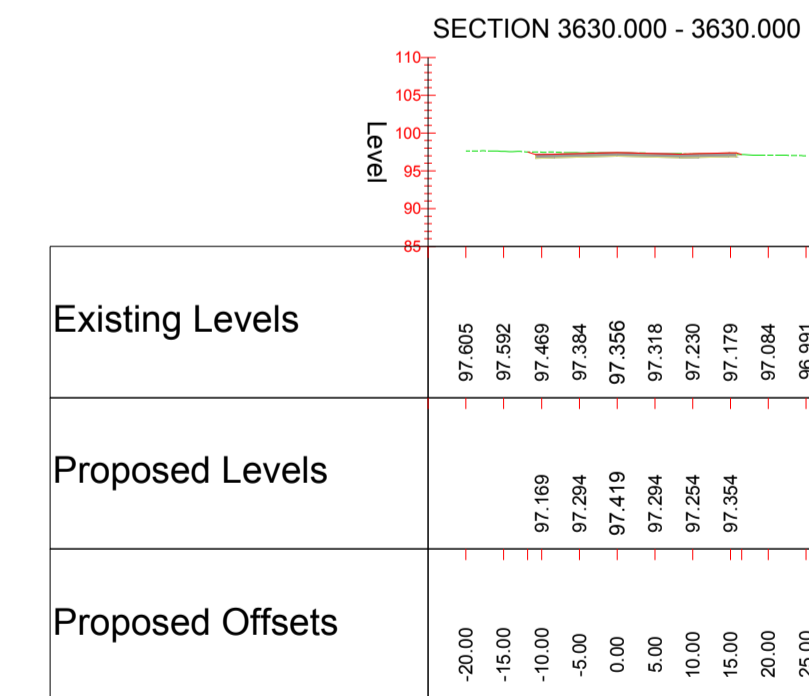
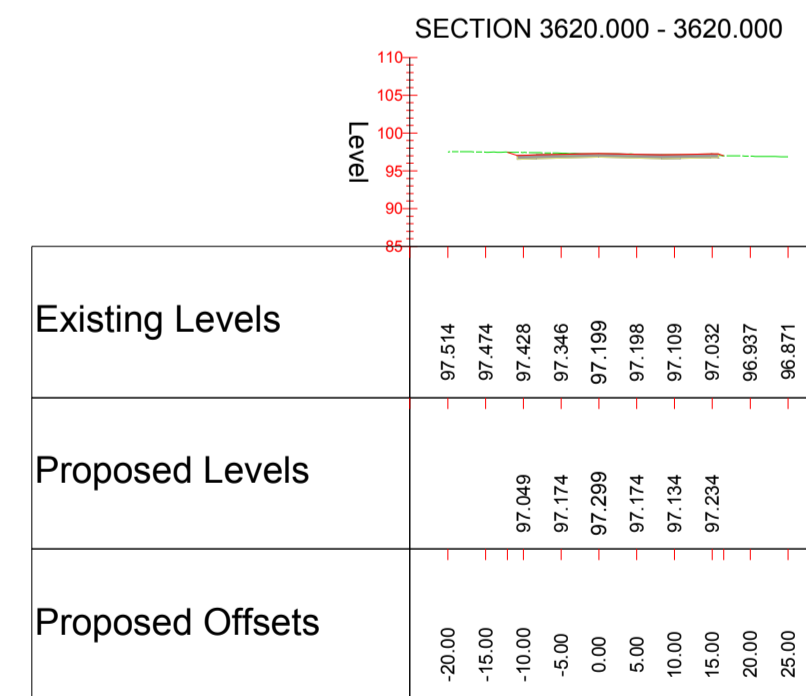
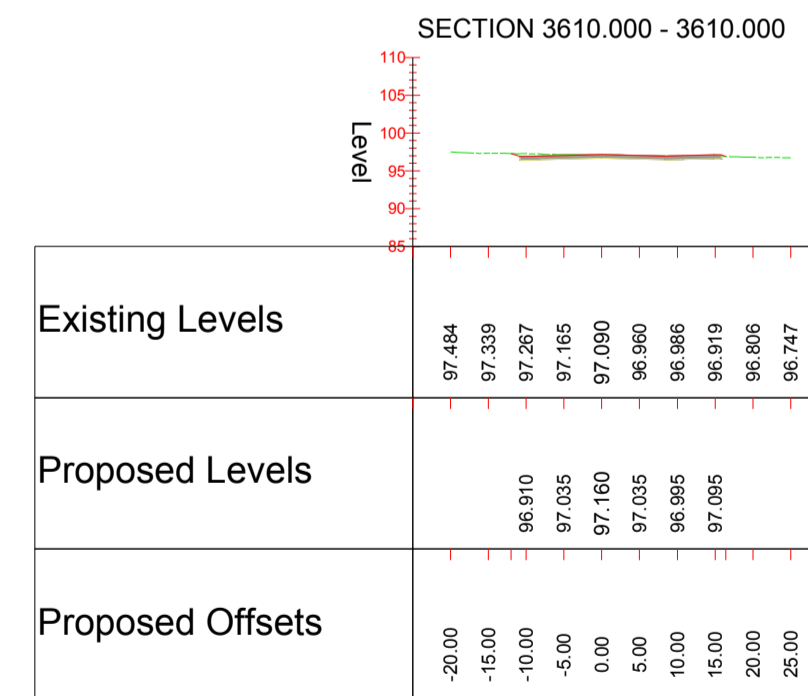
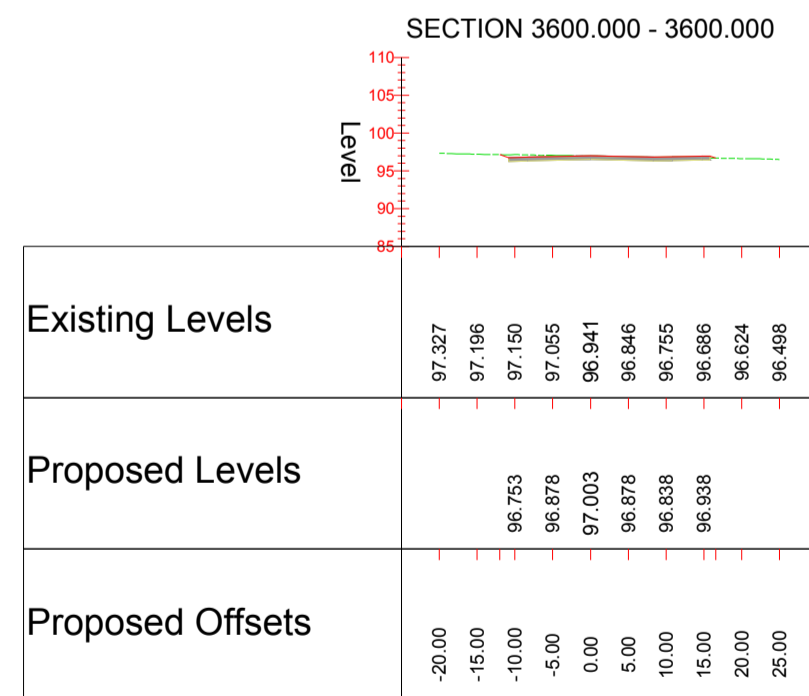
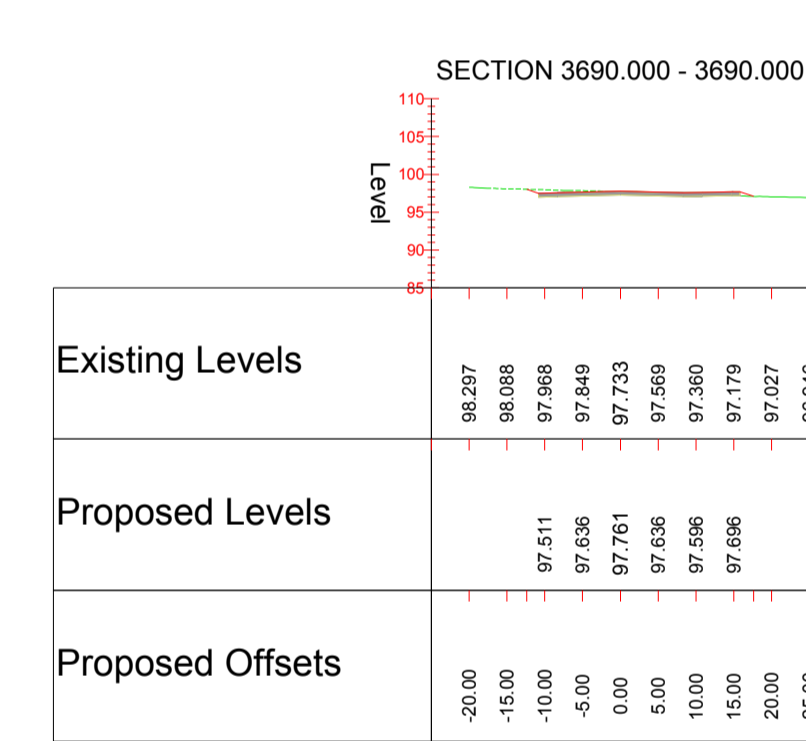
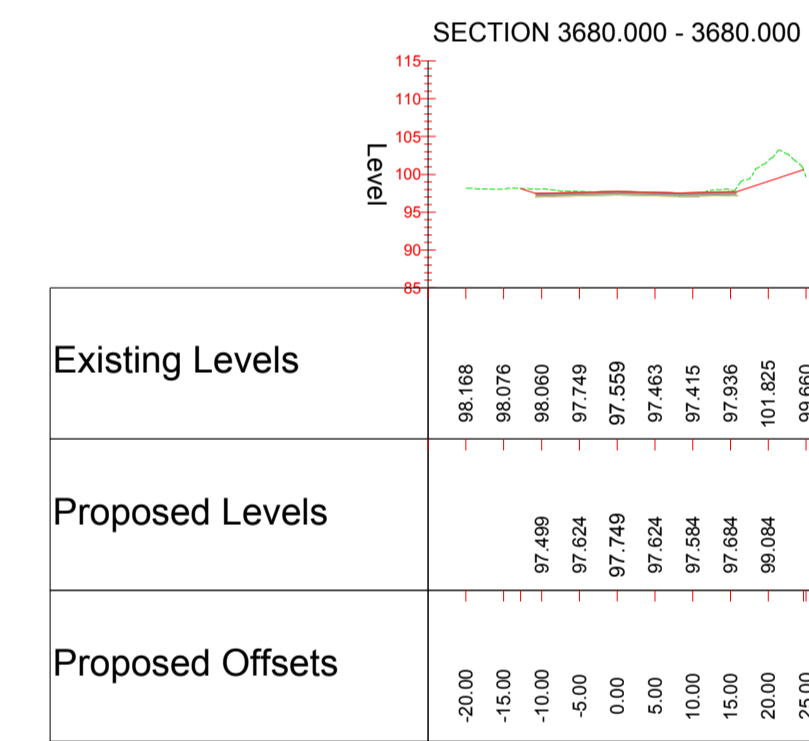
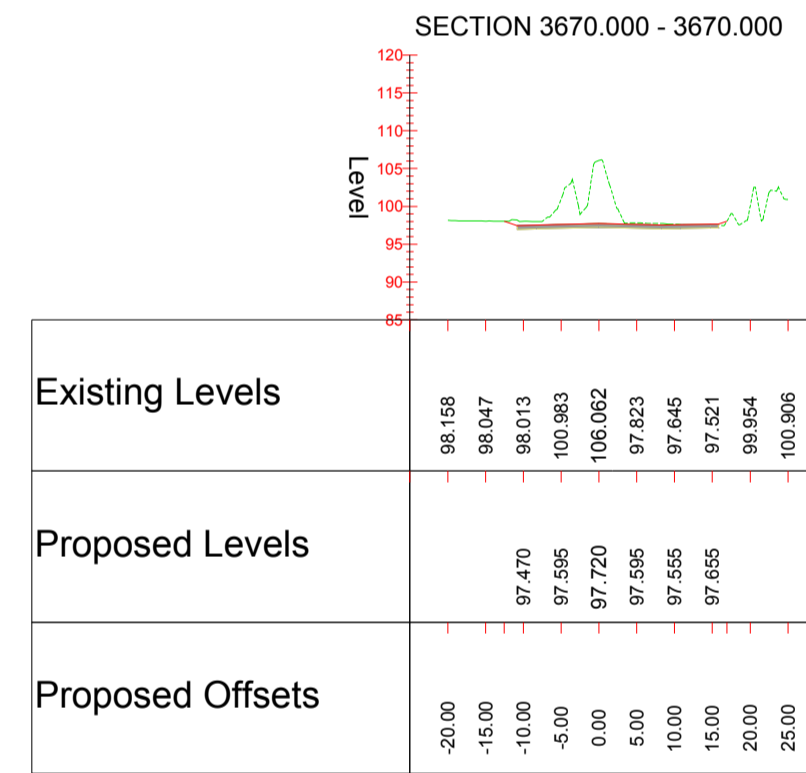
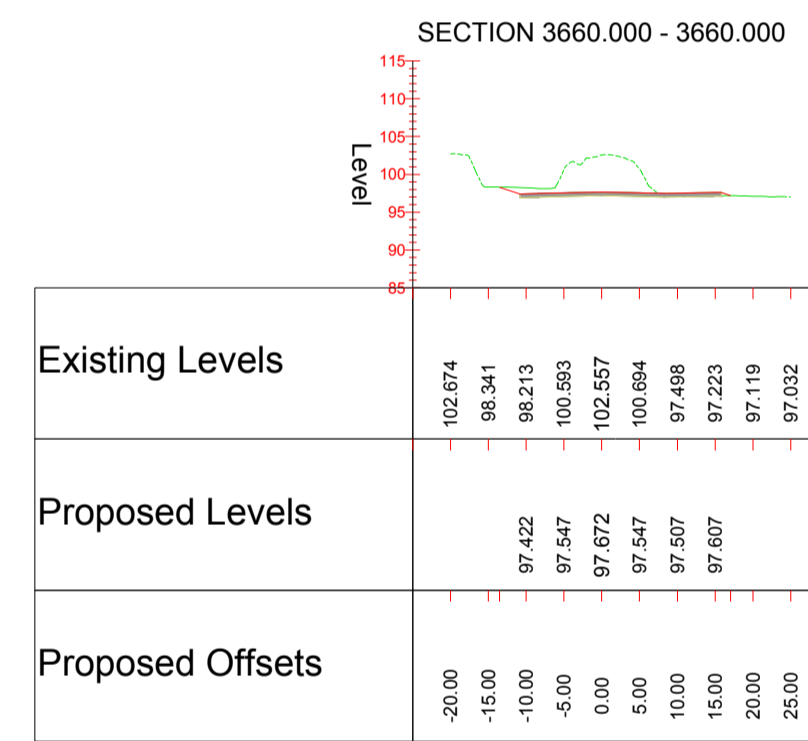
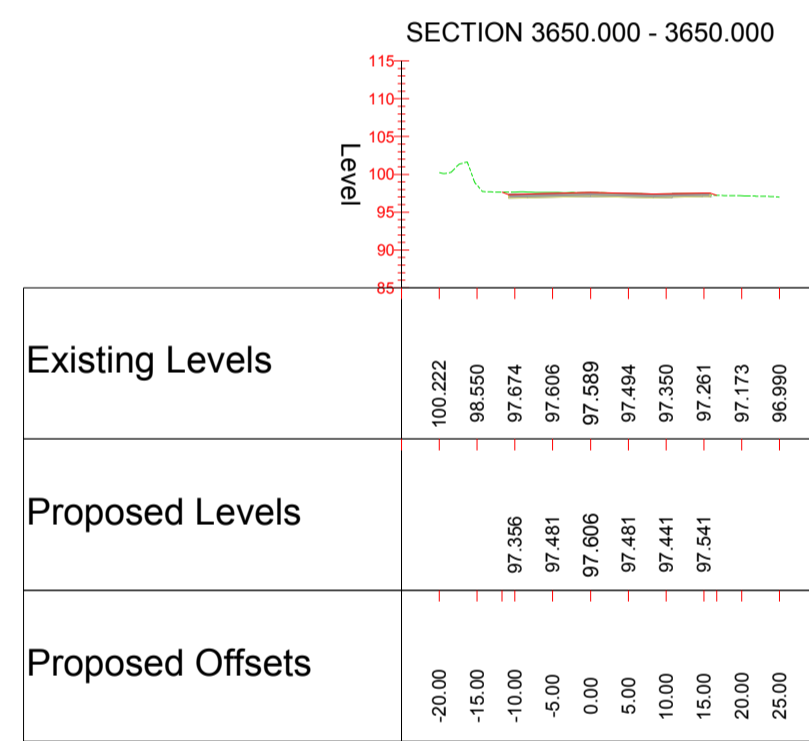
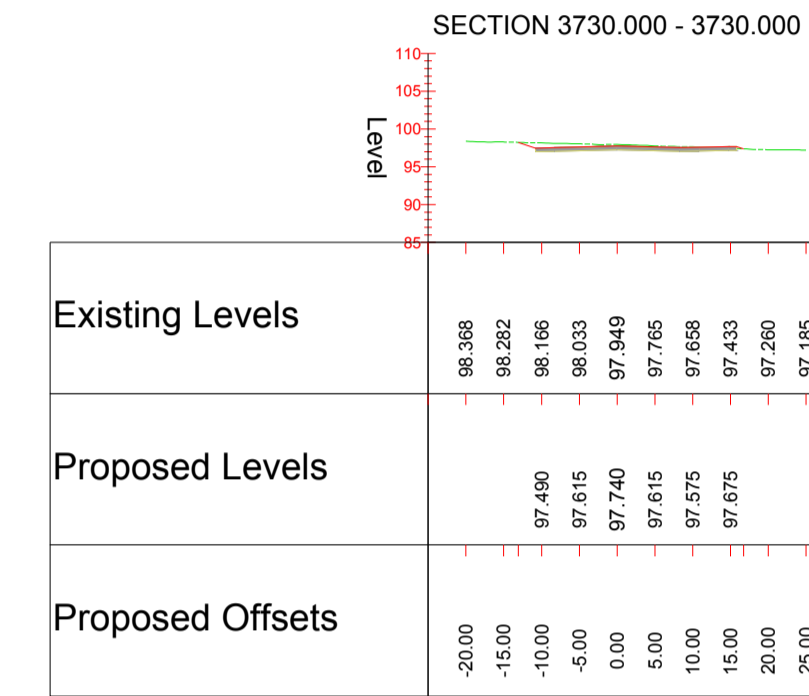
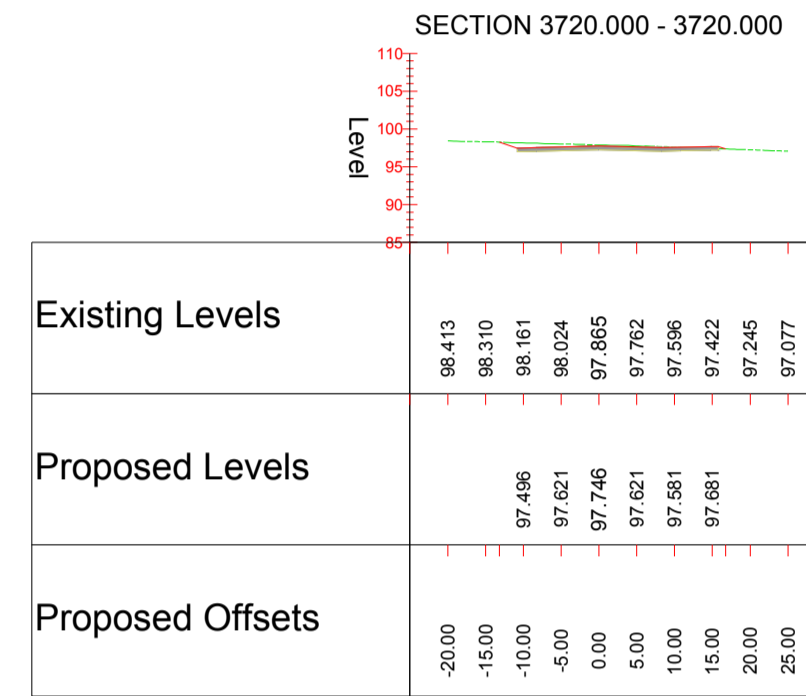
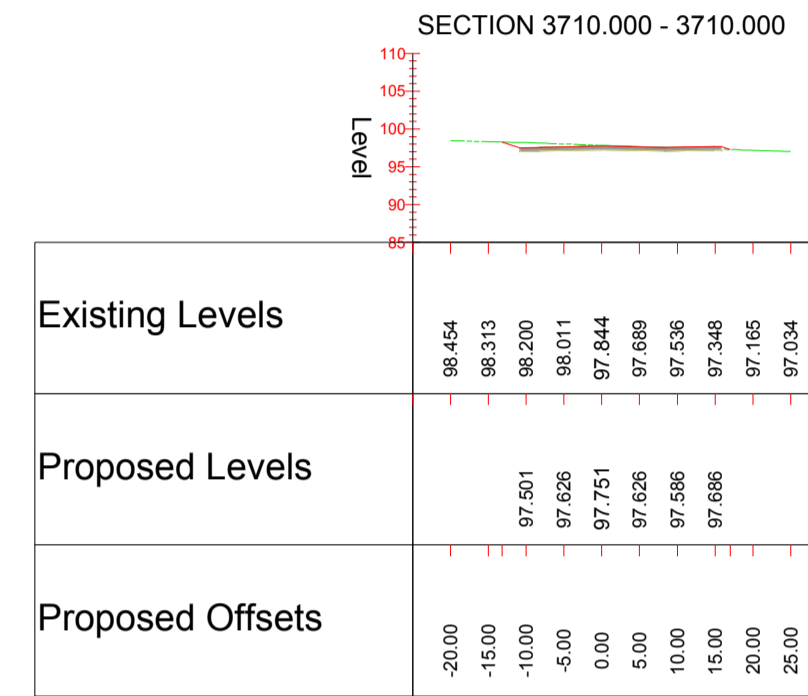
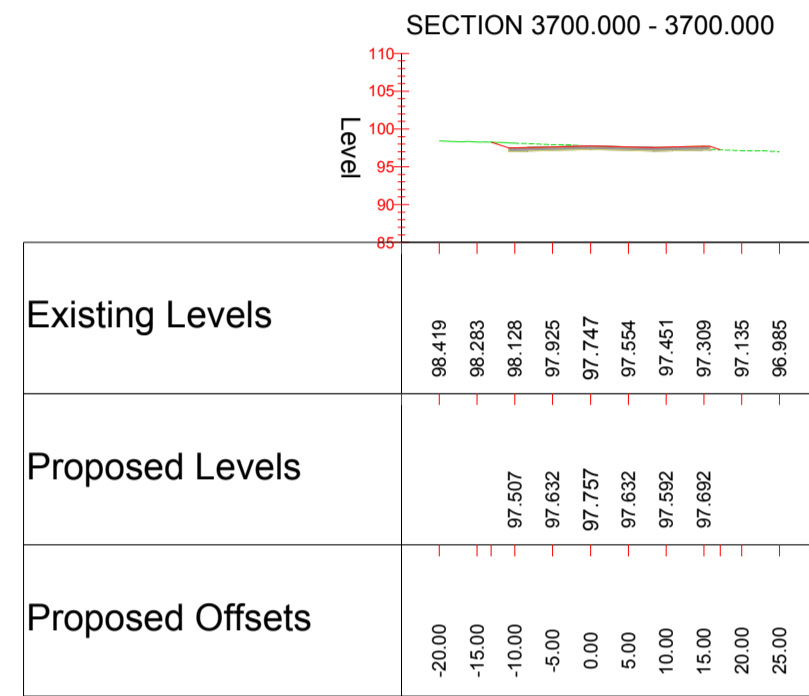
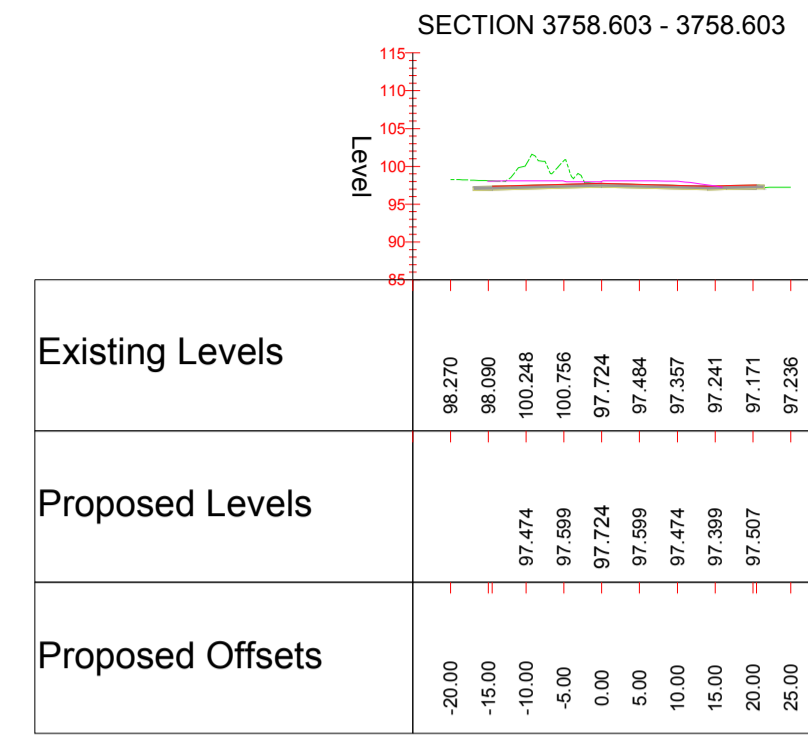
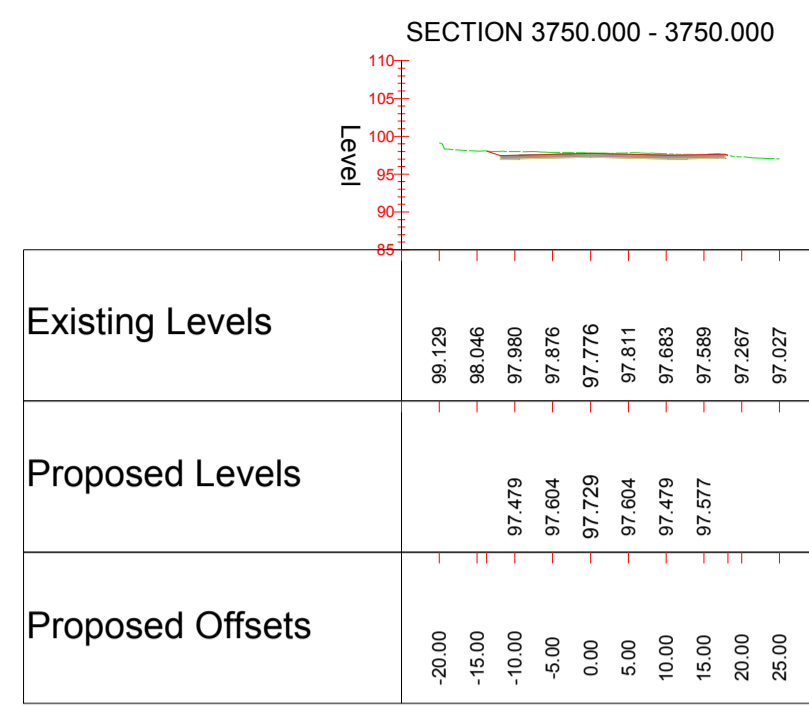
Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION	
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:	
CONSTRUCTION	NONE
MAINTENANCE/CLEANING	NONE
DECOMMISSIONING/DEMOLITION	NONE
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement	
Rev.	Date Description By Chkd App'd
P1	05.02.18 DRAWING CREATED AF

Drawing Status	FOR INFORMATION
Suitability	S2
Project Title	WEST OF ENGLAND WP1
Drawing Title	A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 13 19
Scale	1:1000
Original Size	A1
Date	05/02/18
Client	WEST OF ENGLAND

<p>ATKINS</p> <p>The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com</p> <p>Copyright © Atkins Limited (2014)</p>		<p>Project Ref. No. 0000000</p> <p>Revision P1</p>
<p>EC</p> <p>05/02/18</p>	<p>AH</p> <p>05/02/18</p>	<p>Authorised</p> <p>05/02/18</p>
<p>Woe</p> <p>WP1</p>	<p>ATK</p> <p>- DR - D - 6521</p>	<p>HGN</p> <p>-</p>

CROSS SECTIONS  
Scale 1:1000



Key:

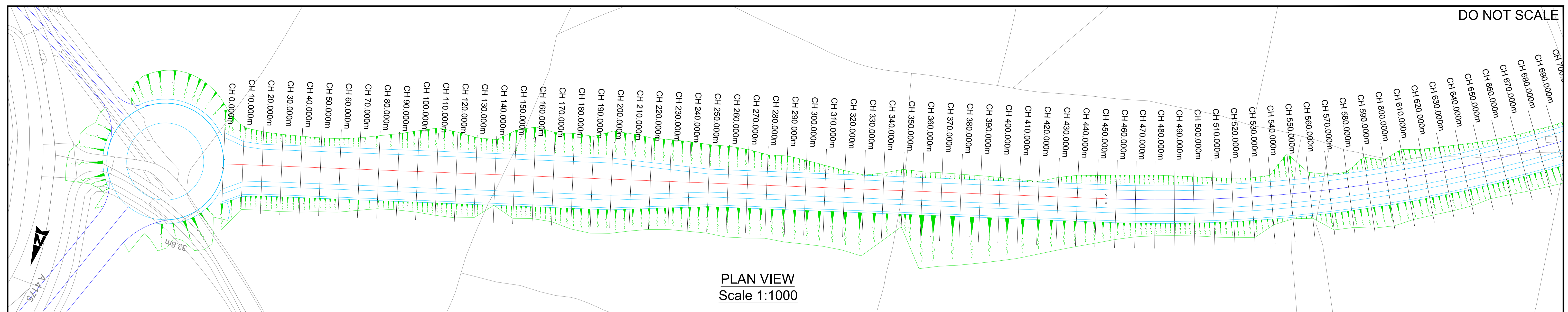
Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION			
NONE			
MAINTENANCE/CLEANING			
NONE			
DECOMMISSIONING/DEMOLITION			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF

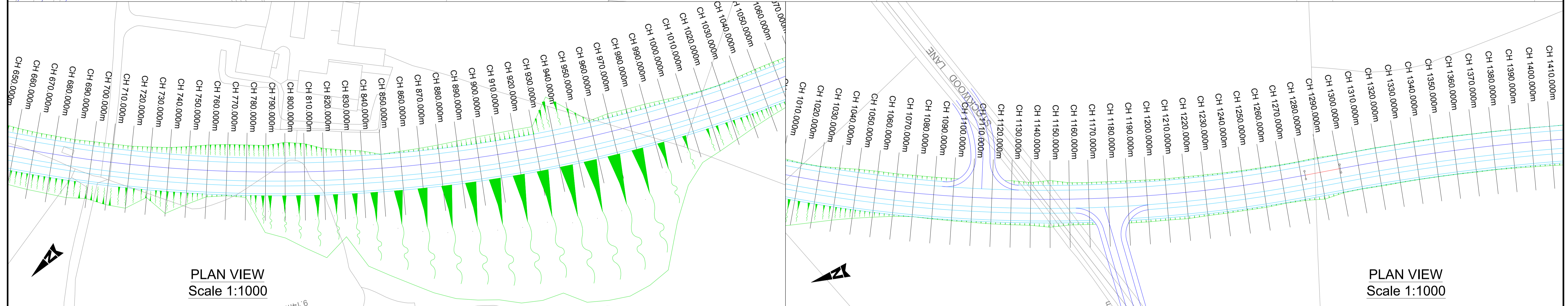
Drawing Status	FOR INFORMATION	Suitability	S2	Project Title	WEST OF ENGLAND WP1						
		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Drawing Title A4 - A37 LINK OPTION 2 PROPOSED CONCEPT CROSS SECTIONS SHEET 13 19							
Copyright	© Atkins Limited (2014)	Scale	1:1000	Designed	EC	Drawn	AA	Checked	AA	Authorised	
Client	WEST OF ENGLAND	Original Size	A1	Date	05/02/18	Date	05/02/18	Date	05/02/18	Date	
Drawing Number	HA PIN	Originator	Woe	Volume	ATK	Revision	HGN	Project Ref. No.	0000000	Revision	
			WP1		- DR - D -		6522			P1	

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Millimetres

DO NOT SCALE

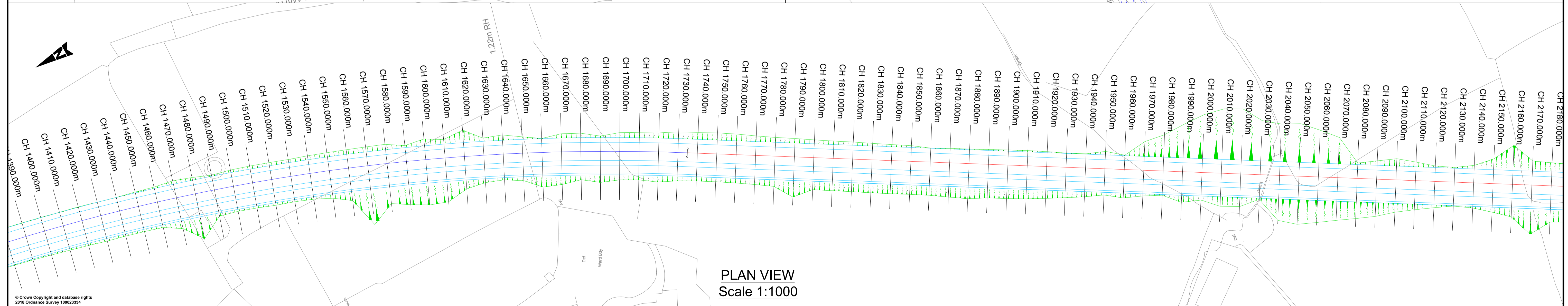


PLAN VIEW  
Scale 1:1000



PLAN VIEW  
Scale 1:1000

PLAN VIEW  
Scale 1:1000



PLAN VIEW  
Scale 1:1000

Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION	
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:	
CONSTRUCTION	NONE
MAINTENANCE/CLEANING	NONE
DECOMMISSIONING/DEMOLITION	NONE
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement	

Rev.	Date	Description	By	Chkd	App'd
P2	13.02.18	Left In/ Left Out Jct with Stockwood Ln added	EC		
P1	05.02.18	DRAWING CREATED	AF		

Drawing Status: **FOR INFORMATION**

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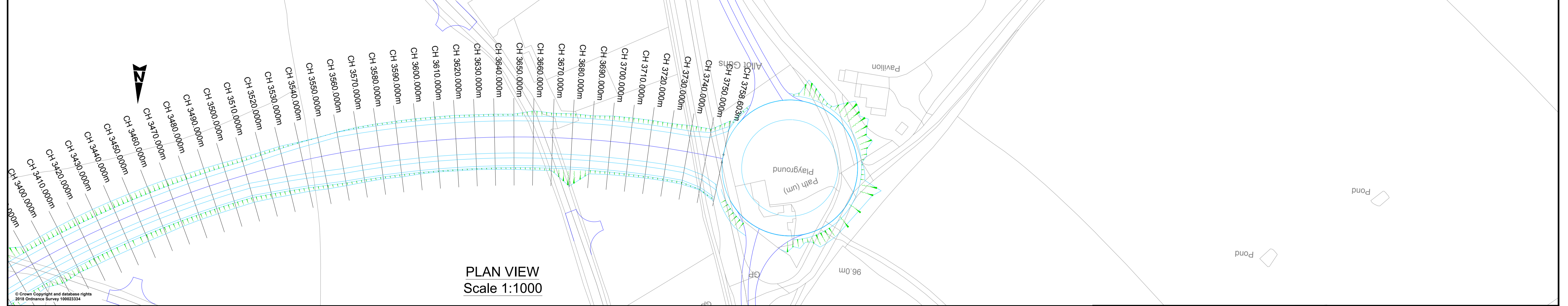
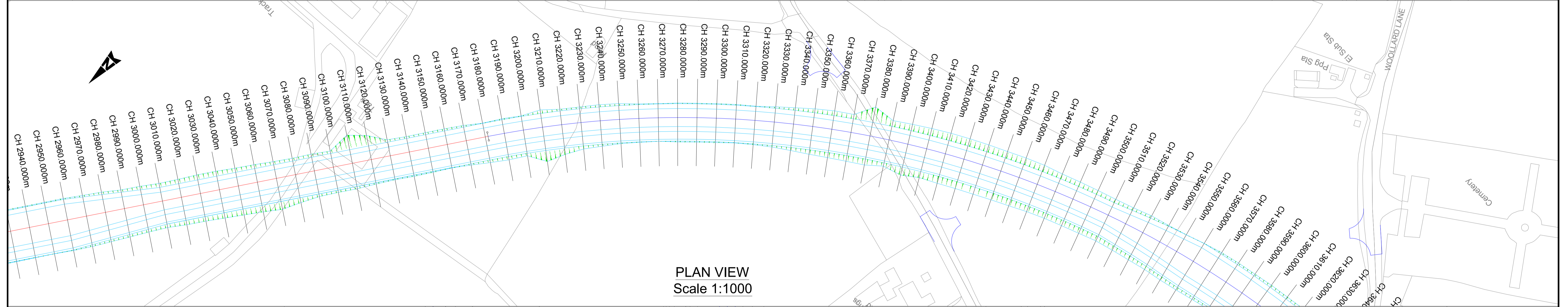
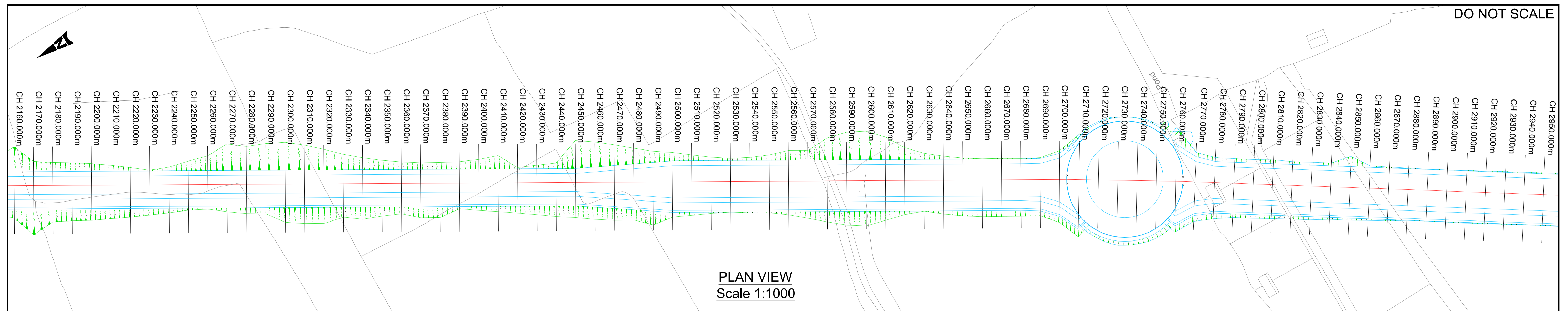
Client: **WEST OF ENGLAND**

Subsidiary: <b>S2</b>	Project Title: <b>WEST OF ENGLAND WP1</b>			
Drawing Title: <b>A4 - A37 LINK OPTION 1 PROPOSED CONCEPT LAYOUT SHEET 12</b>				
Scale: 1:1000	Designed: EC	Drawn: AF	Checked: AH	Authorised:
Original Size: A1	Date: 05/02/18	Date: 05/02/18	Date: 05/02/18	Date:
Drawing Number: <b>Woe</b>	Originator: <b>ATK</b>	Volume: <b>HGN</b>	Project Ref. No.: <b>0000000</b>	Revision:
HA PIN: <b>WP1</b>	- DR - D - 6000	-	-	<b>P2</b>
Location:	Type:	Role:	Number:	

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DO NOT SCALE

100  
10  
0  
Millimetres



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION		
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:		
<b>CONSTRUCTION</b>		
NONE		
<b>MAINTENANCE/CLEANING</b>		
NONE		
<b>DECOMMISSIONING/DEMOLITION</b>		
NONE		
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement		

Rev.	Date	Description	By	Chk'd	App'd
P2	27.02.18	A37-Whitchurch Ln Link deleted	EC		
P1	05.02.18	DRAWING CREATED	AF		

Drawing Status: **FOR INFORMATION**

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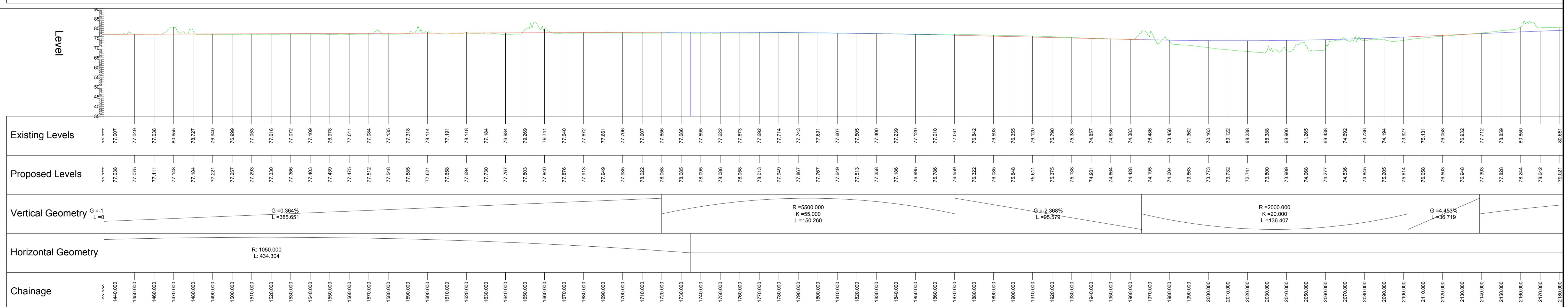
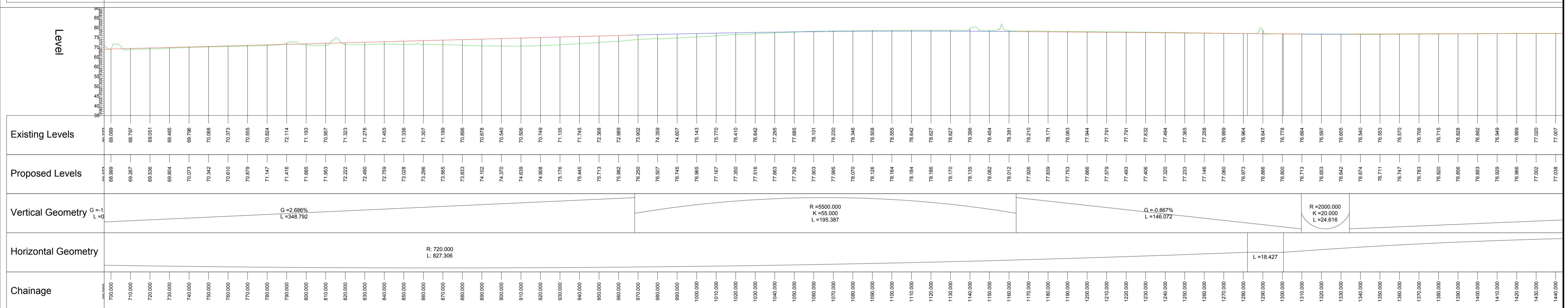
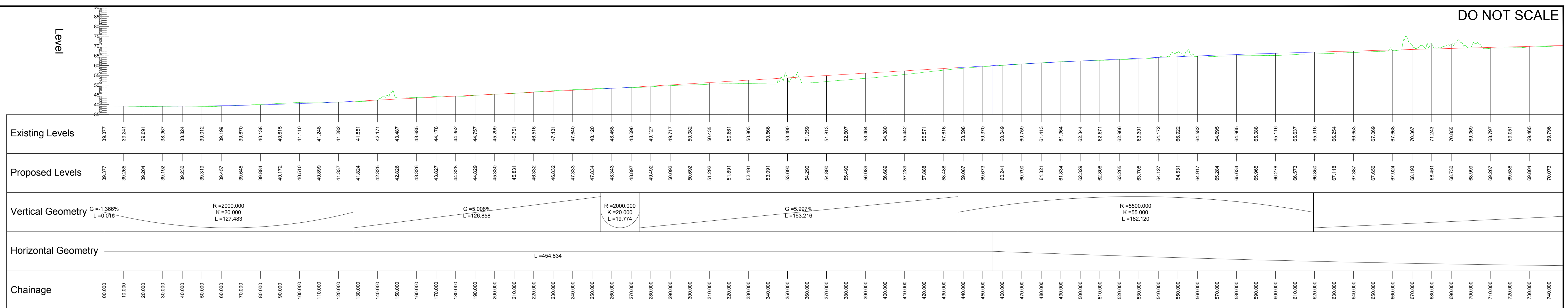
Client: **WEST OF ENGLAND**

Suitability: <b>S2</b>	Project Title: <b>WEST OF ENGLAND WP1</b>			
Drawing Title: <b>A4 - A37 LINK OPTION 1 PROPOSED CONCEPT LAYOUT SHEET 2 2</b>				
Scale: 1:1000	Designed: EC	Drawn: AF	Checked: AH	Authorised:
Original Size: A1	Date: 05/02/18	Date: 05/02/18	Date: 05/02/18	Date:
Drawing Number: Woe WP1	Originator: ATK	Volume: HGN	Project Ref. No.: 0000000	Revision: P2
Location:	Type: DR - D	Role: 6001	Number:	

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Millimetres

DO NOT SCALE



Key:

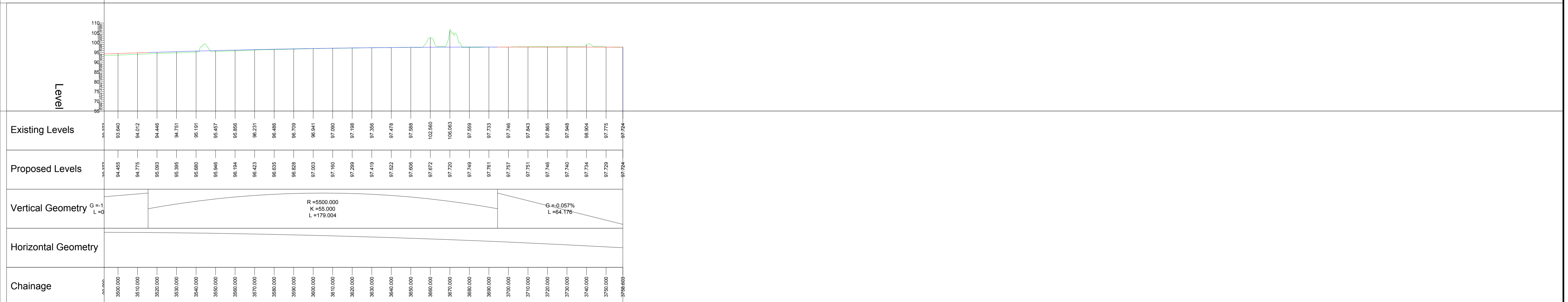
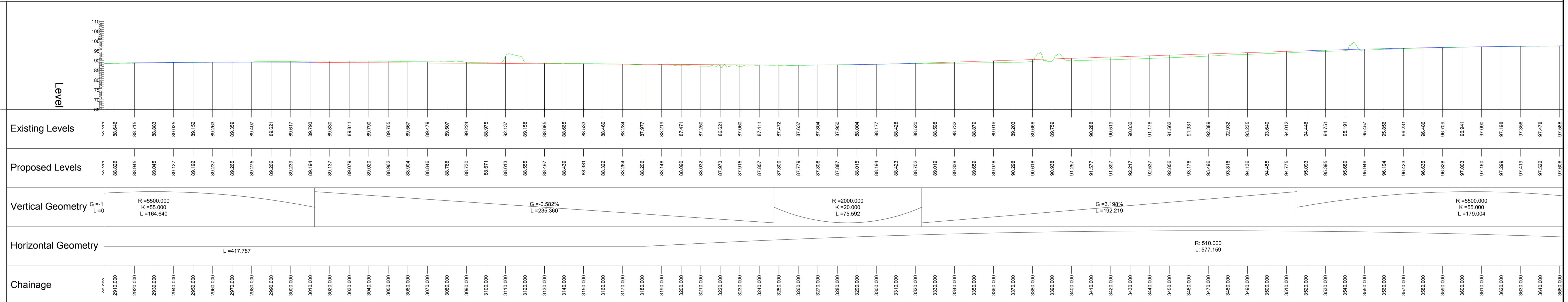
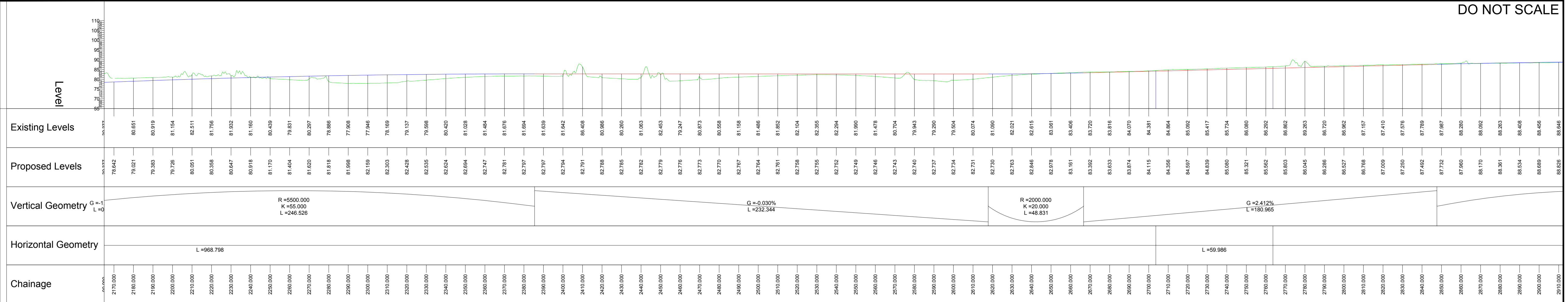
Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
<b>CONSTRUCTION</b>			
NONE			
<b>MAINTENANCE/CLEANING</b>			
NONE			
<b>DECOMMISSIONING/DEMOLITION</b>			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	App'd
P1	05.02.18	DRAWING CREATED	AF

Drawing Status <b>FOR INFORMATION</b>		Suitability <b>S2</b>		Project Title <b>WEST OF ENGLAND WP1</b>	
<p>The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com</p>		Drawing Title <b>A4 - A37 LINK OPTION 1 PROPOSED CONCEPT LONGSECTION SHEET 12</b>		Scale 1:1000	
		<p>Original Size: A1 Date: 05/02/18</p> <p>Designed: EC Date: 05/02/18</p> <p>Drawn: AH Date: 05/02/18</p> <p>Checked: AH Date: 05/02/18</p> <p>Authorised: AH Date: 05/02/18</p>		<p>Project Ref. No.: 0000000</p> <p>Revision: P1</p>	
Client <b>WEST OF ENGLAND</b>		<p>HA PIN: Woe   Originator: ATK   Volume: HGN</p> <p>WP1 - DR - D - 6002</p>		<p>Location:   Type:   Role:   Number:  </p>	

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Millimetres

DO NOT SCALE



Key:

Notes:

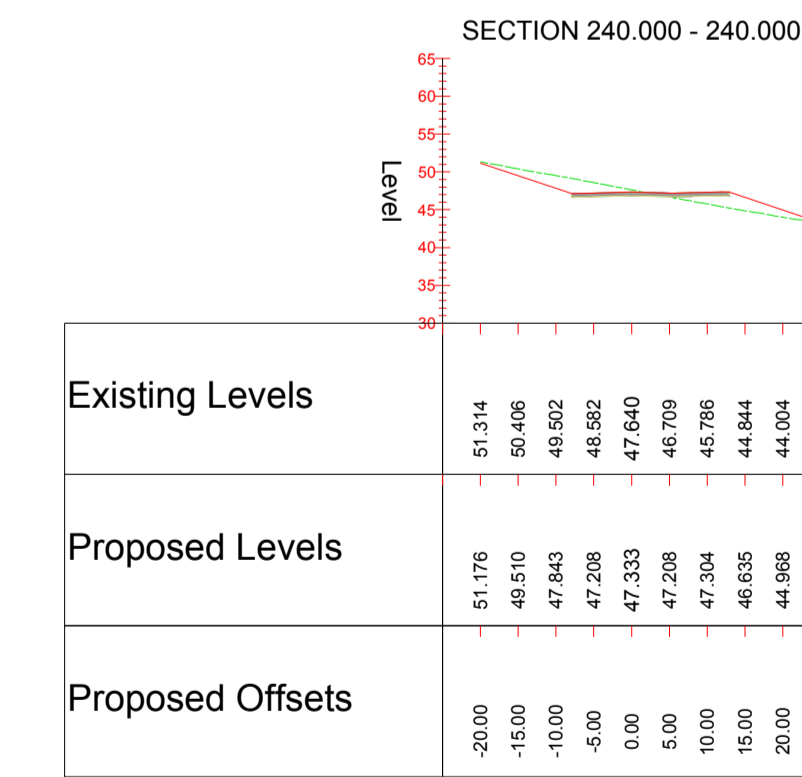
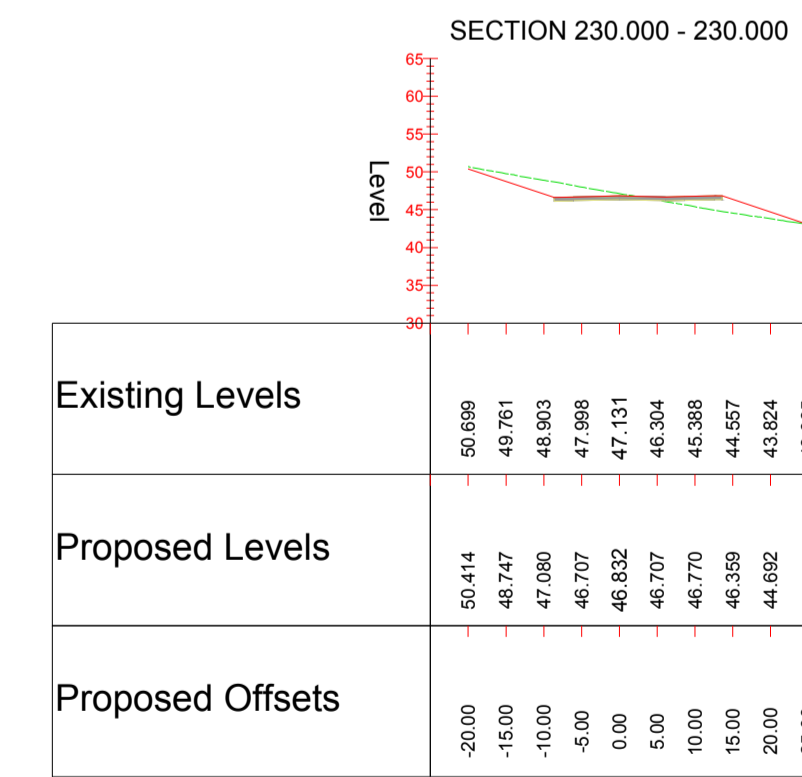
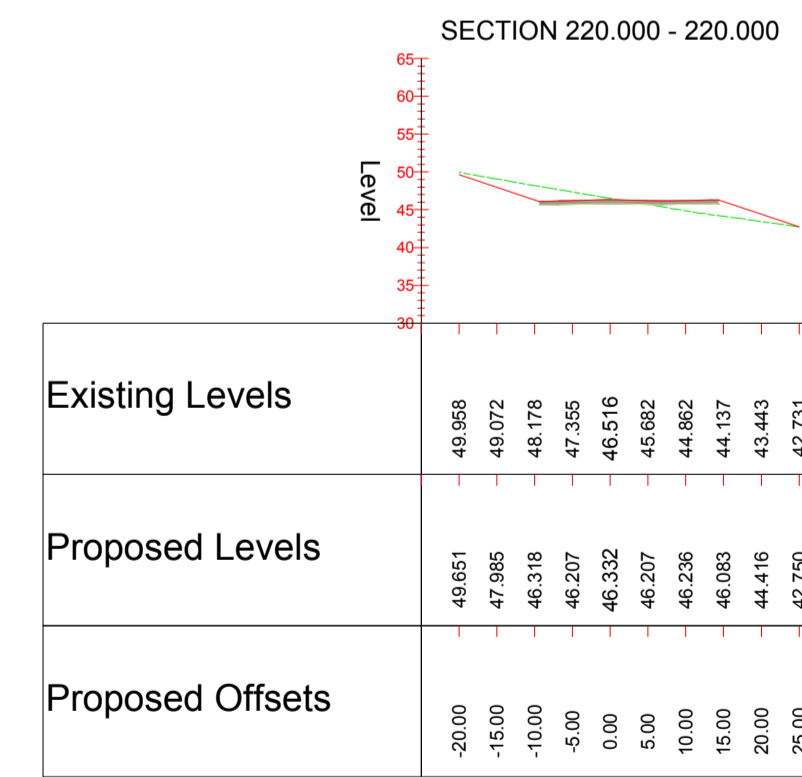
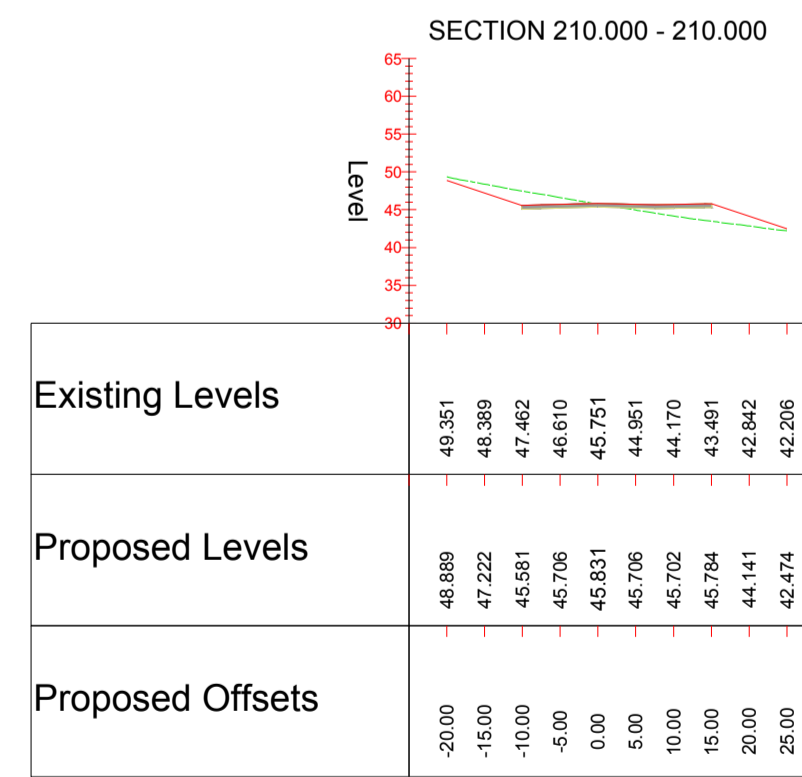
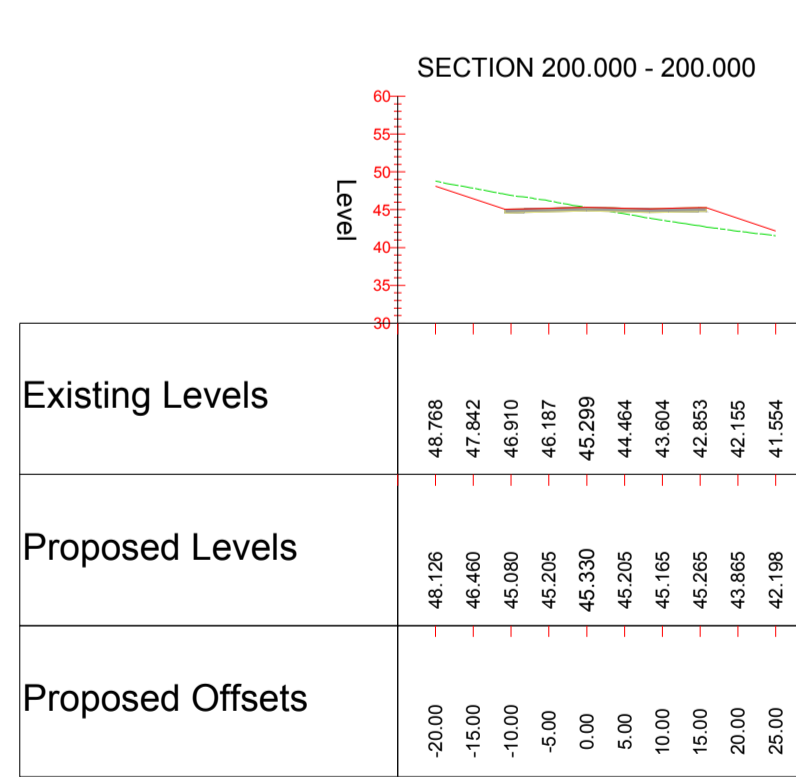
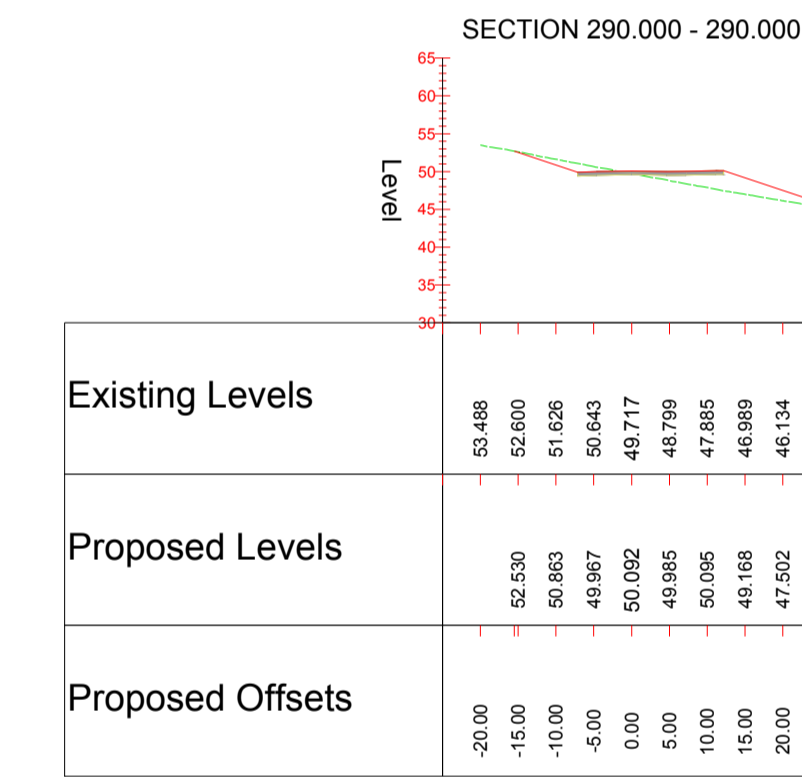
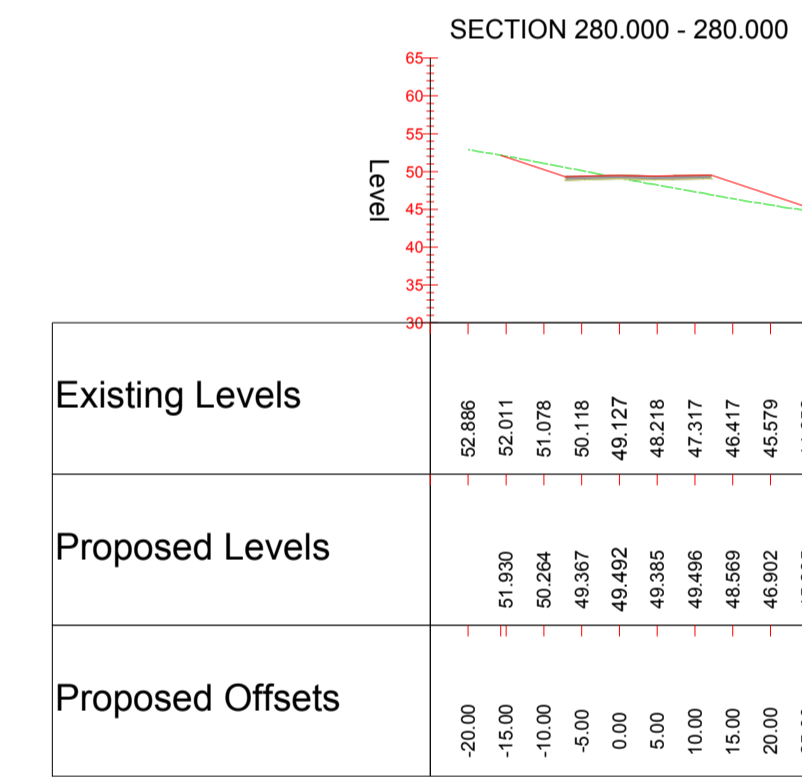
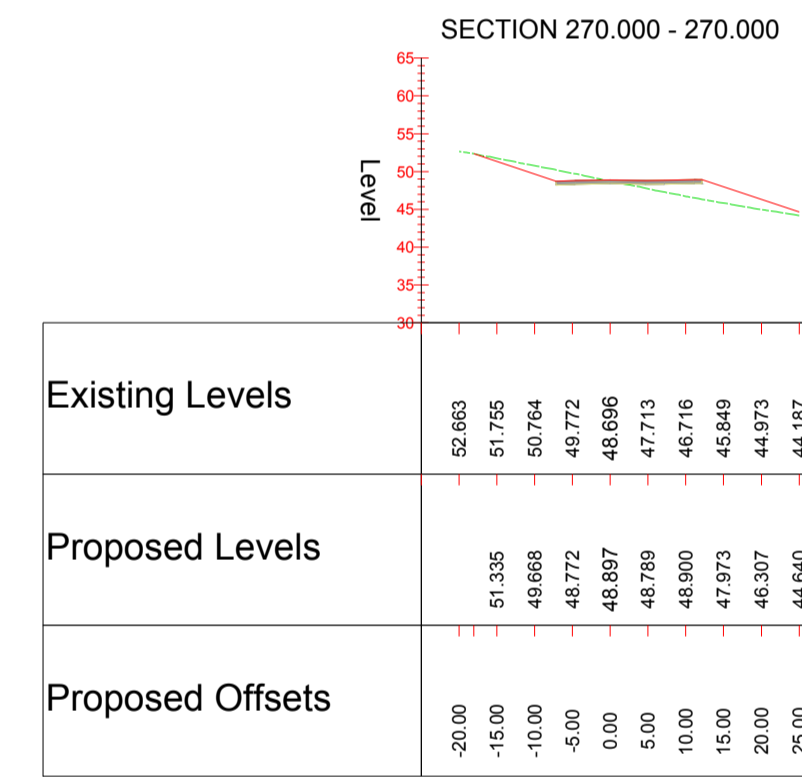
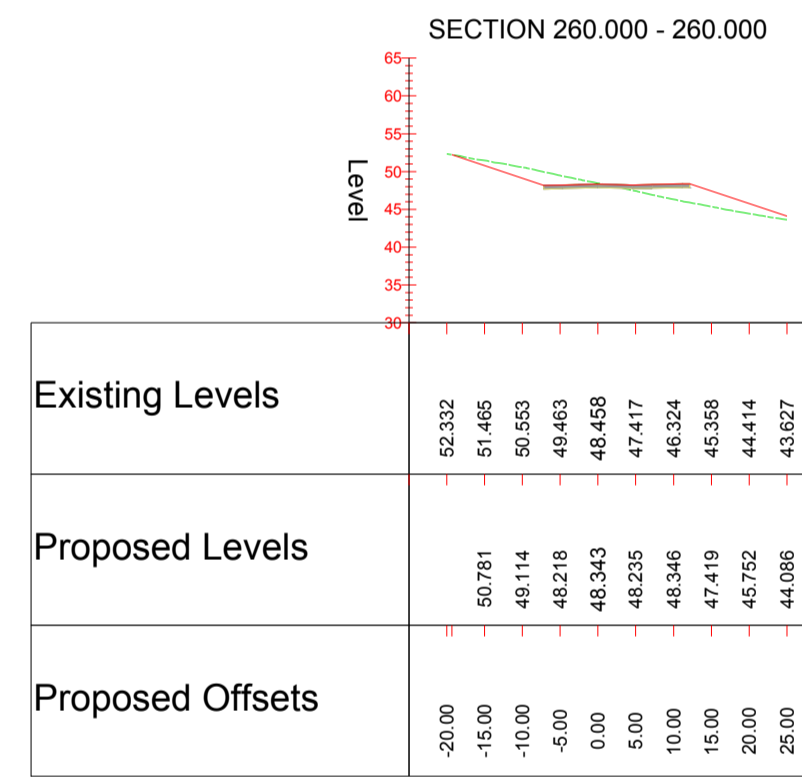
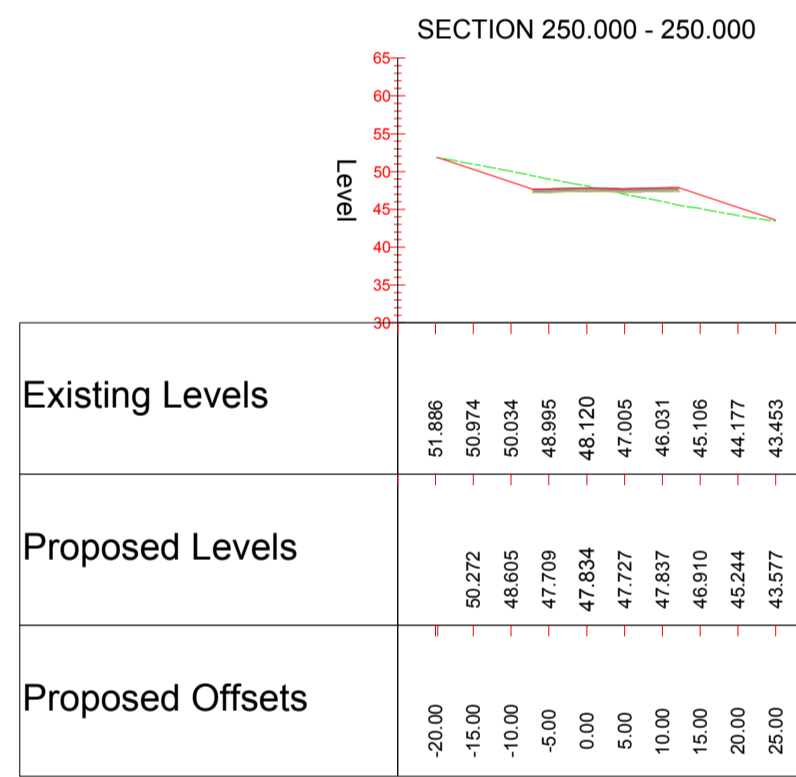
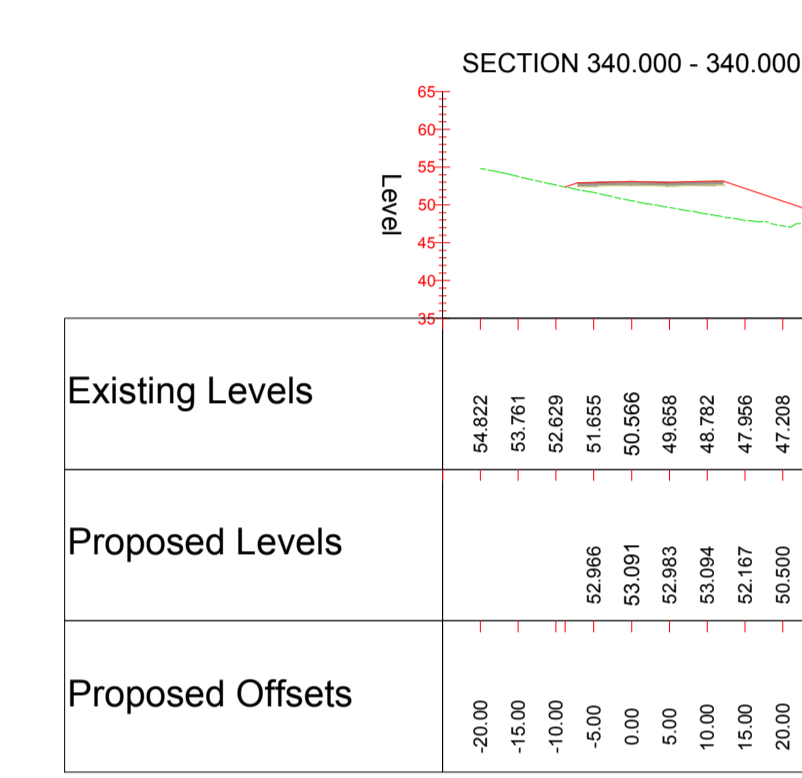
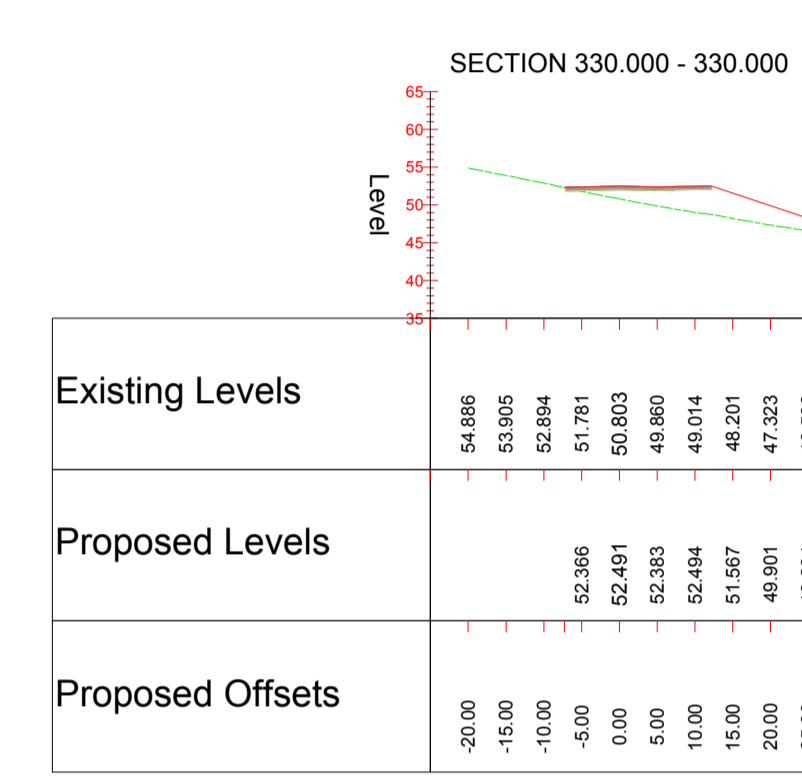
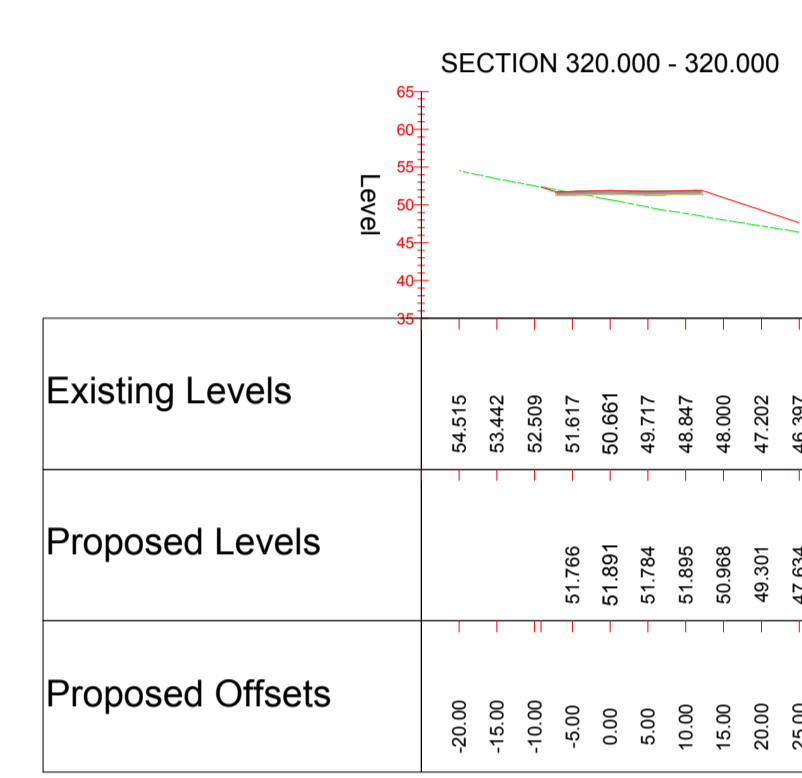
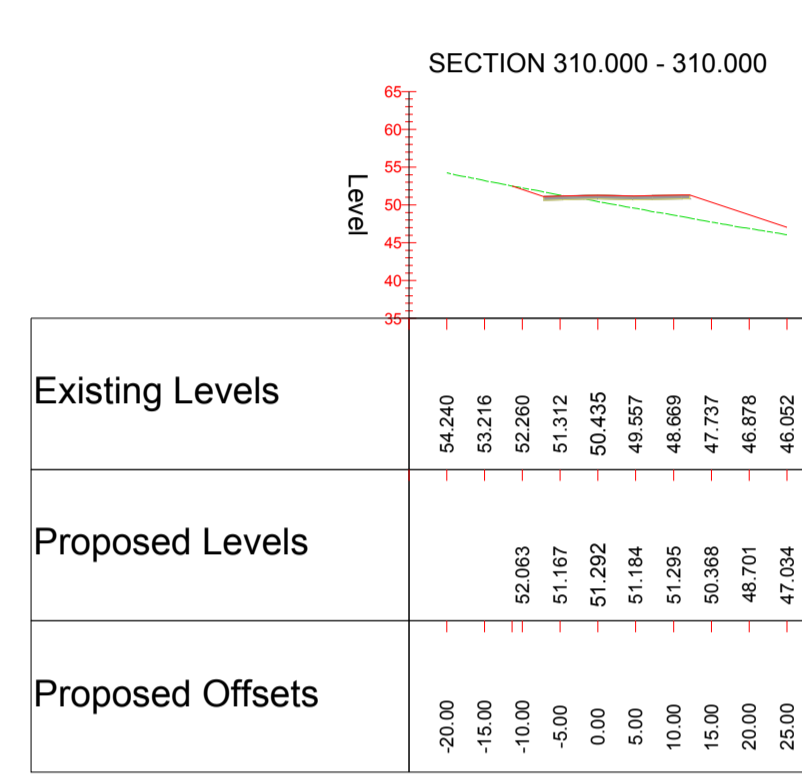
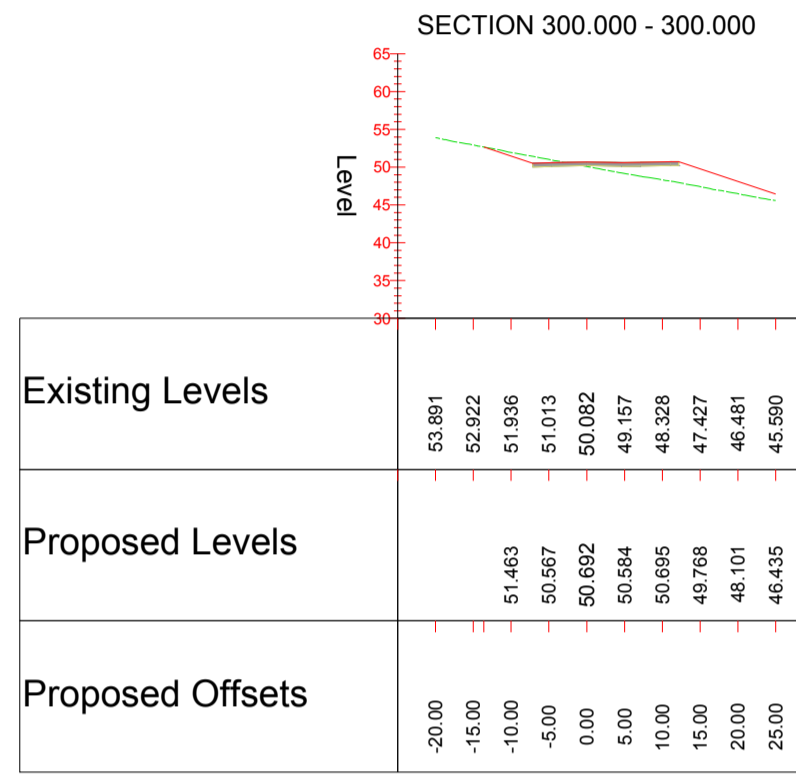
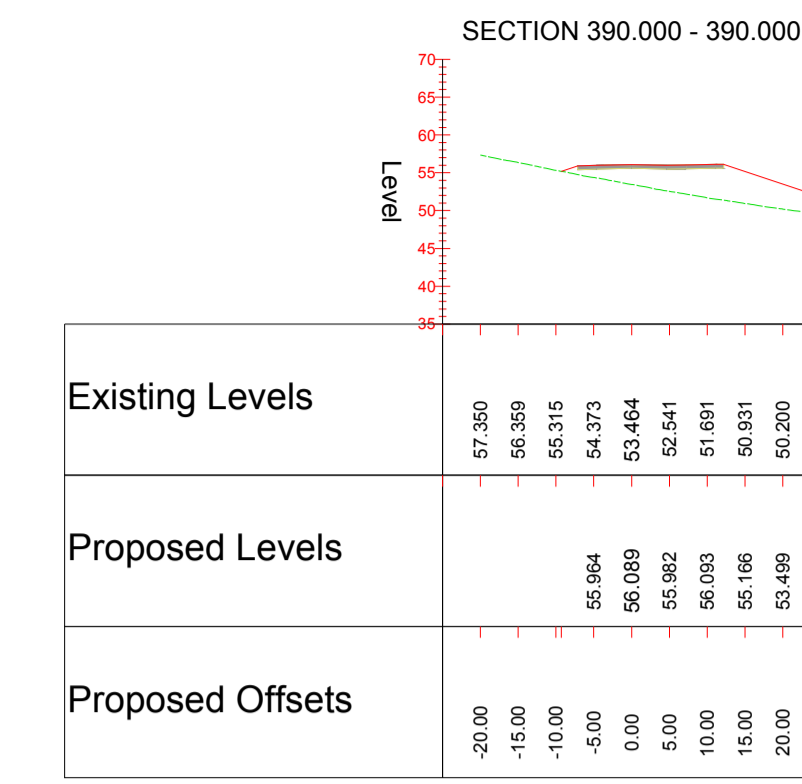
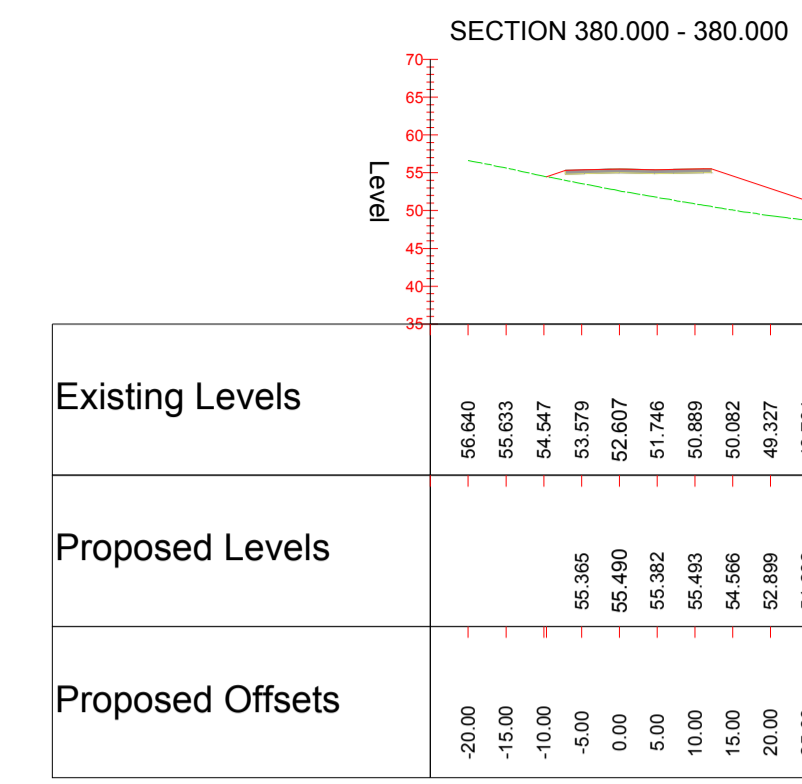
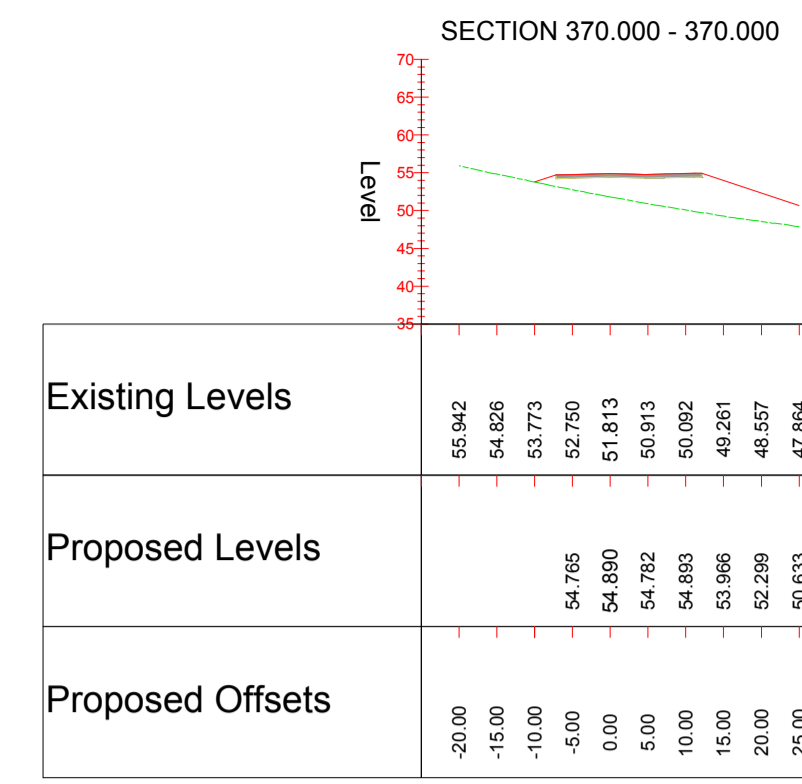
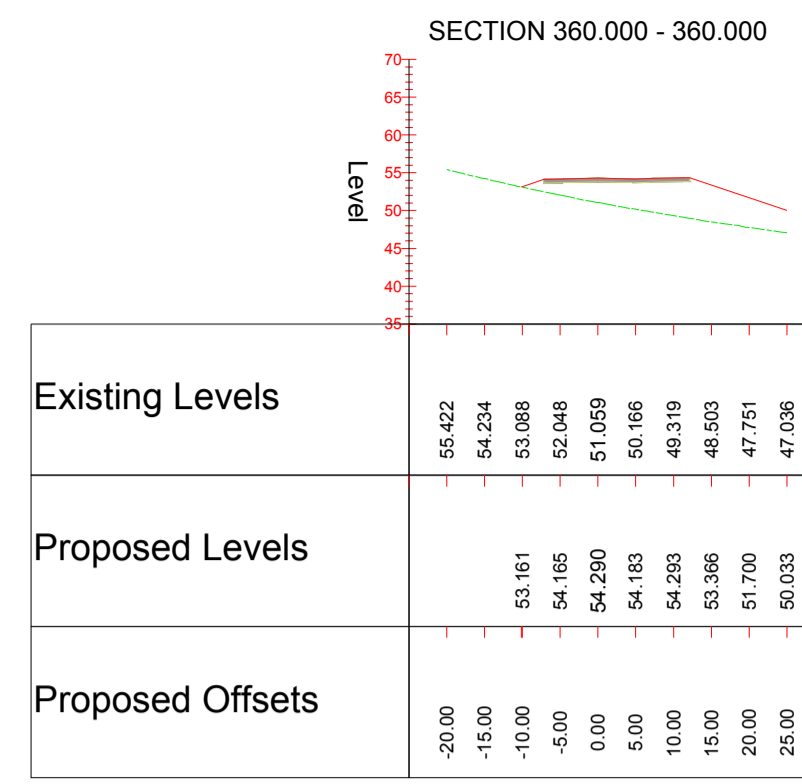
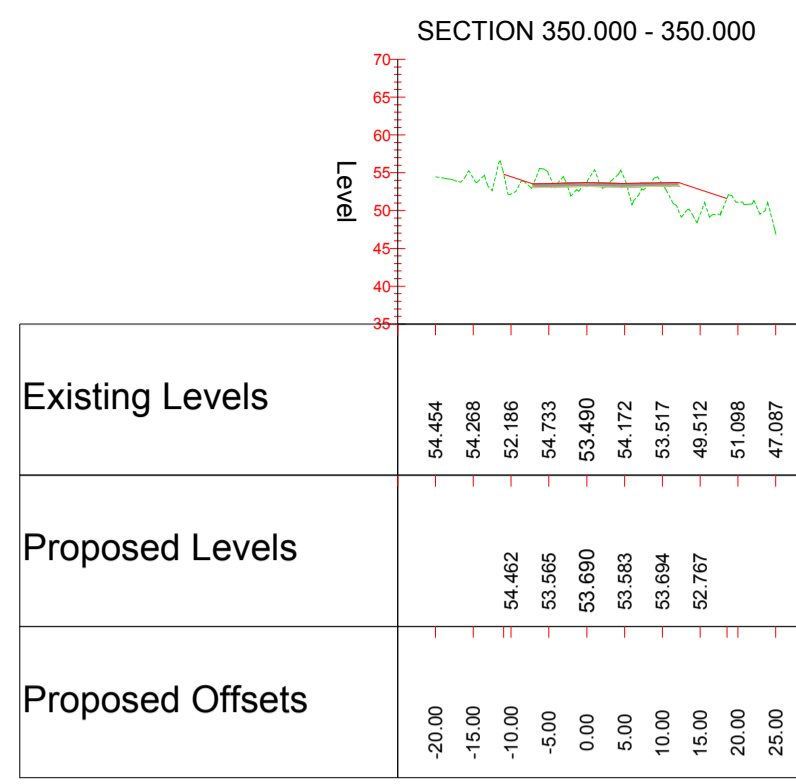
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION				
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:				
<b>CONSTRUCTION</b>				
NONE				
<b>MAINTENANCE/CLEANING</b>				
NONE				
<b>DECOMMISSIONING/DEMOLITION</b>				
NONE				
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement				
Rev.	Date	Description	By	App'd
P1	05.02.18	DRAWING CREATED	AF	

Drawing Status <b>FOR INFORMATION</b>		Sustainability <b>S2</b>		Project Title <b>WEST OF ENGLAND WP1</b>	
		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Drawing Title <b>A4 - A37 LINK OPTION 1 PROPOSED CONCEPT LONGSECTION SHEET 2 2</b>	
Scale 1:1000	Designed EC	Drawn JL	Checked AH	Authorised	
Original Size A1	Date 05/02/18	Date 05/02/18	Date 05/02/18	Date	
Drawing Number HA PIN Woe WP1	Originator ATK - DR - D -	Volume HGN - 6003	Project Ref. No. 0000000	Revision P1	
Client <b>WEST OF ENGLAND</b>		Location Type Role Number			





CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION	NONE		
MAINTENANCE/CLEANING	NONE		
DECOMMISSIONING/DEMOLITION	NONE		
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	App'd
P1	05.02.18	DRAWING CREATED	AF

Drawing Status		FOR INFORMATION	
Client		WEST OF ENGLAND	
Sustainability		S2	
Project Title		WEST OF ENGLAND WP1	
Drawing Title		A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 2/19	
Scale	1:1000	Designed	EC
Original Size	A1	Date	05/02/18
Drawing Number	HA PIN	Originator	Woe
Project Ref. No.	0000000	Volume	ATK - HGN -
Revision		Number	6005
Location		Type	DR - D
		Role	
		Number	
			P1

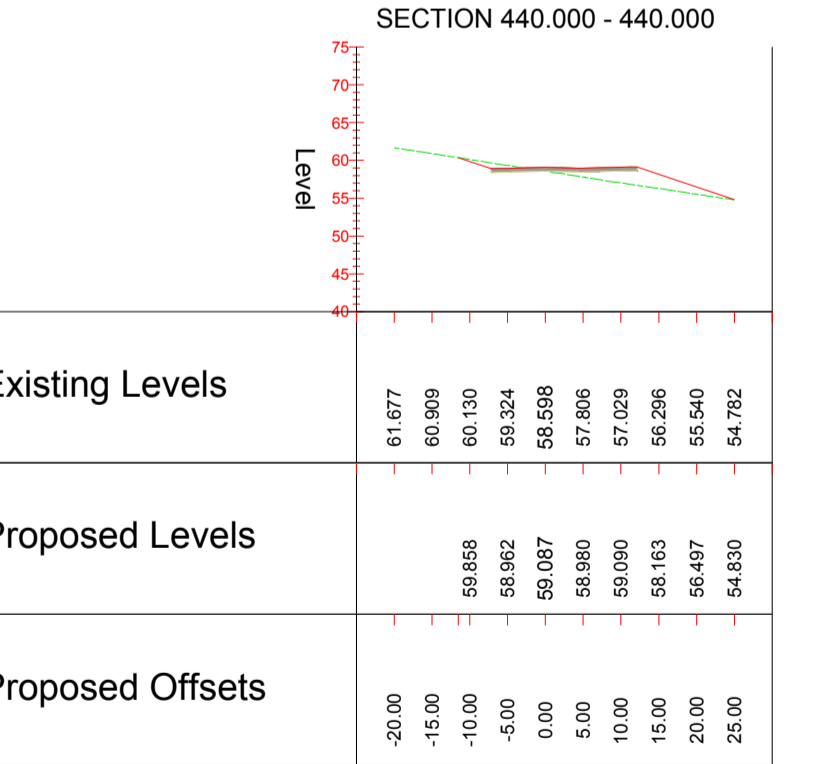
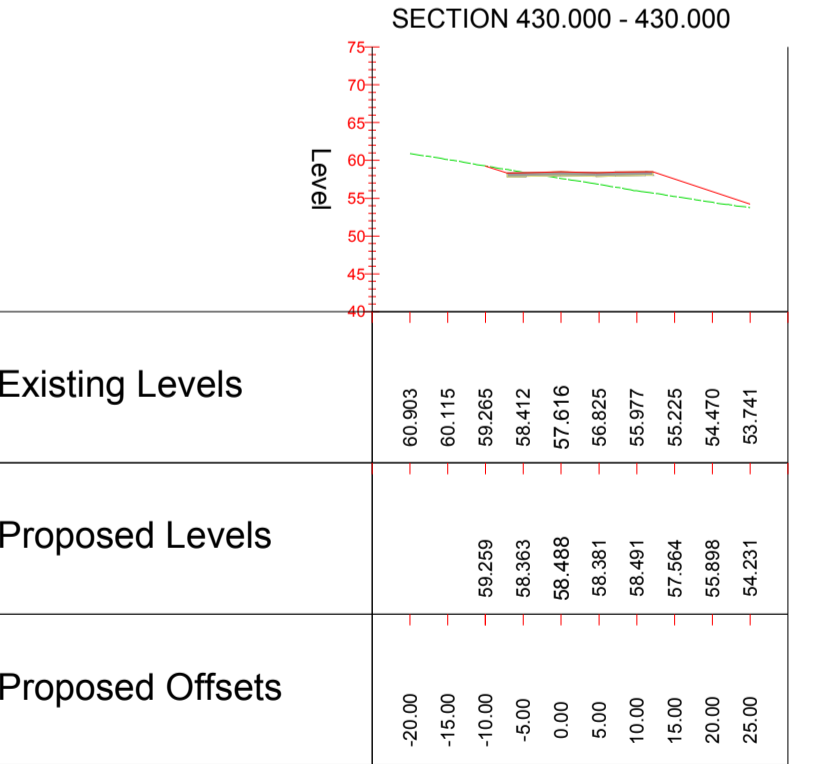
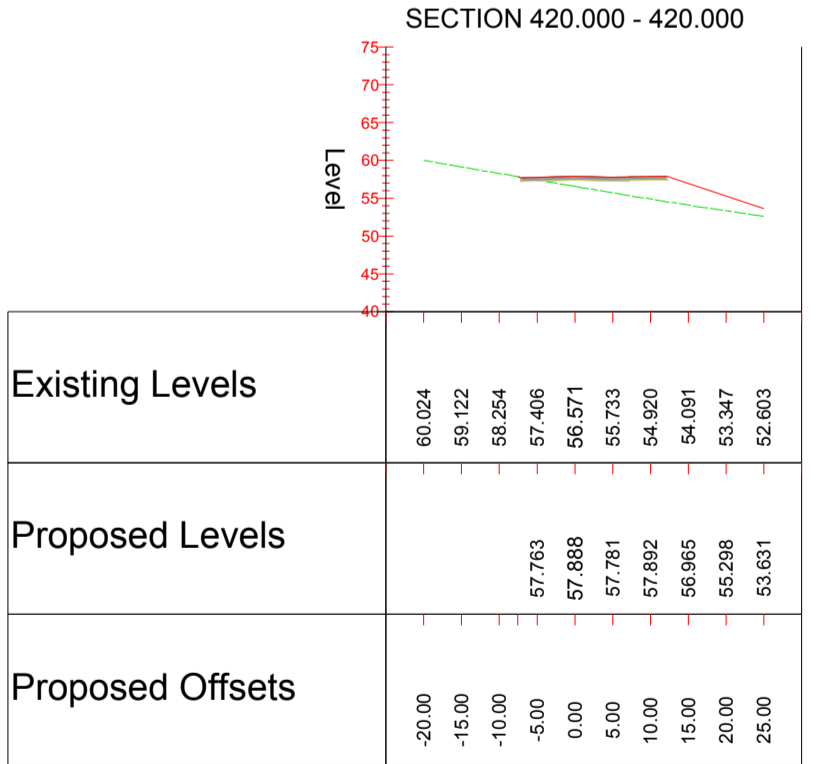
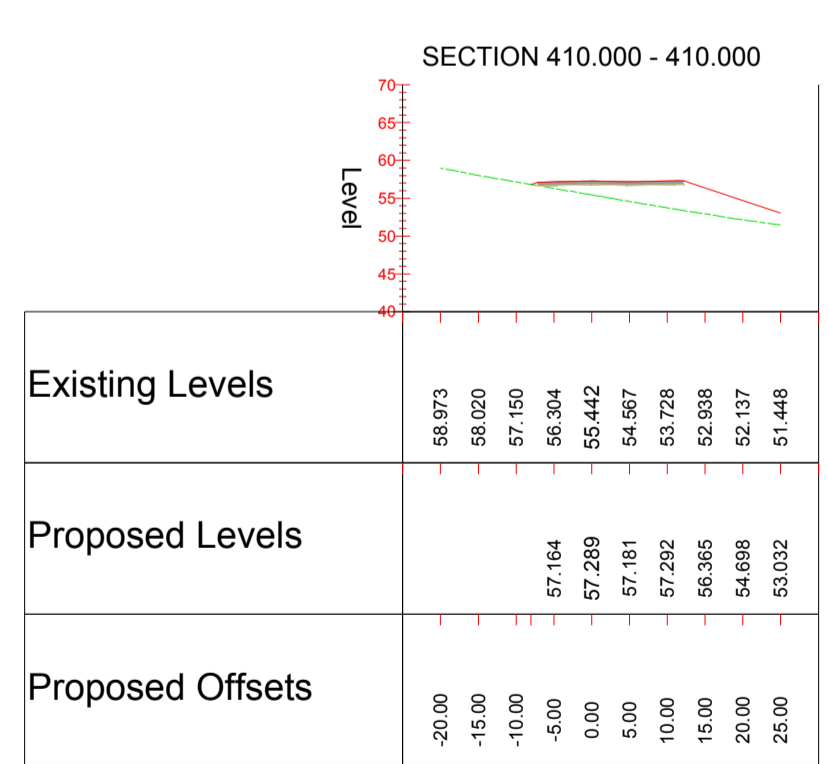
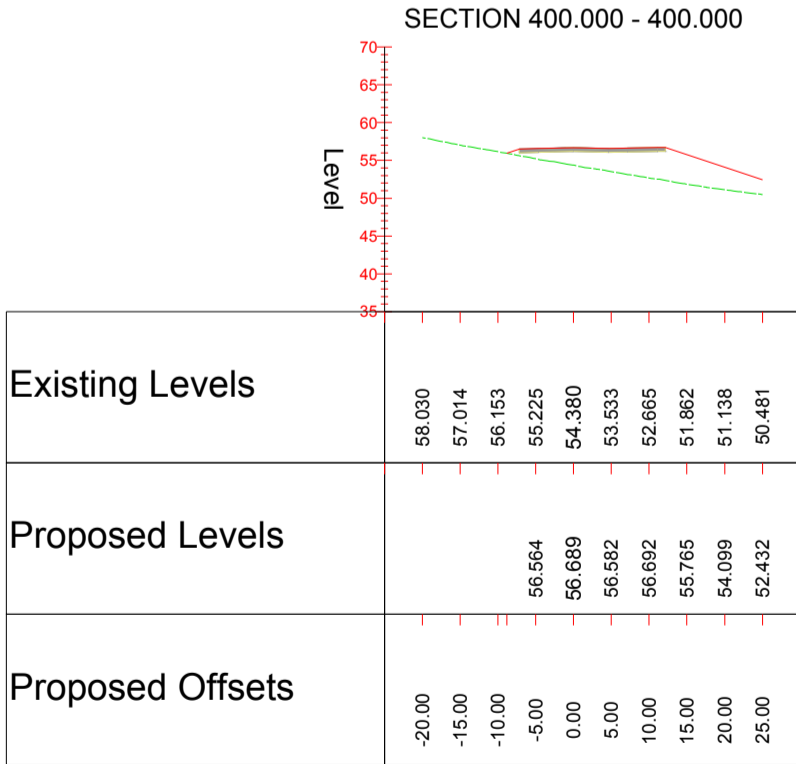
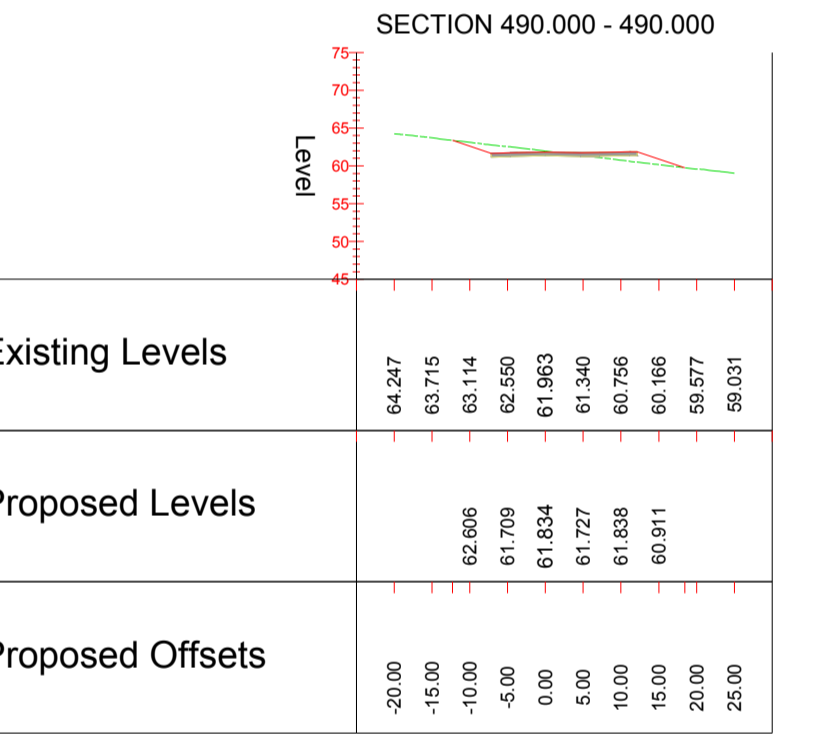
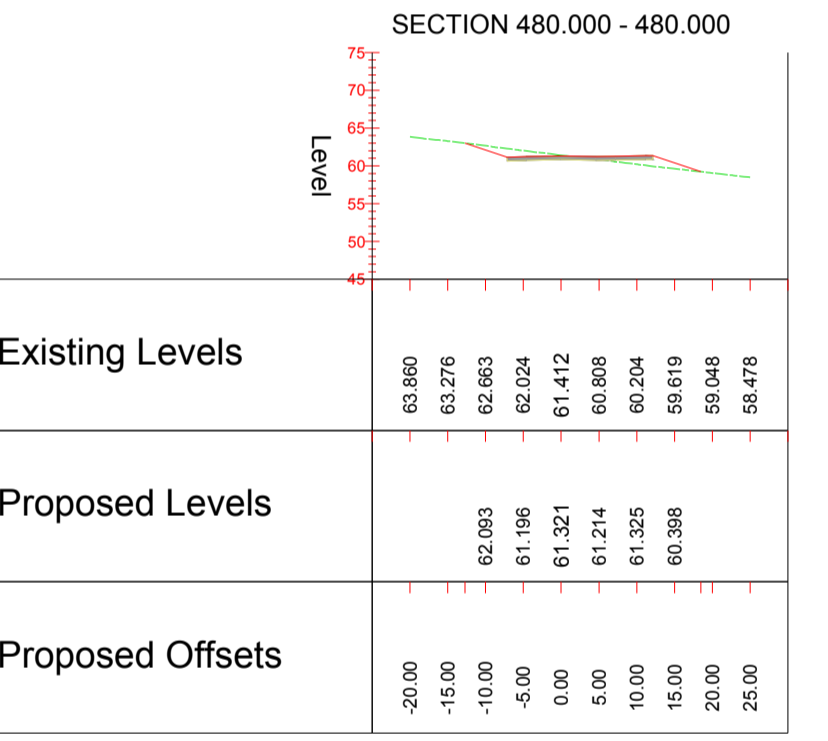
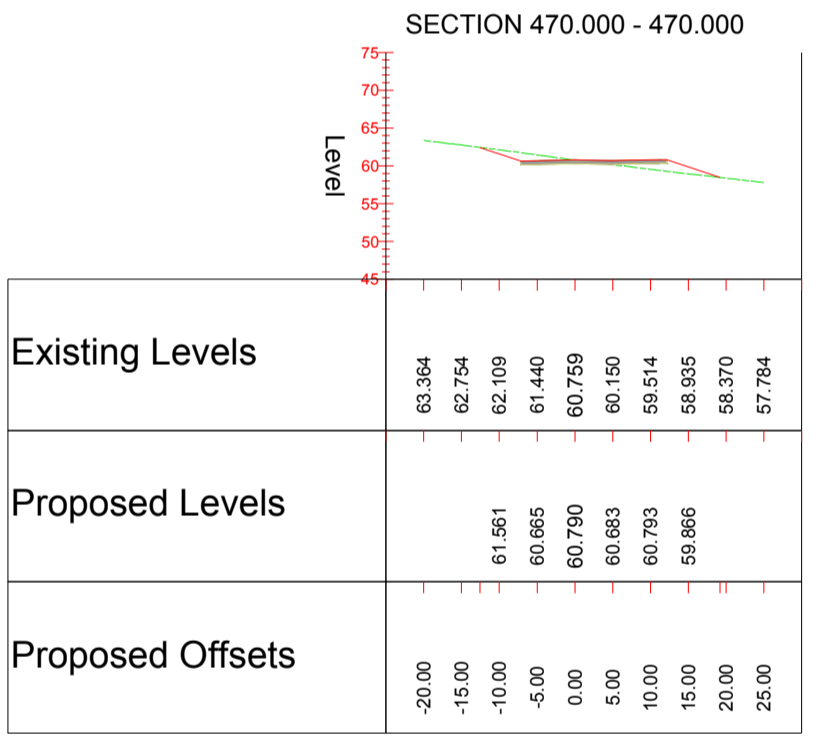
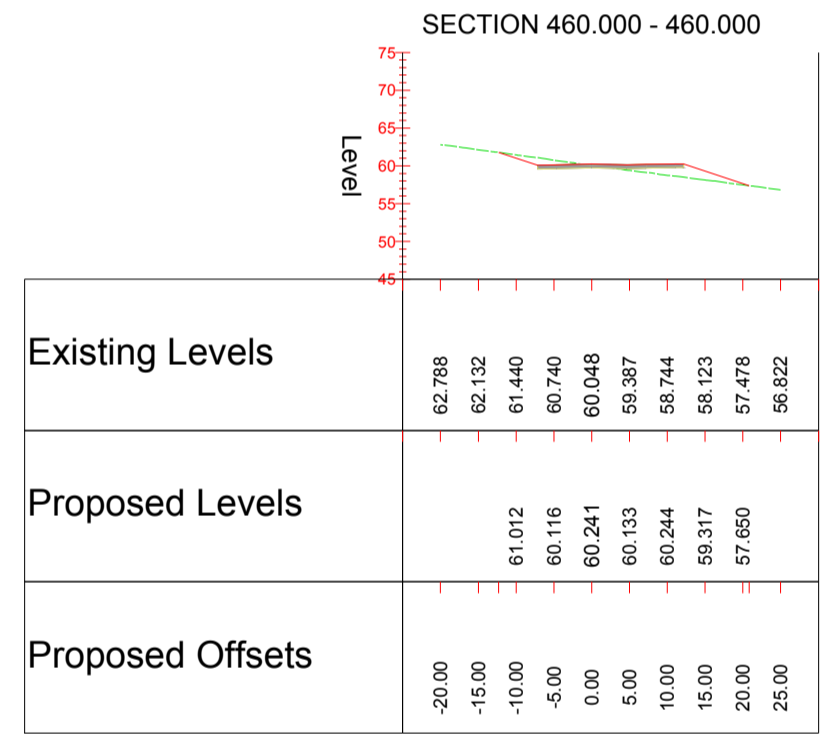
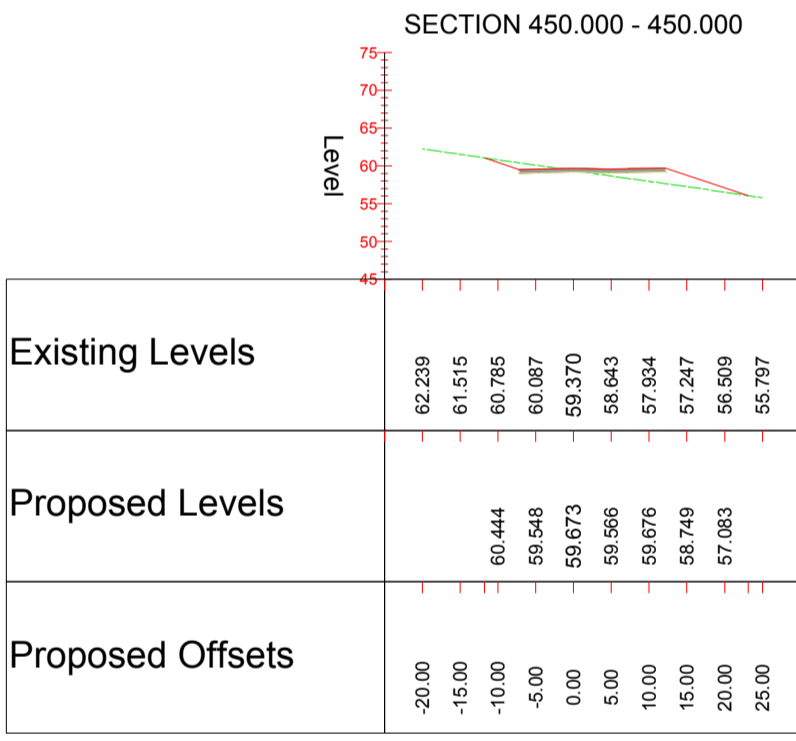
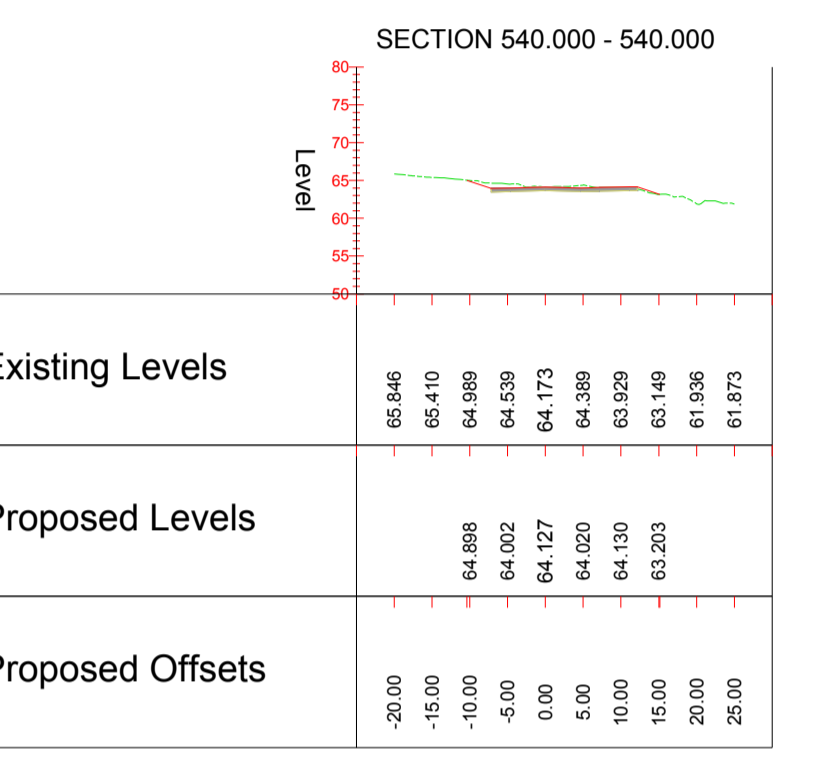
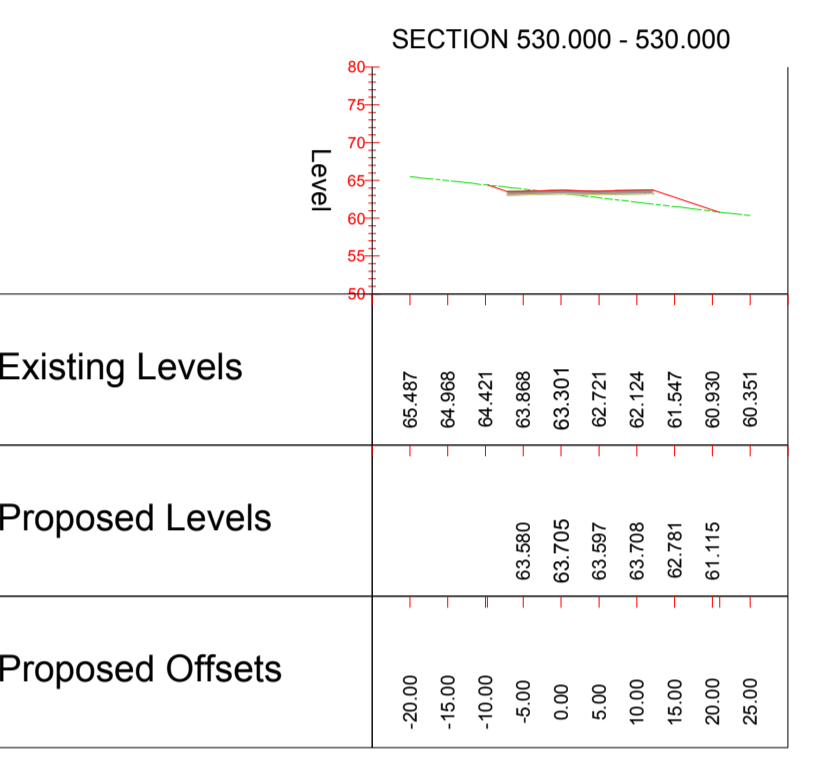
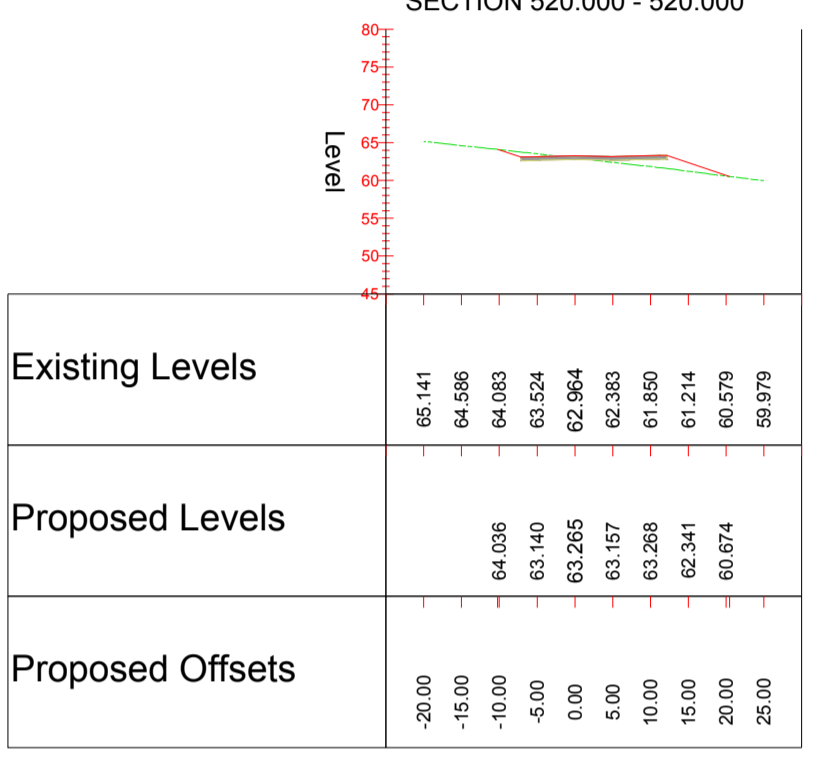
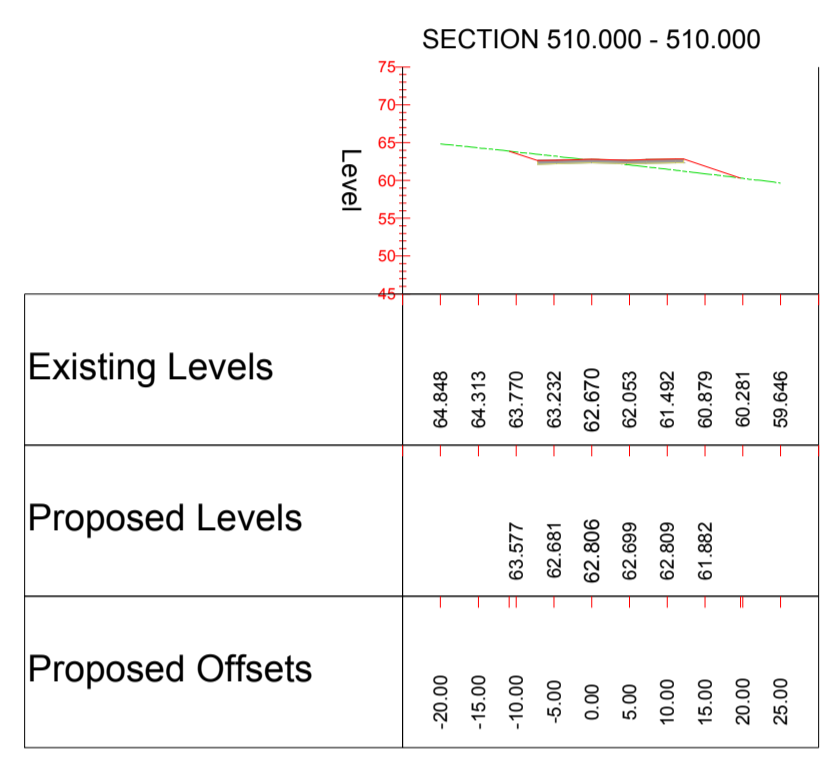
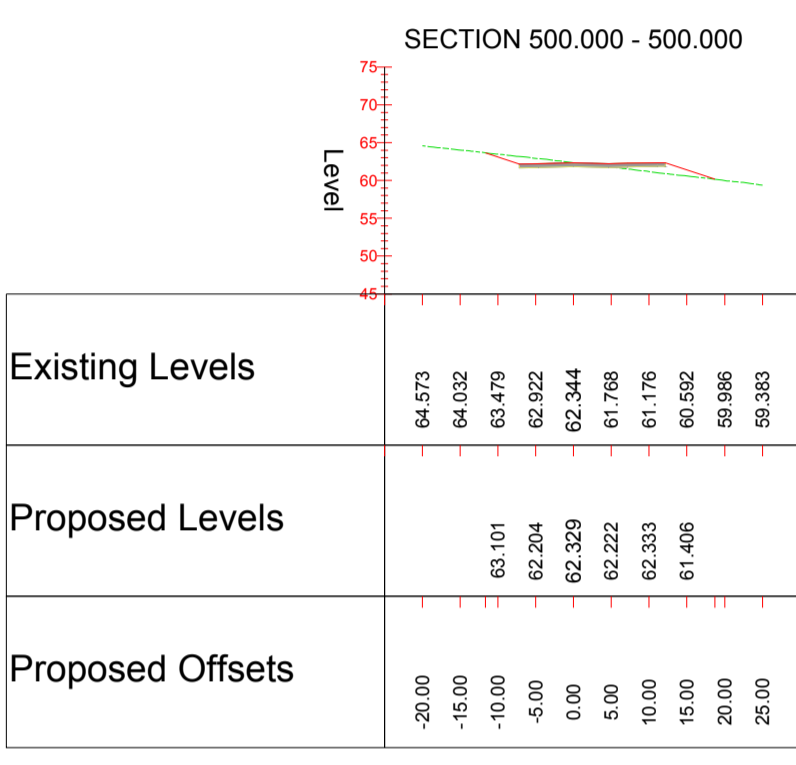
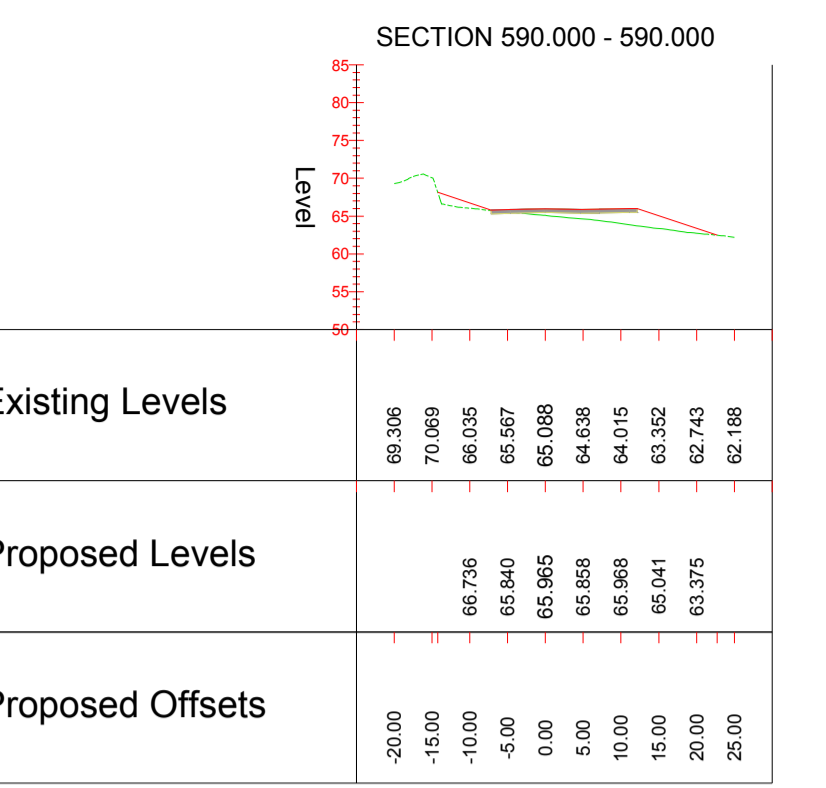
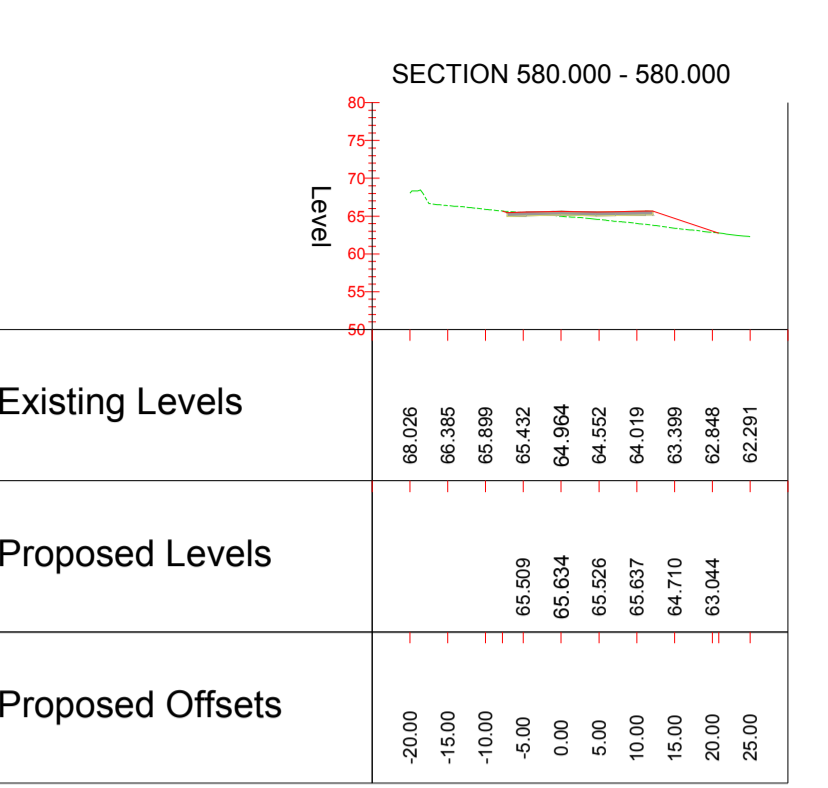
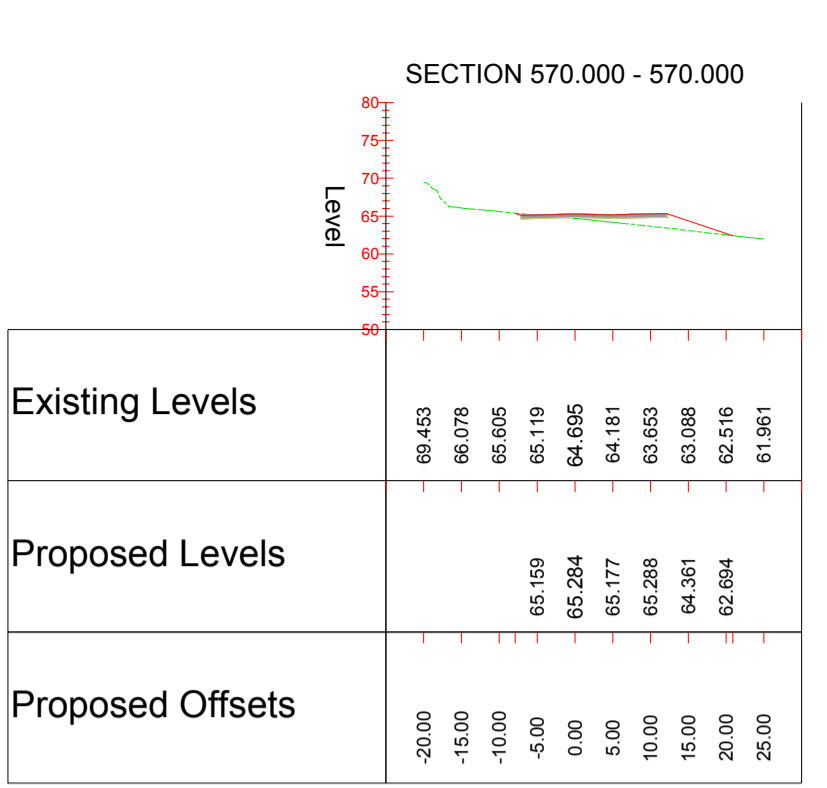
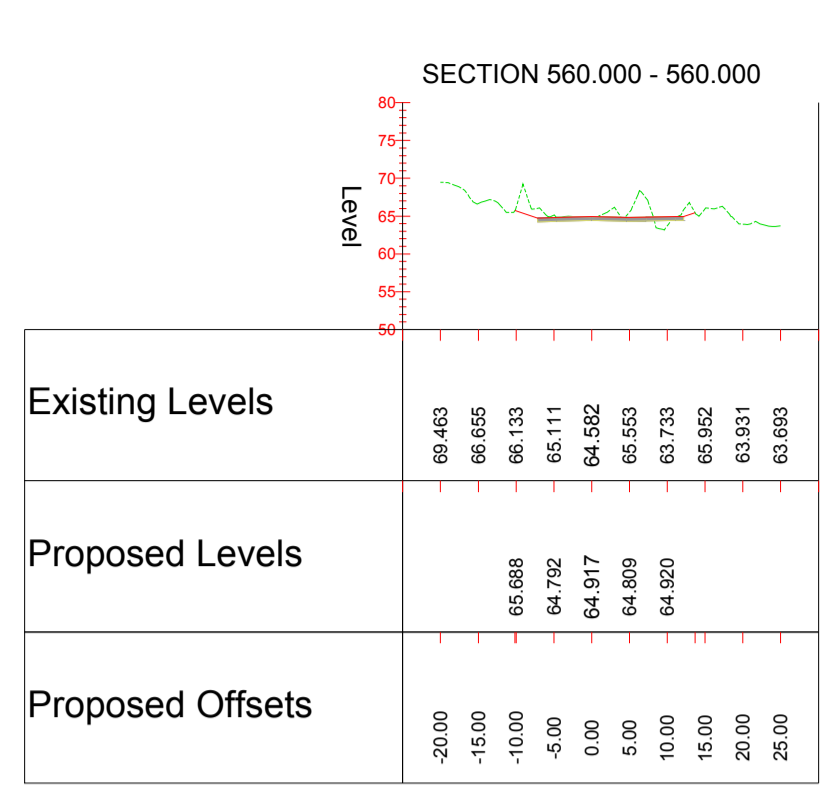
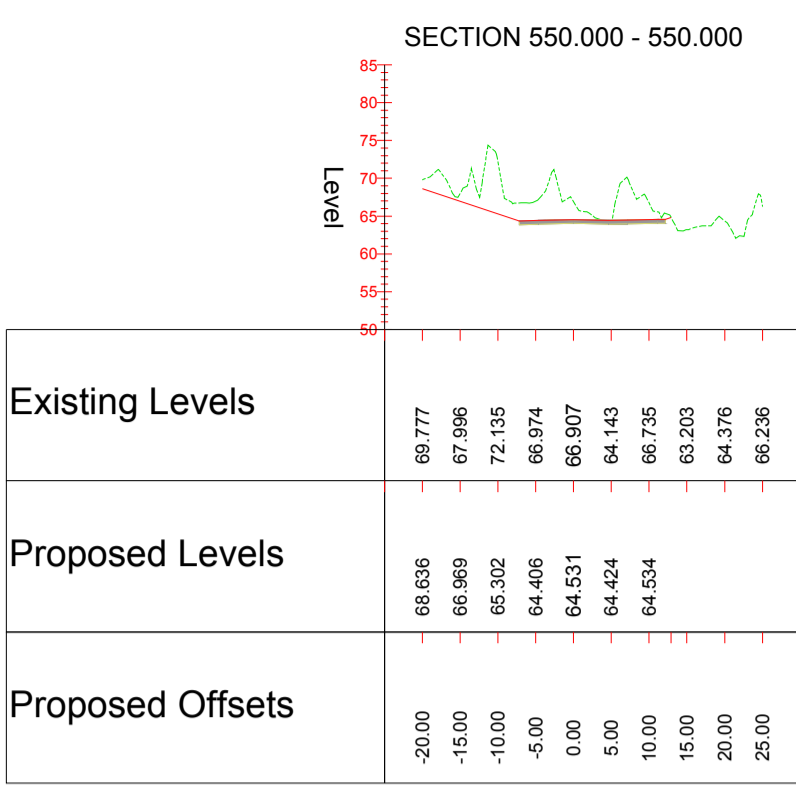
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WEST OF ENGLAND

# CROSS SECTIONS

Scale 1:1000



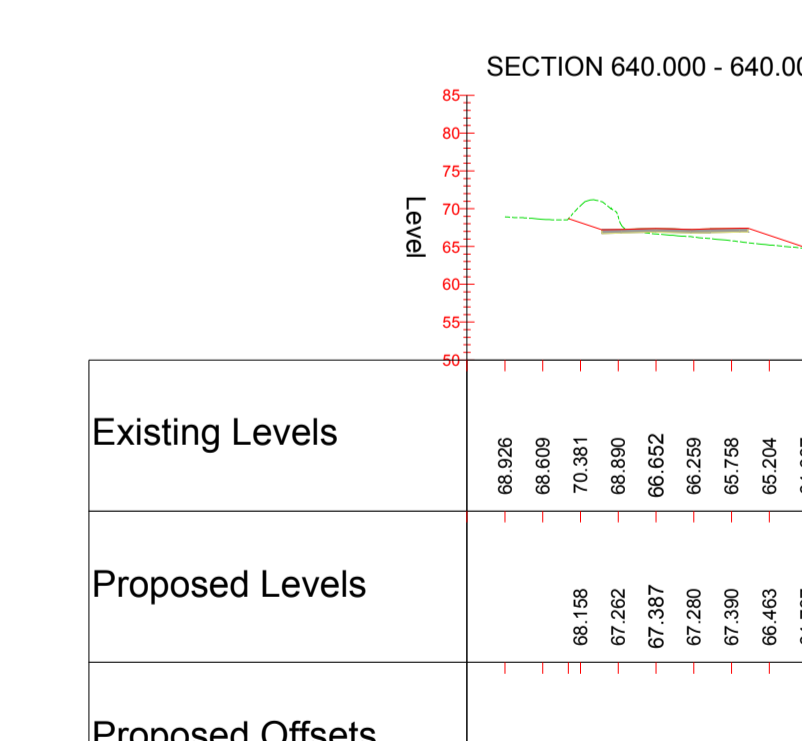
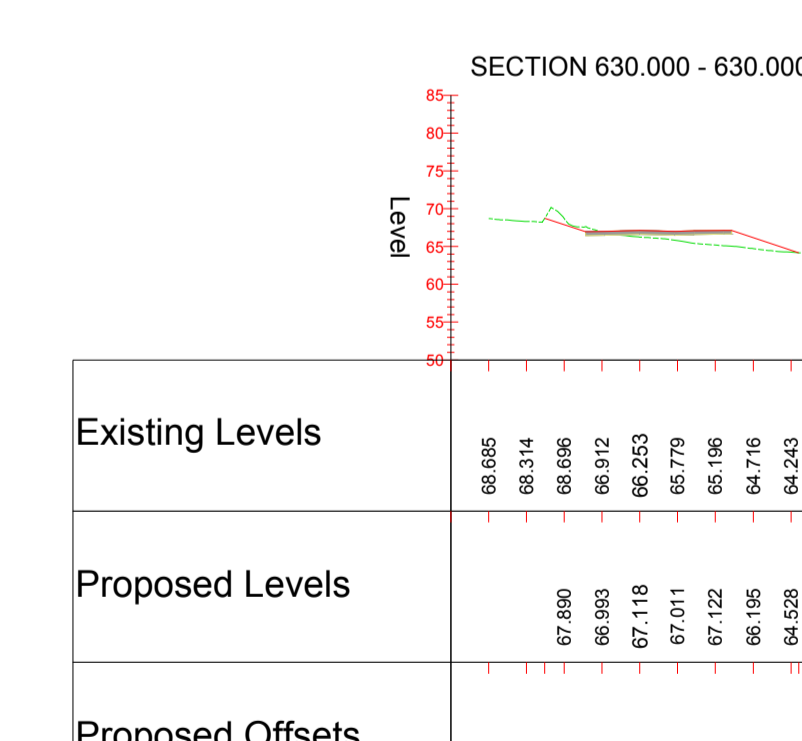
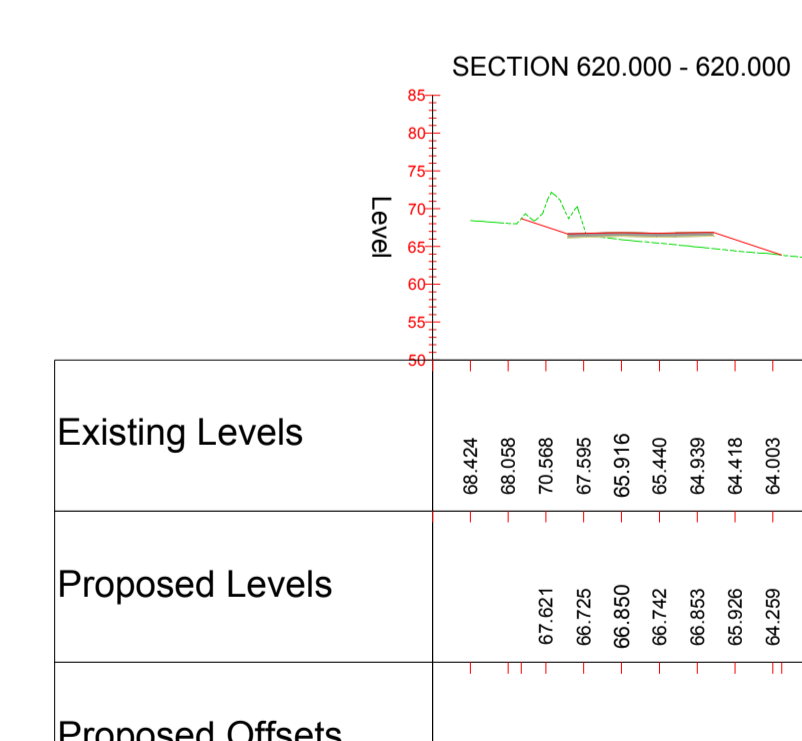
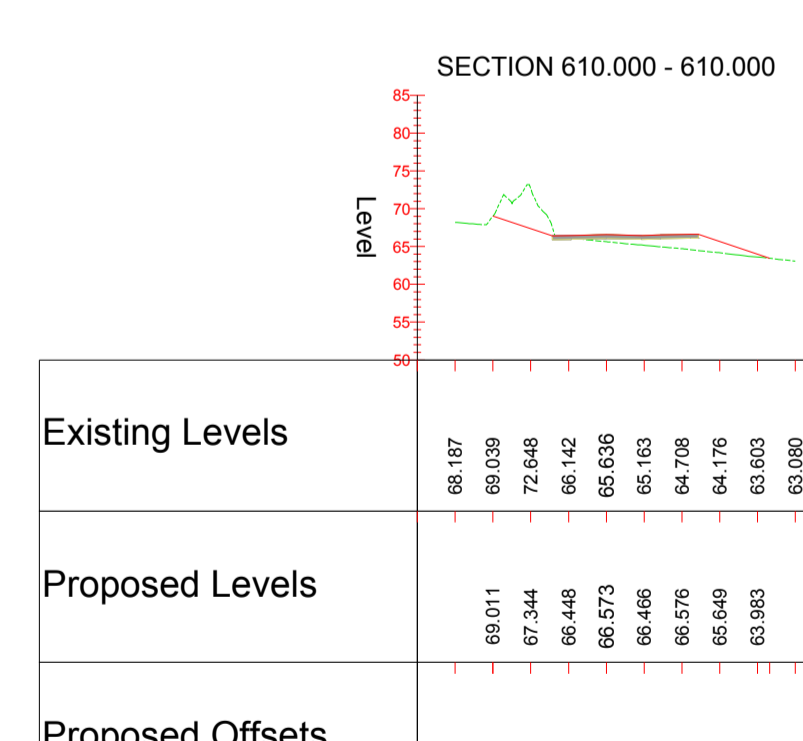
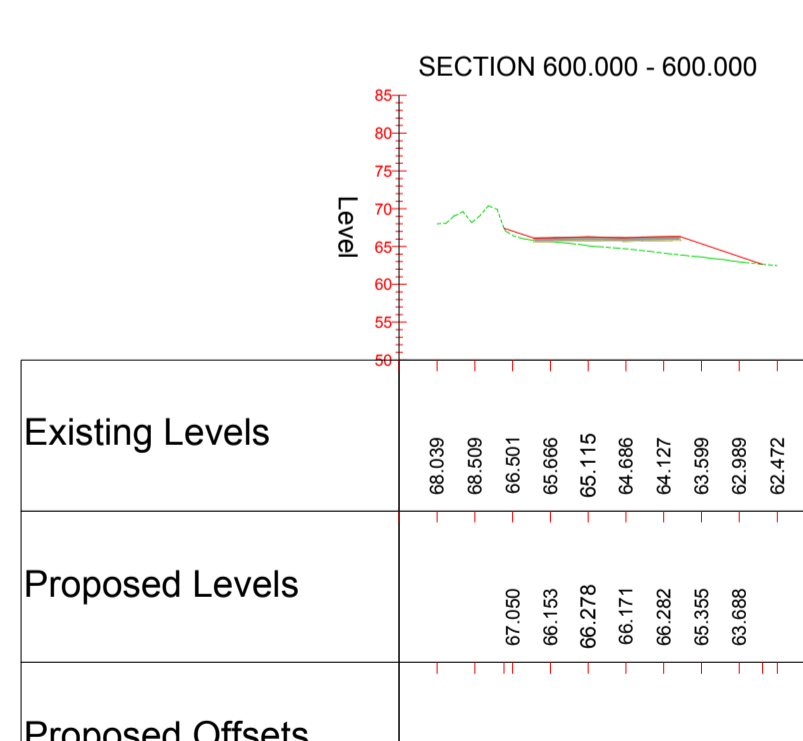
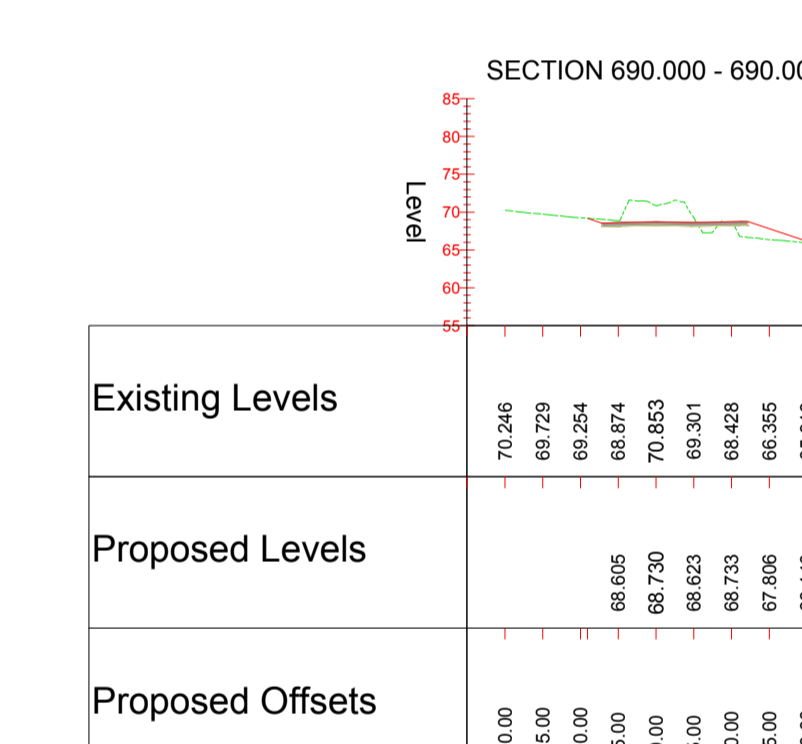
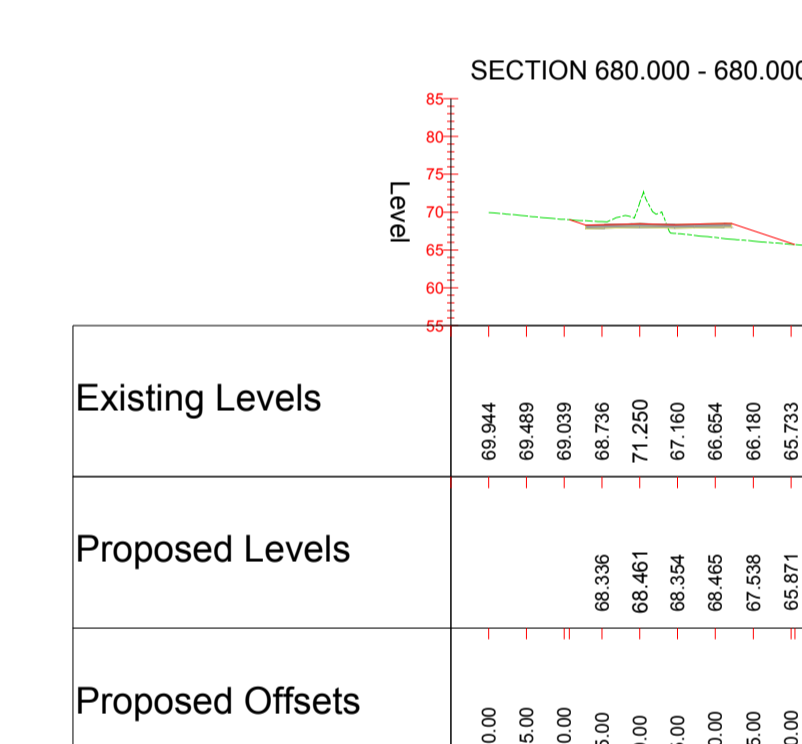
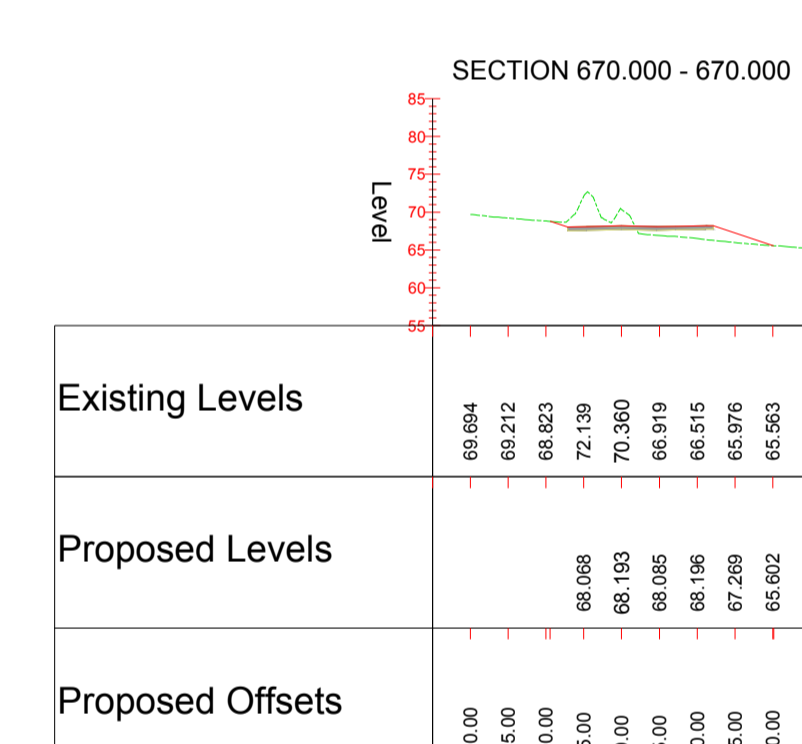
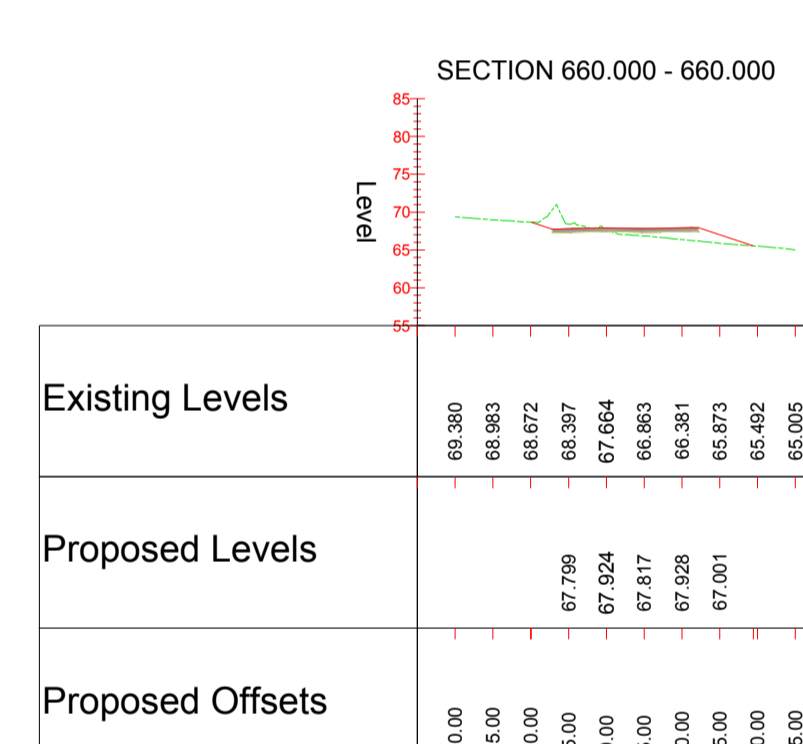
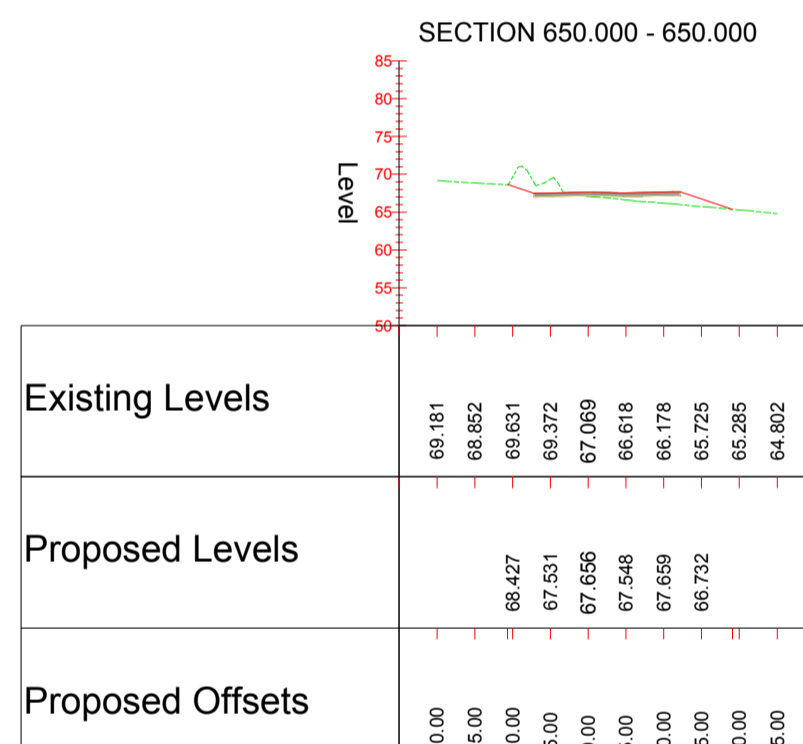
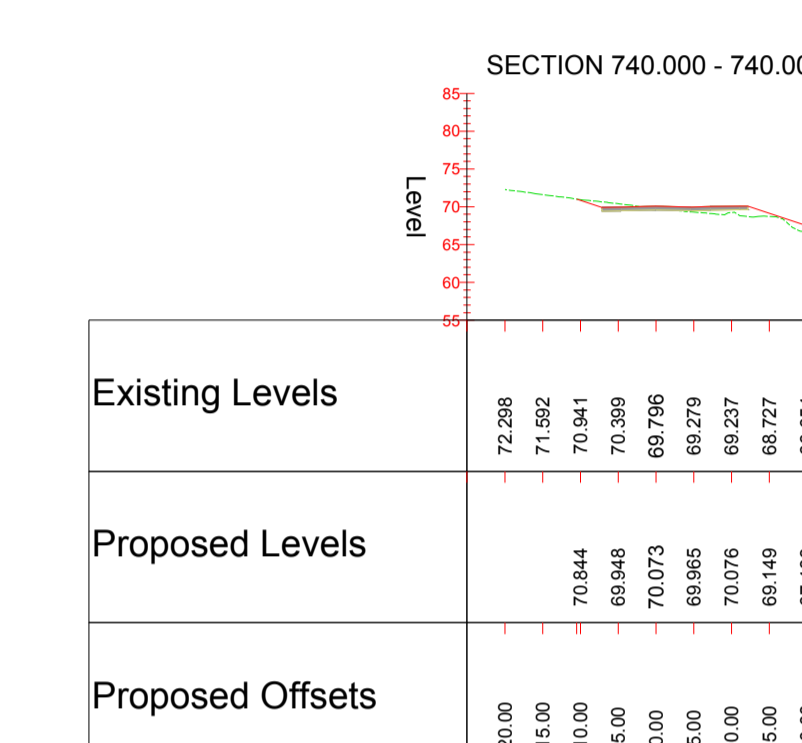
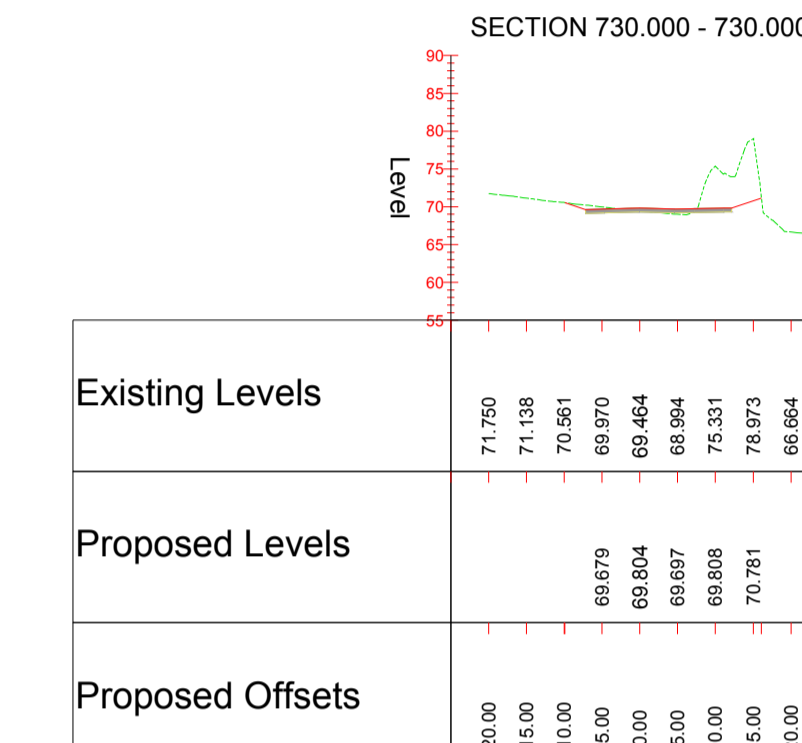
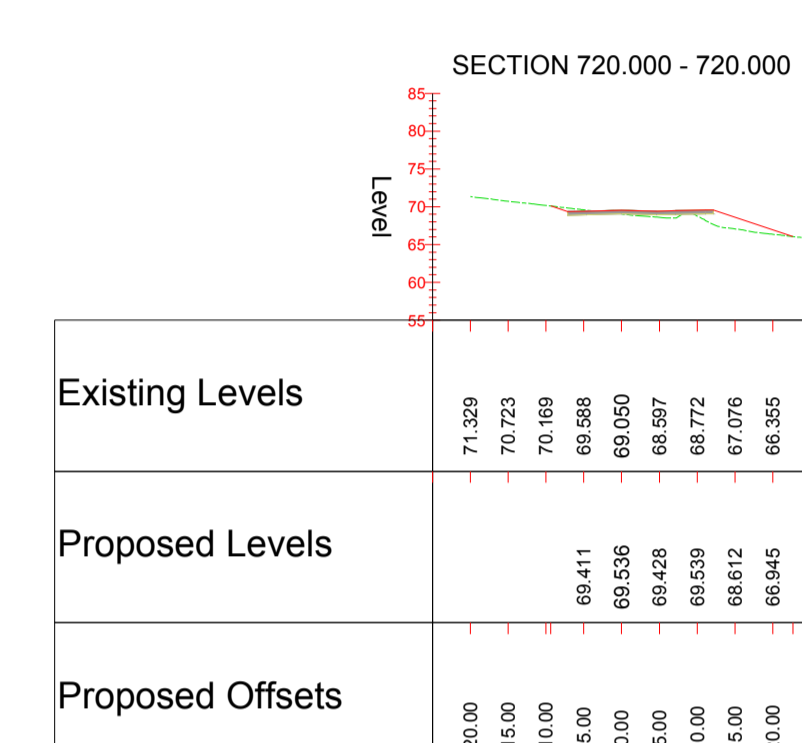
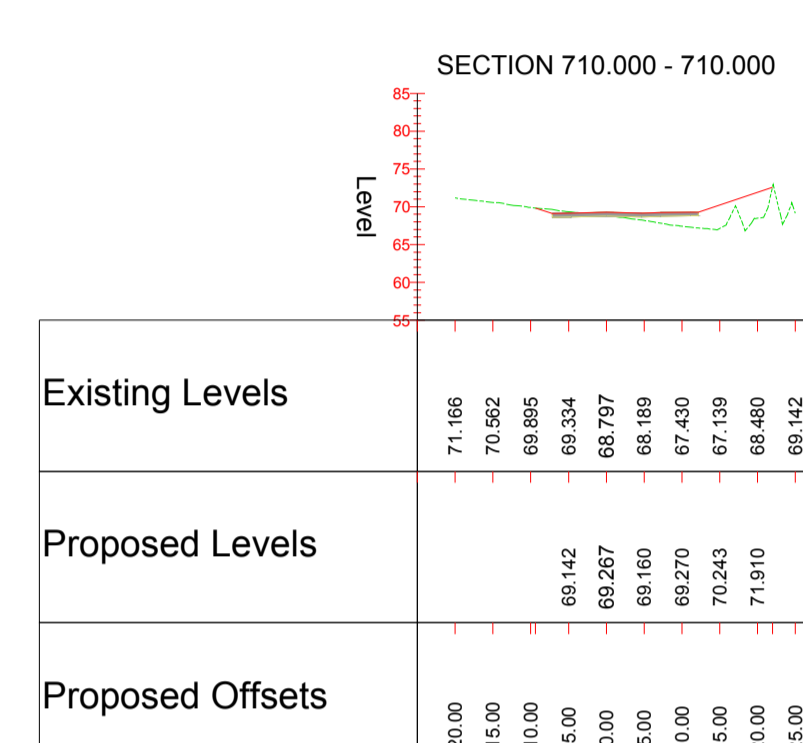
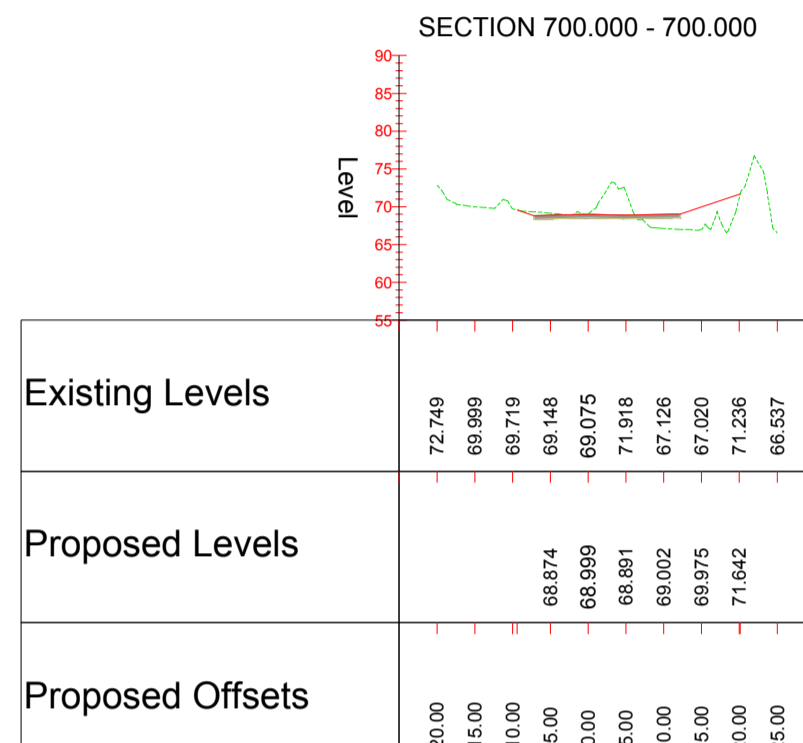
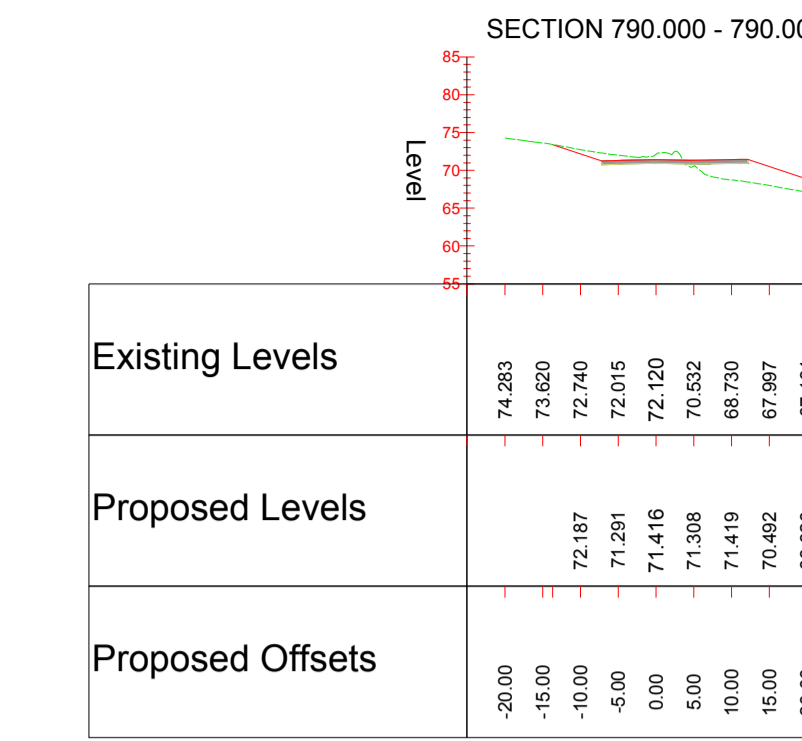
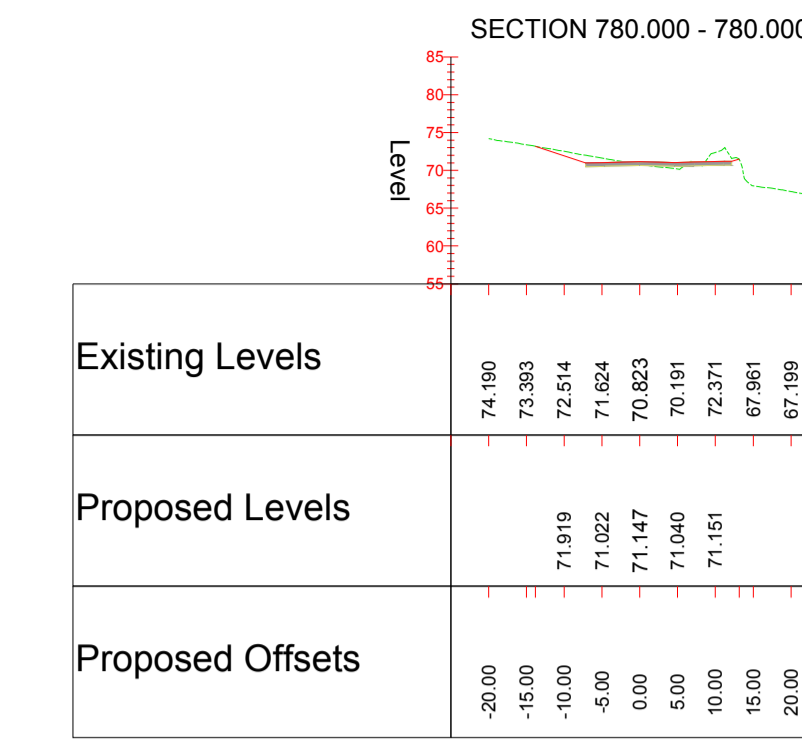
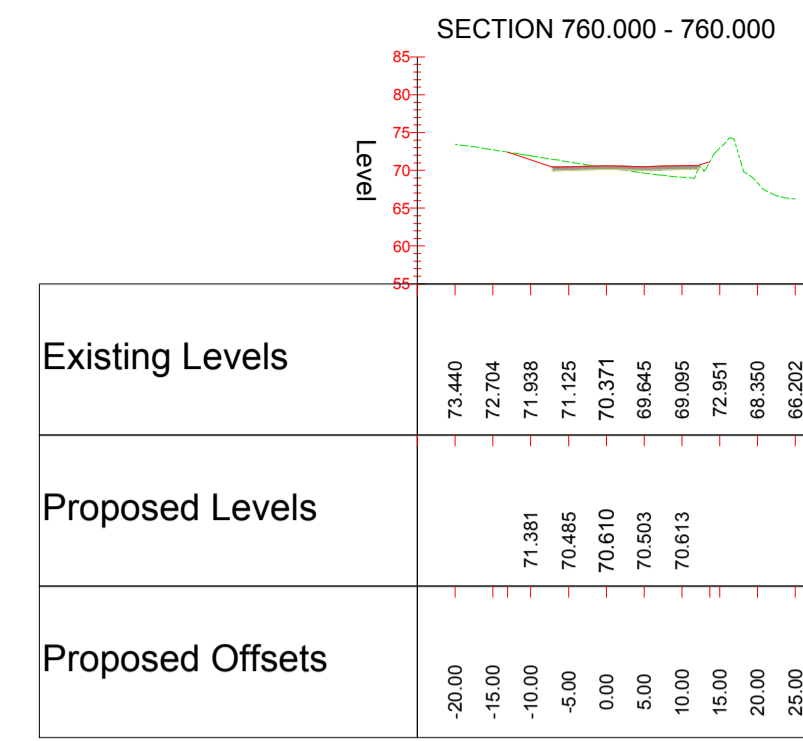
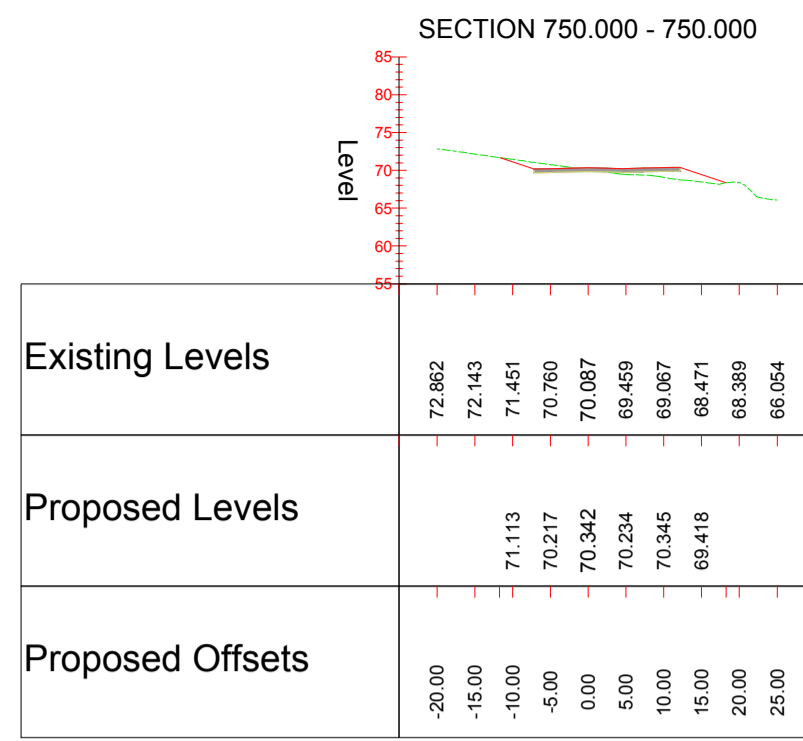
**Key:**

**Notes:**

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
<b>CONSTRUCTION</b>			
NONE			
<b>MAINTENANCE/CLEANING</b>			
NONE			
<b>DECOMMISSIONING/DEMOLITION</b>			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF

Drawing Status	FOR INFORMATION	Suitability	S2	Project Title	WEST OF ENGLAND WP1								
<b>ATKINS</b>		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Drawing Title	A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 3 / 9								
Copyright	© Atkins Limited (2014)	Client	WEST OF ENGLAND	Scale	1:1000	Designed	EC	Drawn	AF	Checked	AH	Authorised	
Original Size	A1	Date	05/02/18	Date	05/02/18	Date	05/02/18	Date		Date		Date	
Drawing Number	Woe	HA PIN	WP1	Originator	ATK	Volume	HGN	Project Ref. No.	0000000	Revision		Date	
Location	DR	Type	D	Number	6006								P1

CROSS SECTIONS  
Scale 1:1000



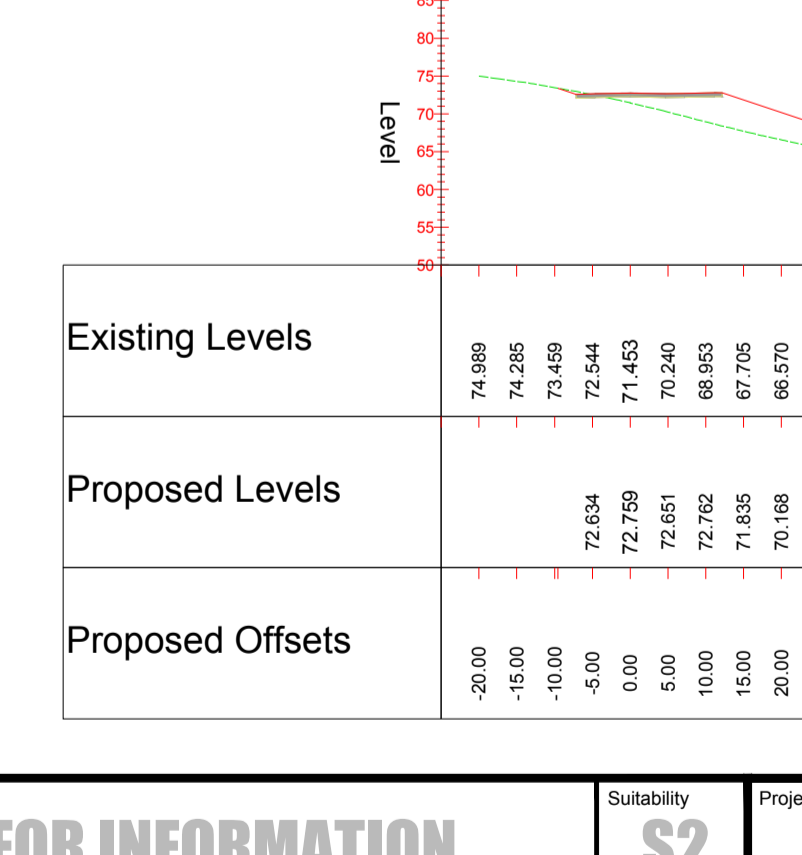
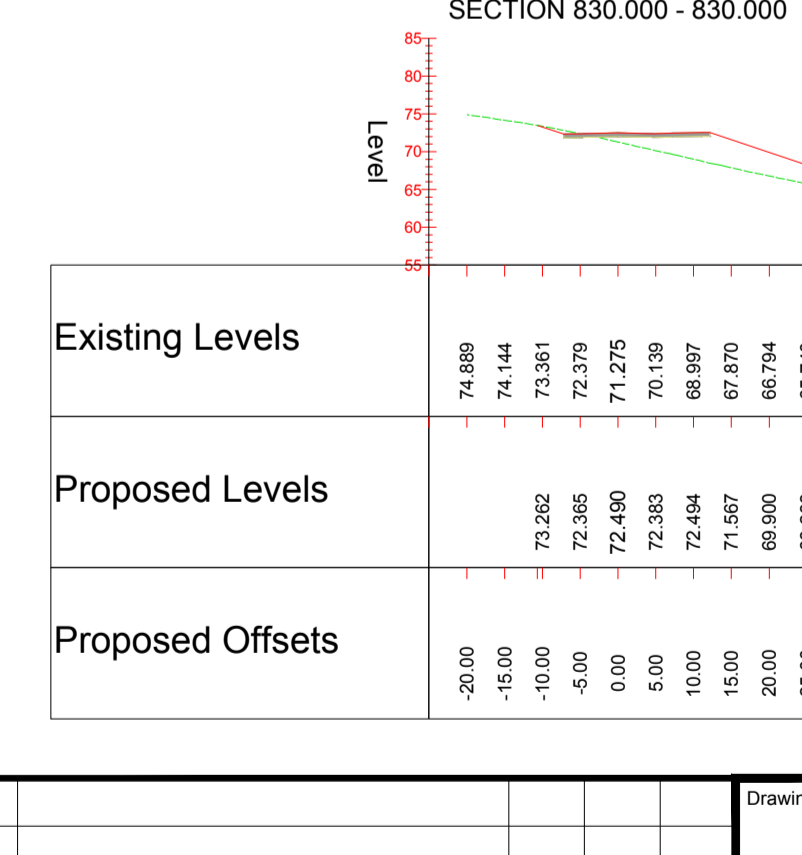
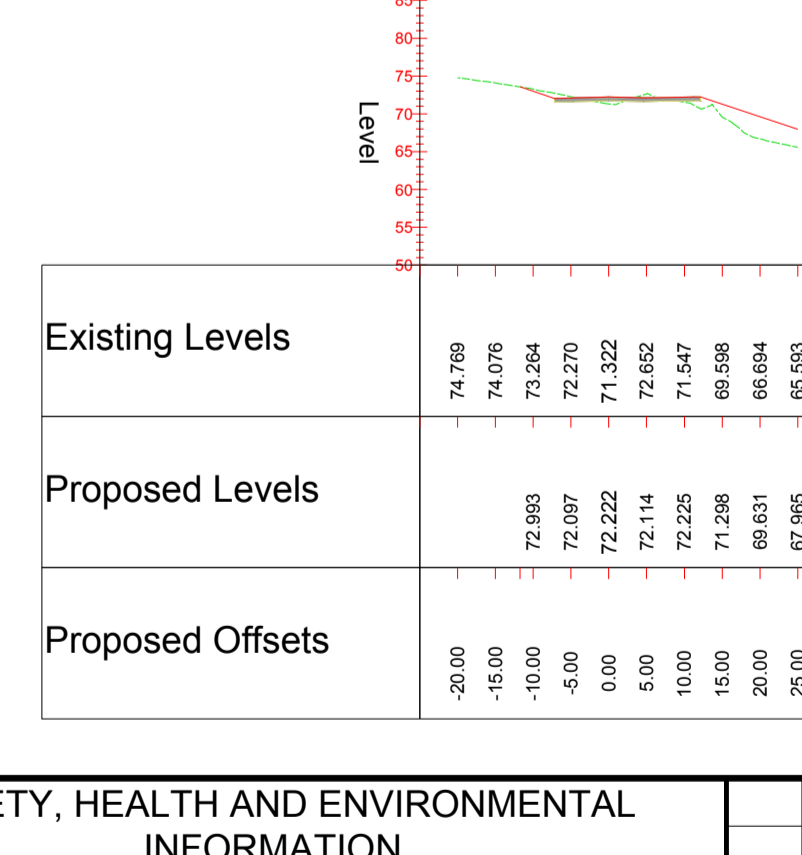
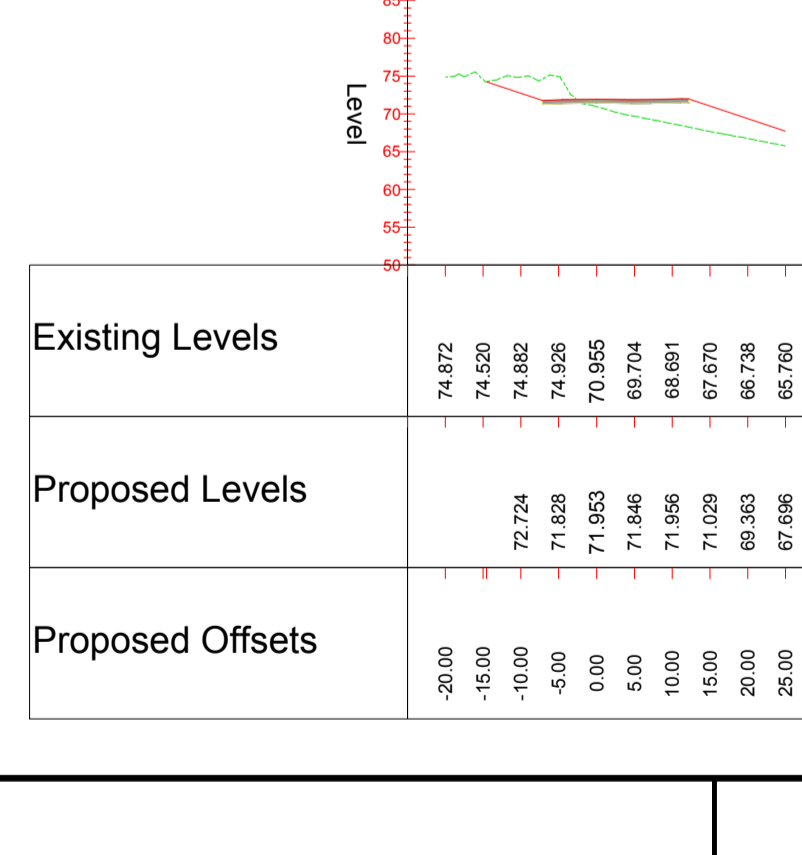
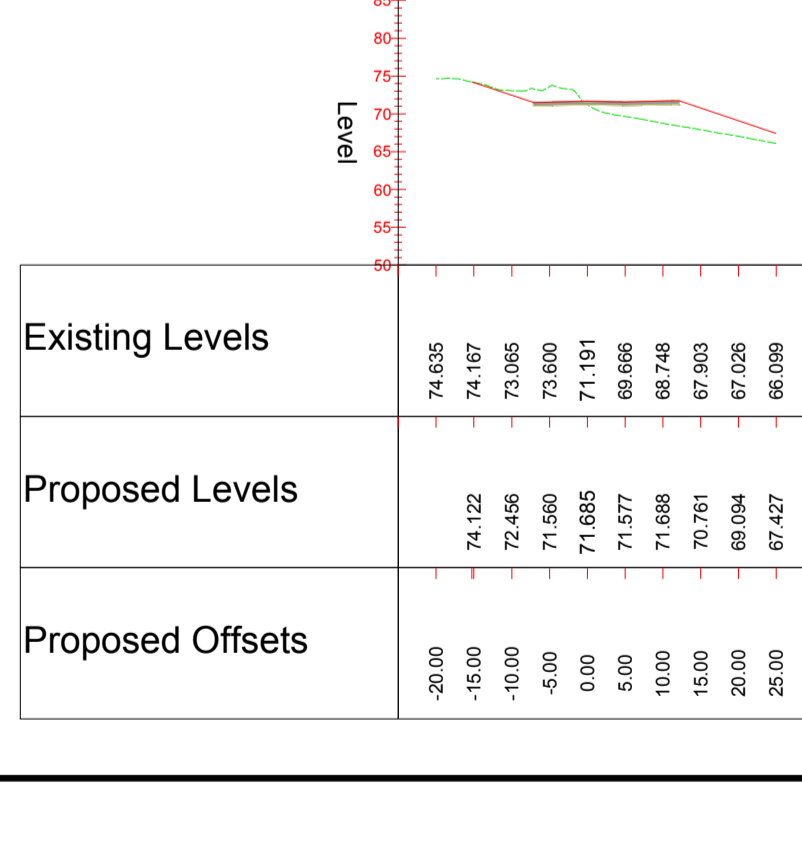
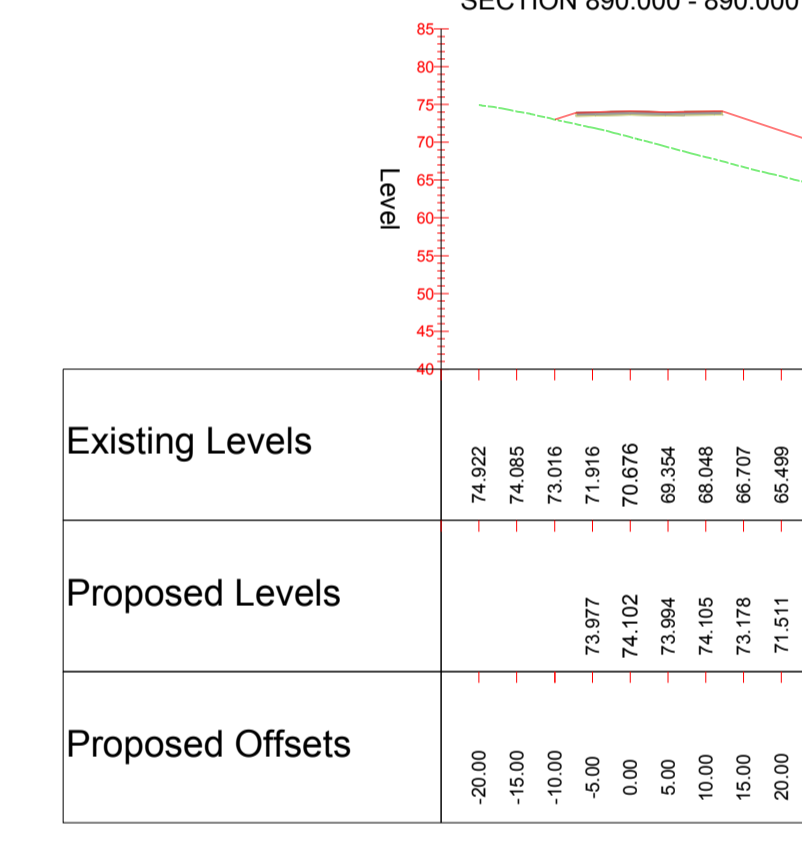
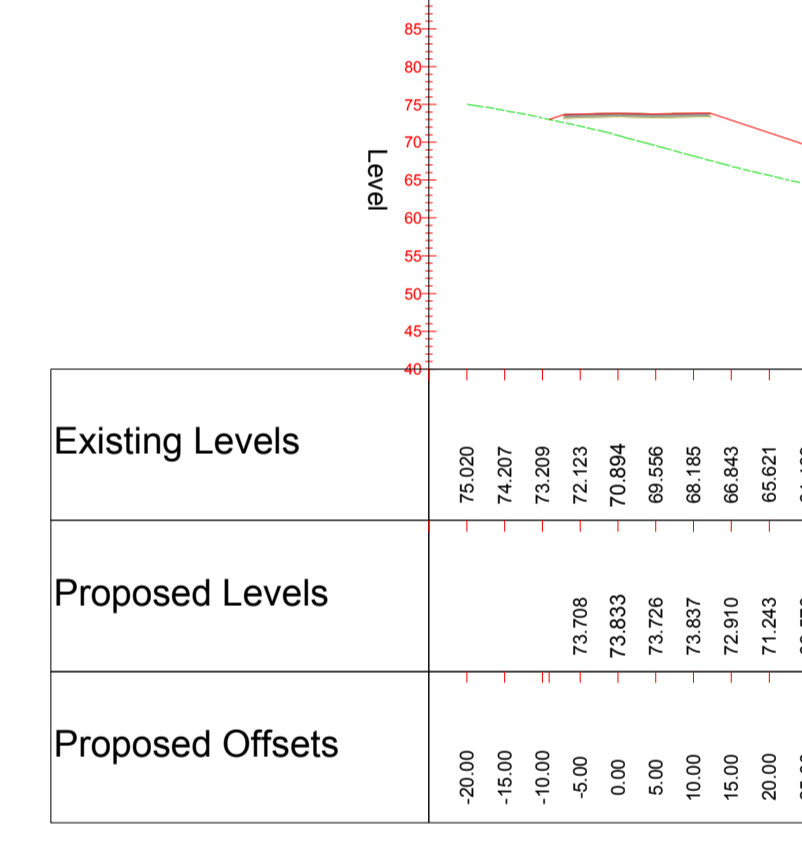
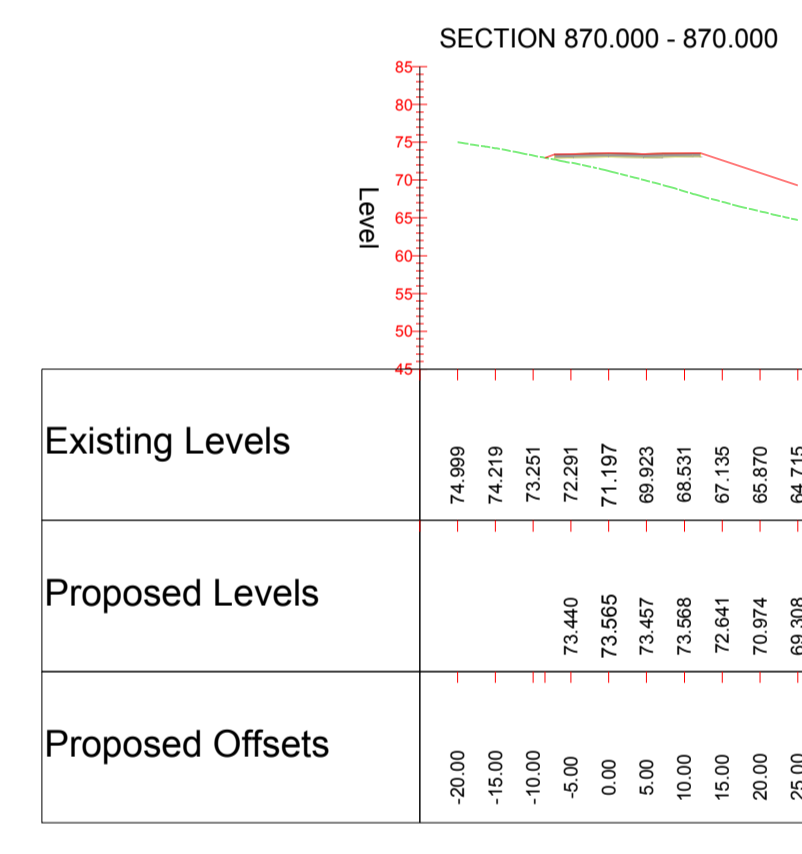
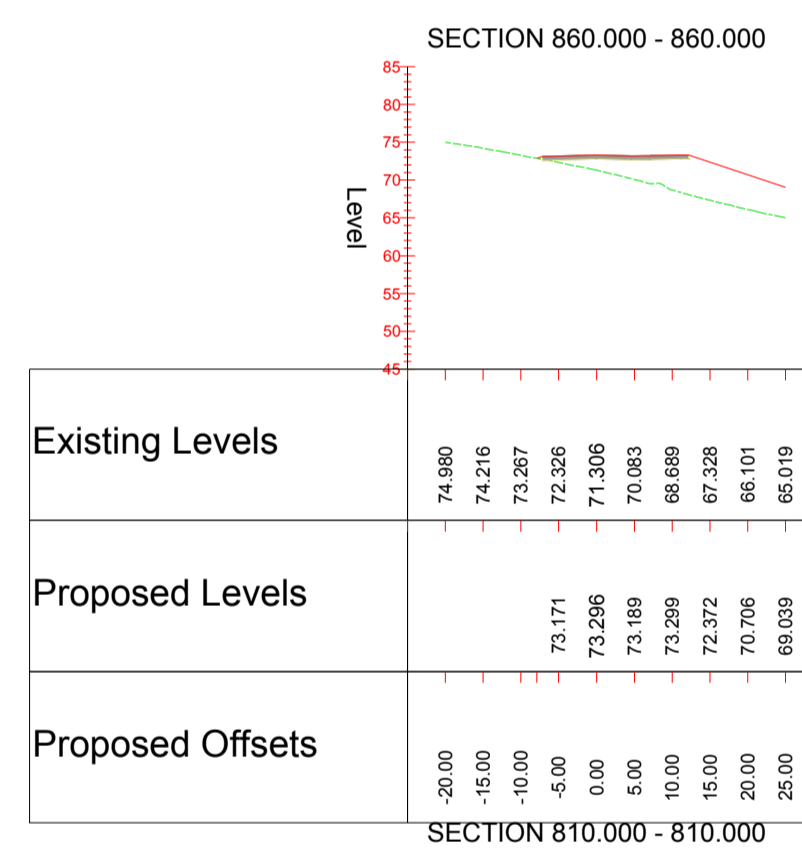
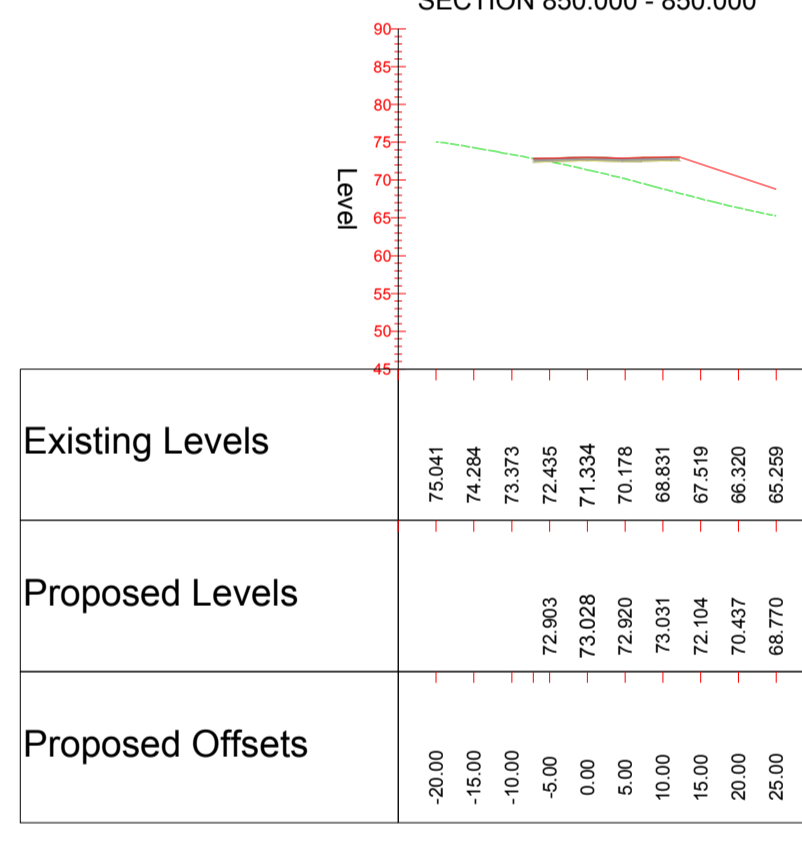
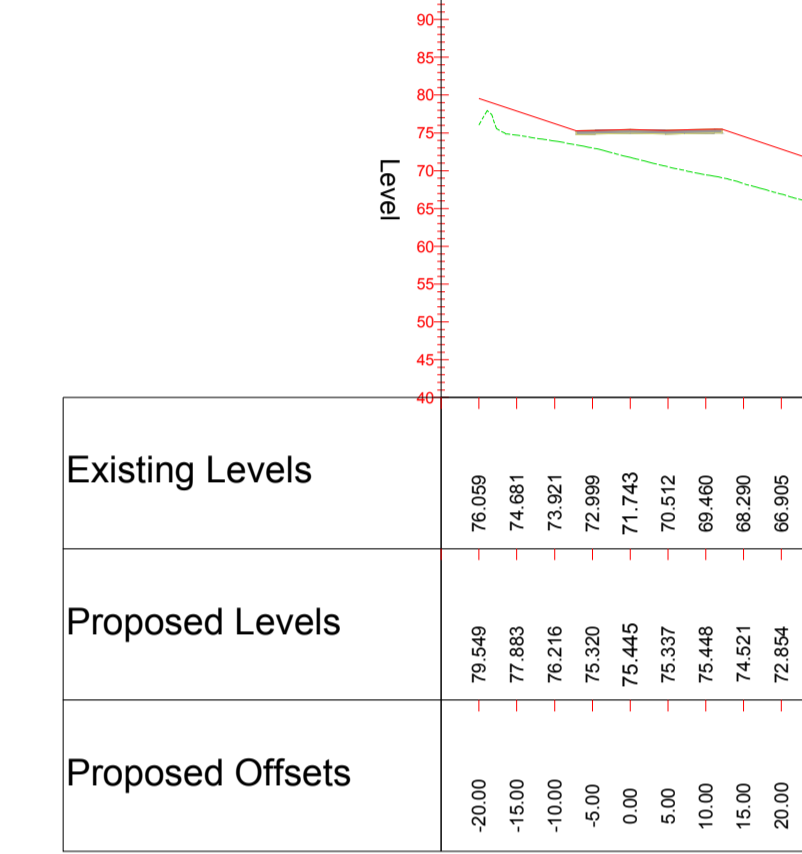
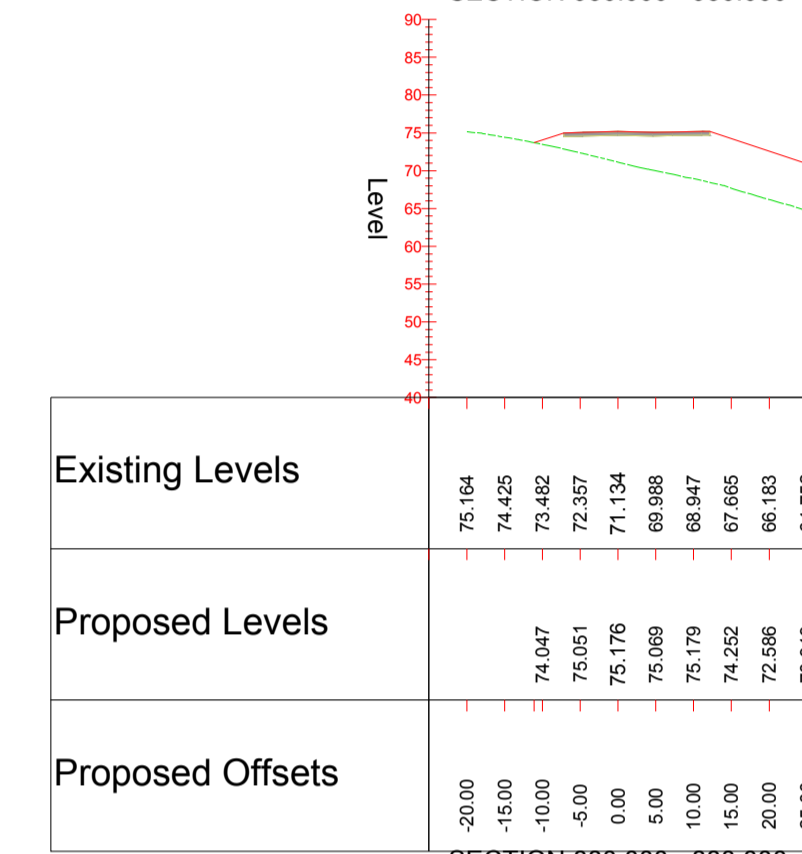
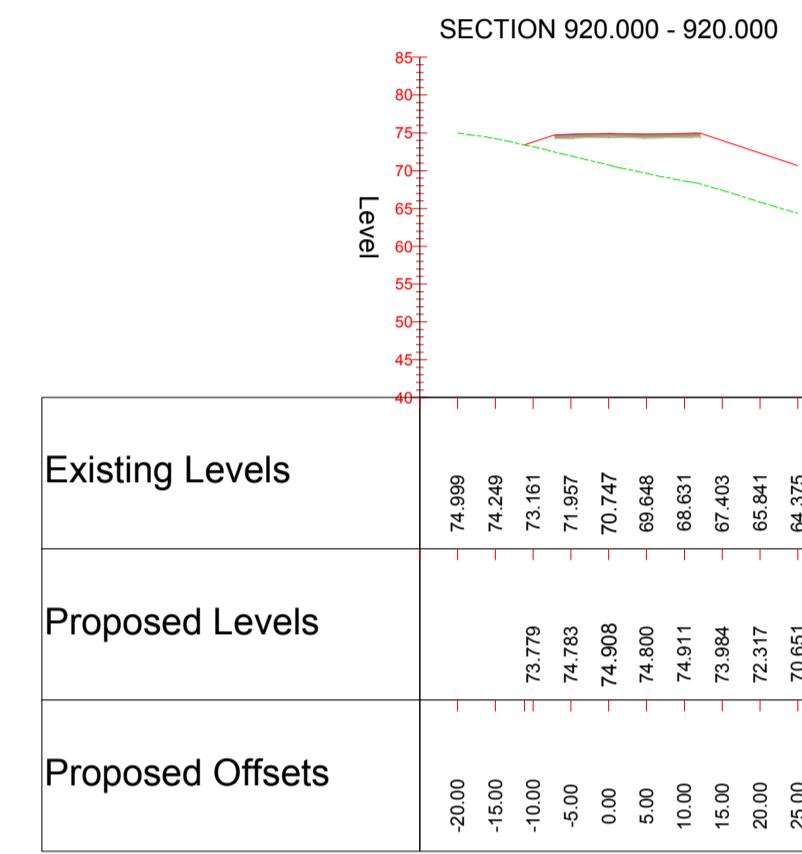
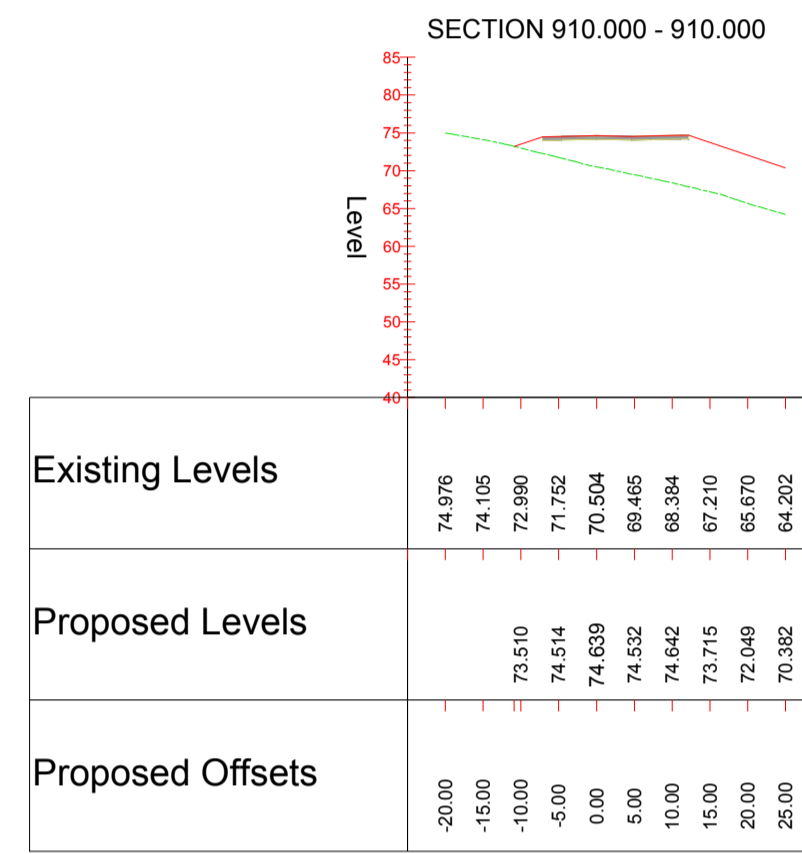
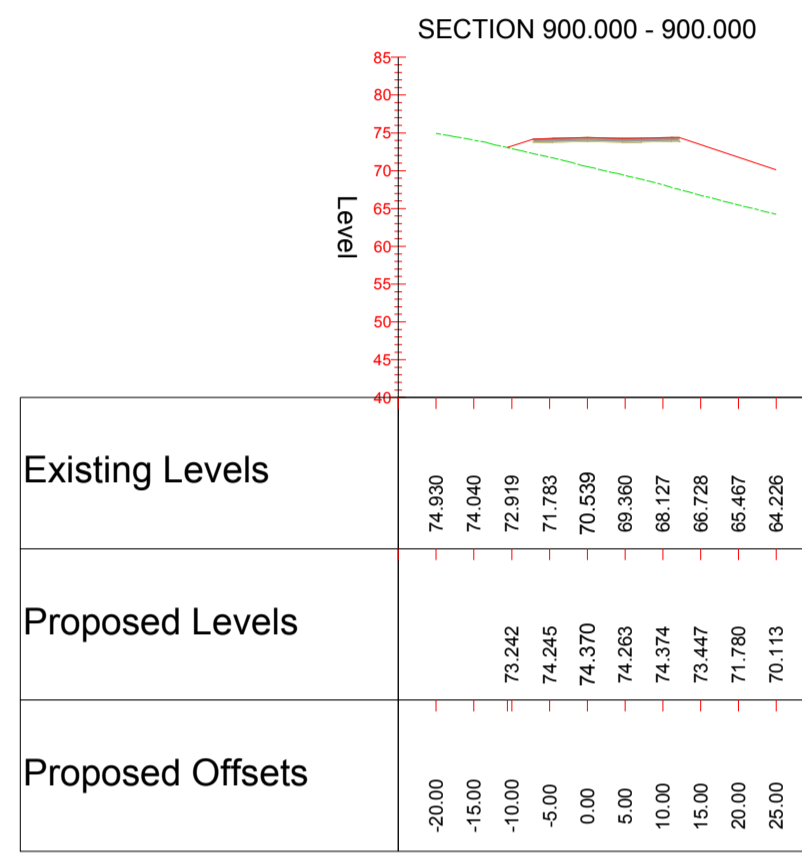
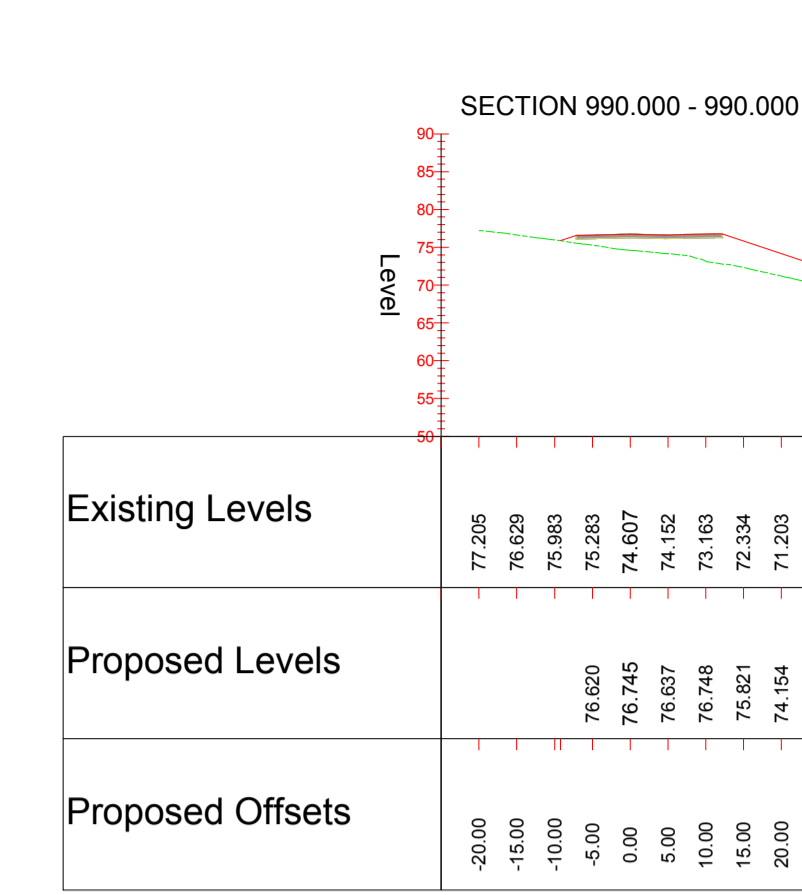
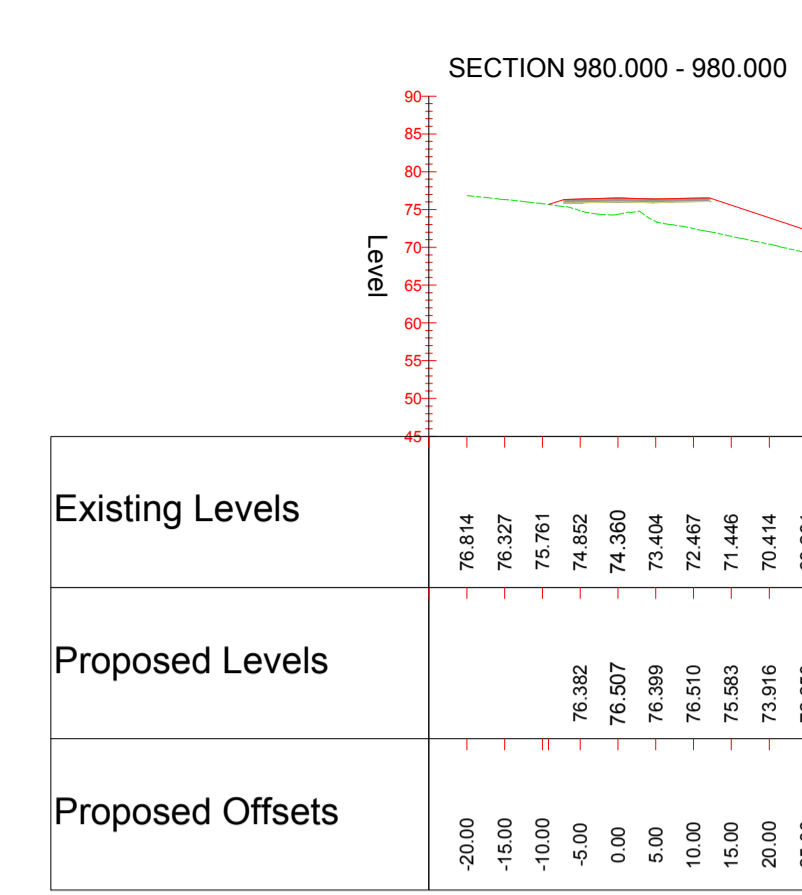
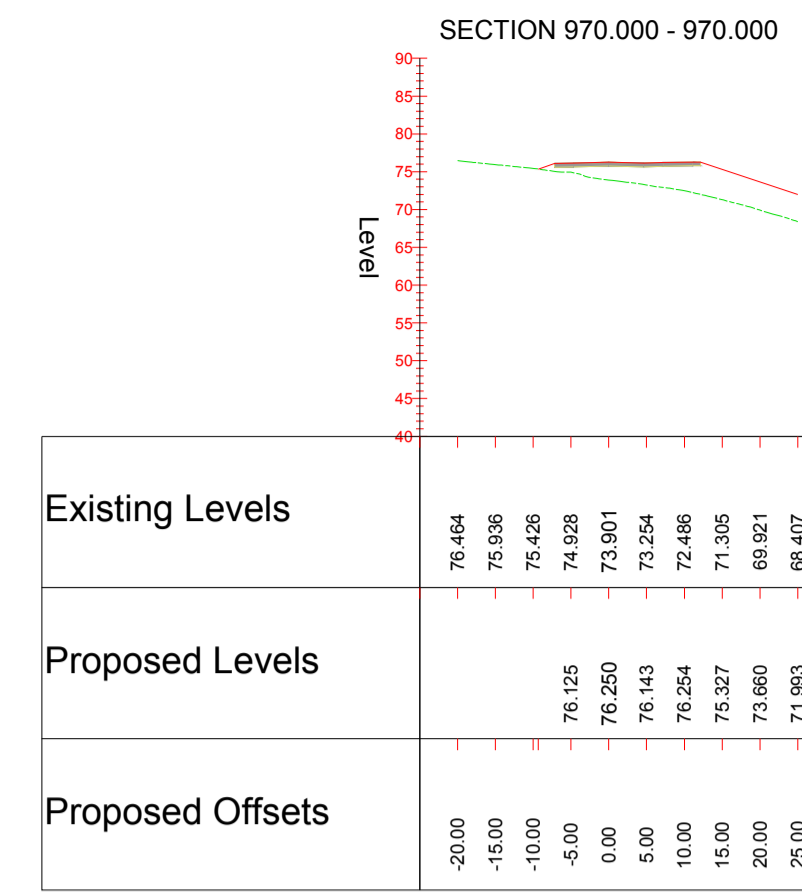
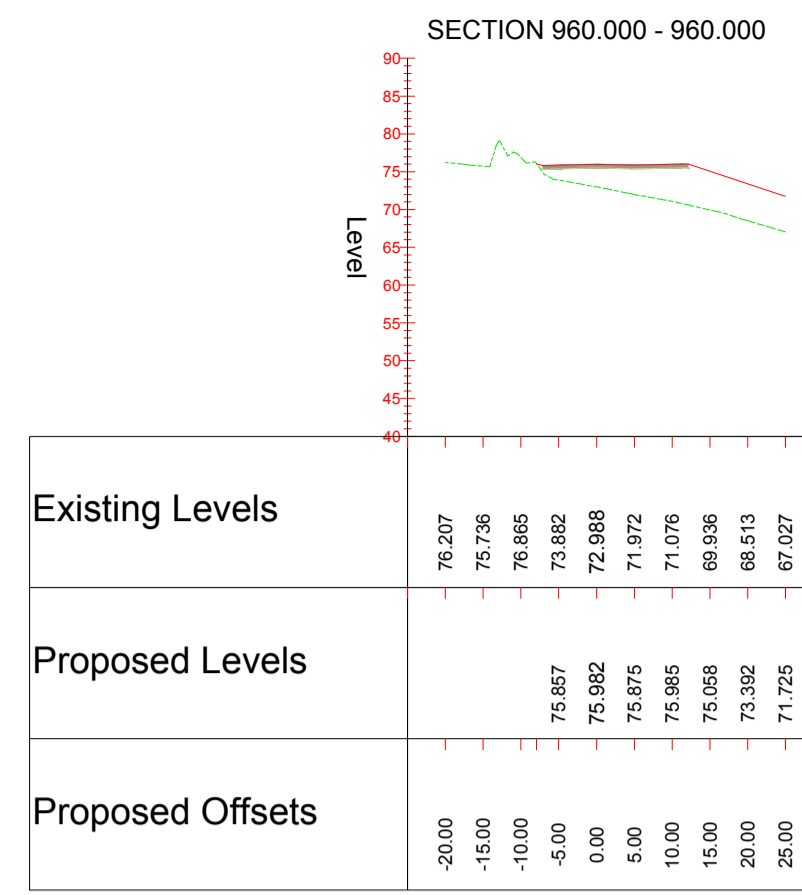
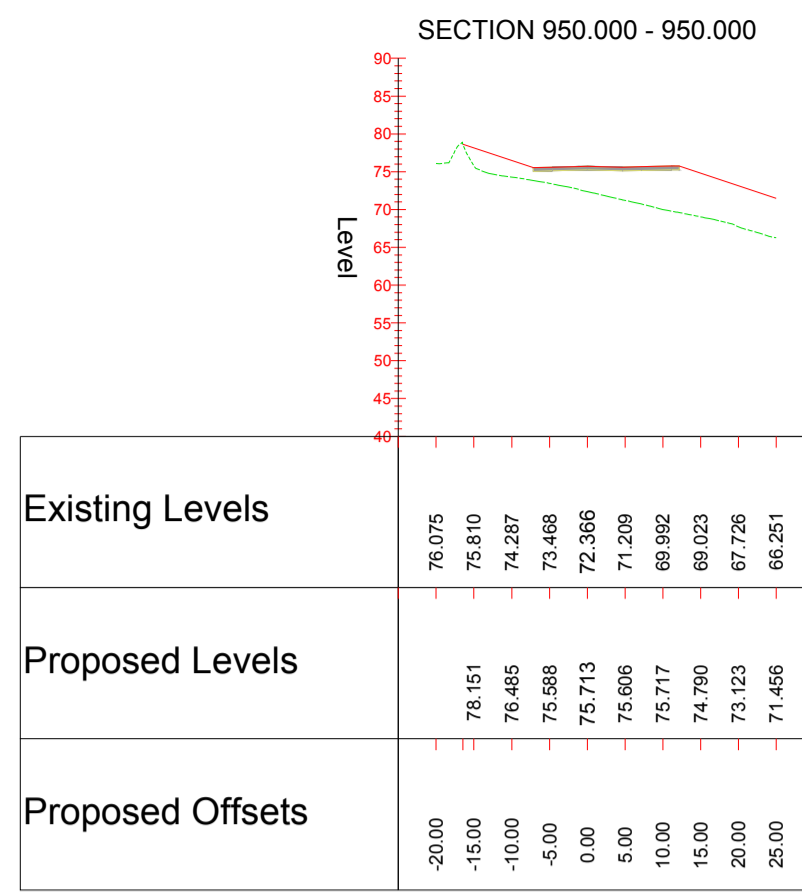
Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION					
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:					
CONSTRUCTION					
NONE					
MAINTENANCE/CLEANING					
NONE					
DECOMMISSIONING/DEMOLITION					
NONE					
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement					
Rev.	Date	Description	By	Chkd	App'd
P1	05.02.18	DRAWING CREATED	AF		

Drawing Status <b>FOR INFORMATION</b>		Suitability <b>S2</b>	Project Title <b>WEST OF ENGLAND WP1</b>			
<p>The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com</p>		Drawing Title <b>A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 4/19</b>				
Copyright © Atkins Limited (2014)		Scale 1:1000	Designed EC	Drawn AH	Checked AH	Authorised
Client <b>WEST OF ENGLAND</b>		Original Size A1	Date 05/02/18	Date 05/02/18	Date 05/02/18	Date
Drawing Number HA PIN <b>WoE WP1</b>		Originator <b>ATK</b>	Volume <b>HGN</b>	Project Ref. No. <b>0000000</b>	Revision <b>P1</b>	
Location		Type	Role	Number		

CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION		
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:		
CONSTRUCTION		
NONE		
MAINTENANCE/CLEANING		
NONE		
DECOMMISSIONING/DEMOLITION		
NONE		
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement		
Rev.	Date	Description
P1	05.02.18	DRAWING CREATED
		By: AF
		Chkd: App'd:

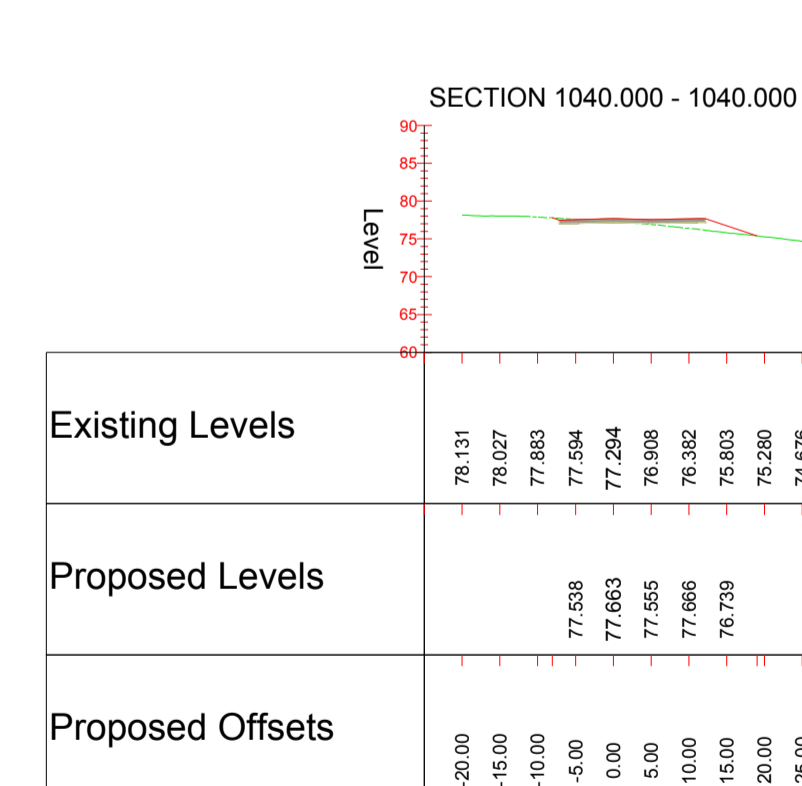
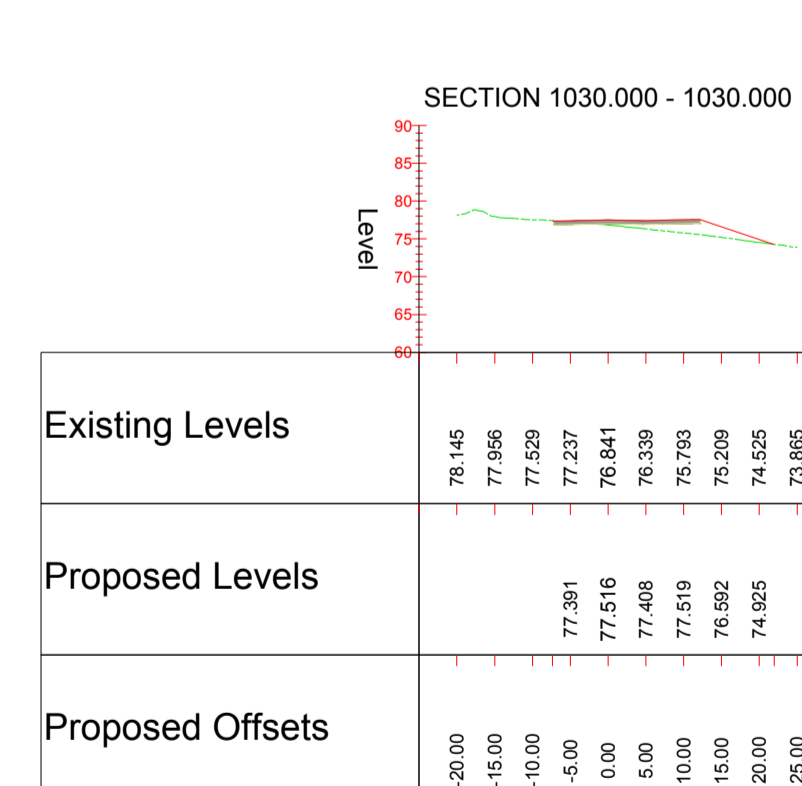
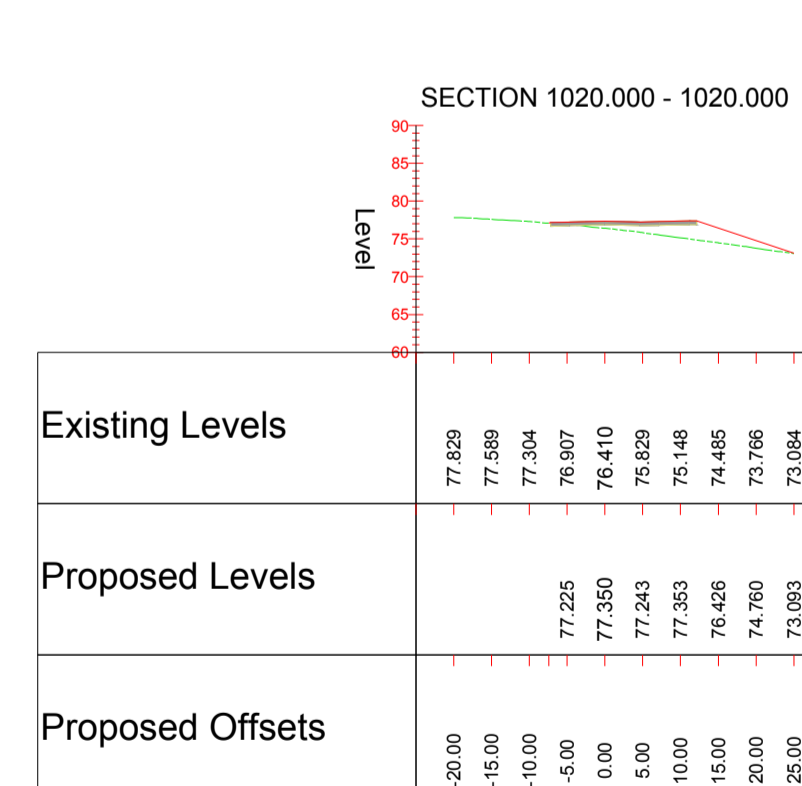
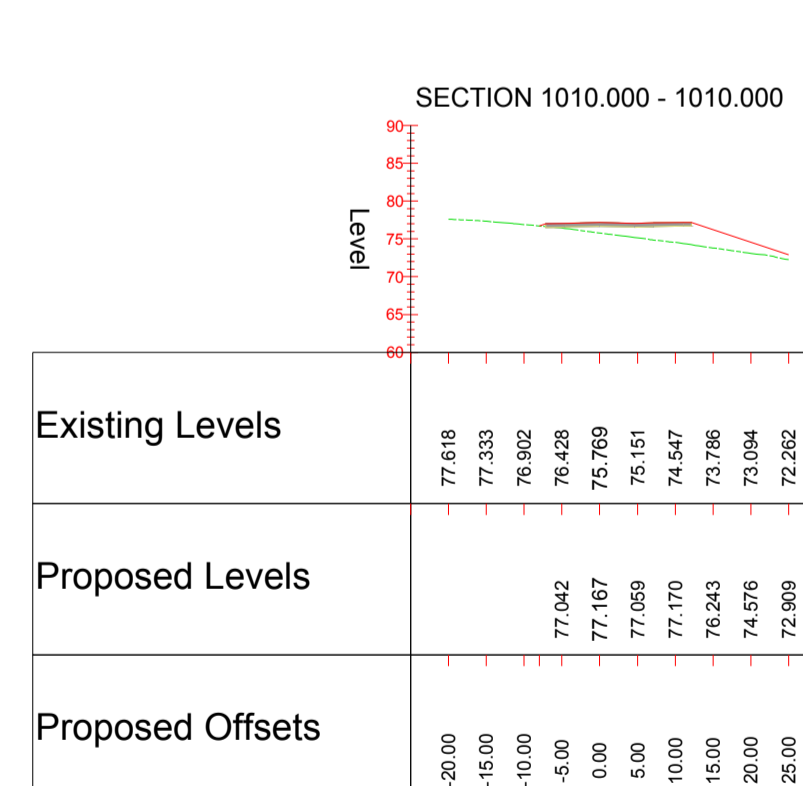
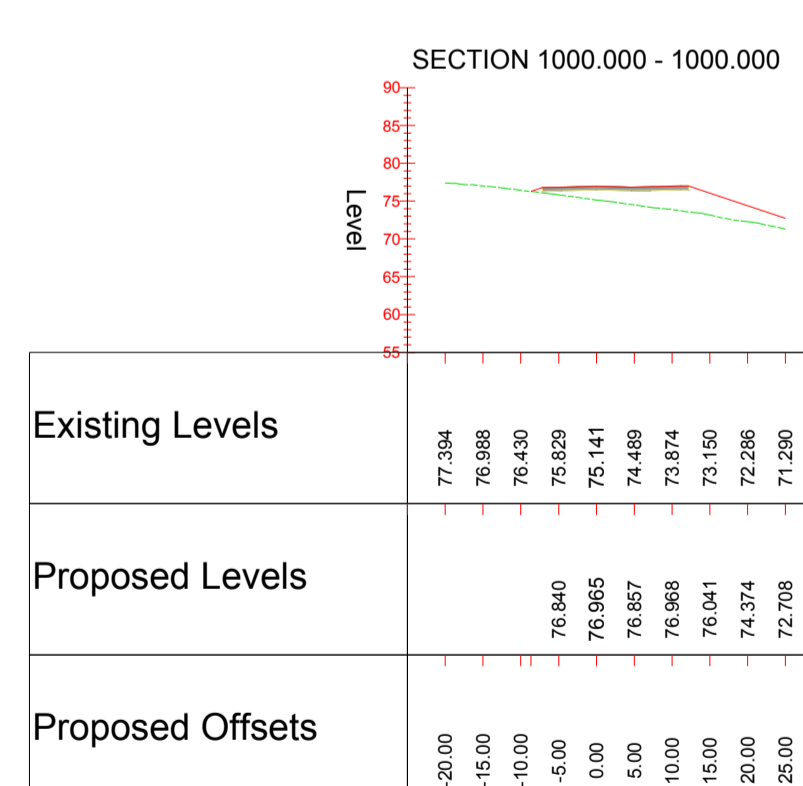
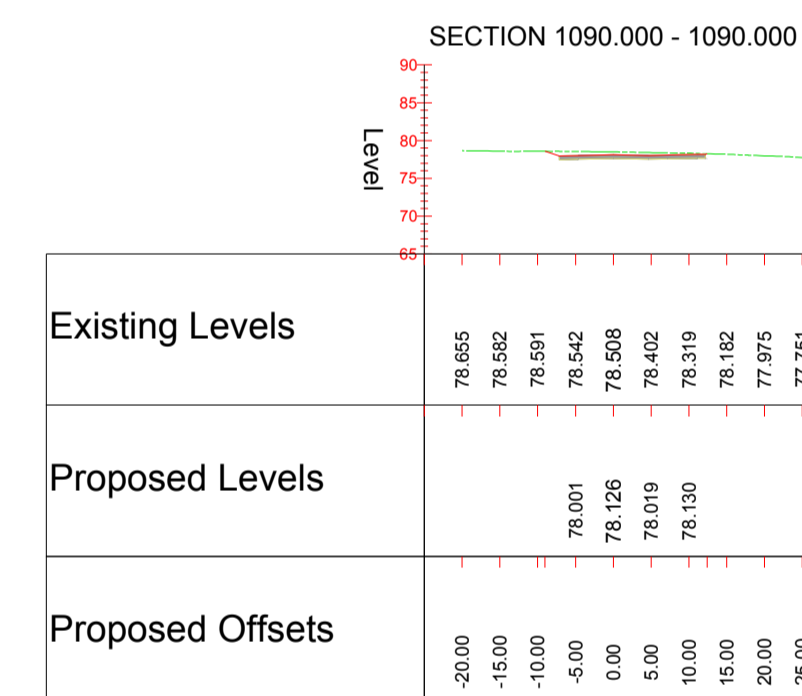
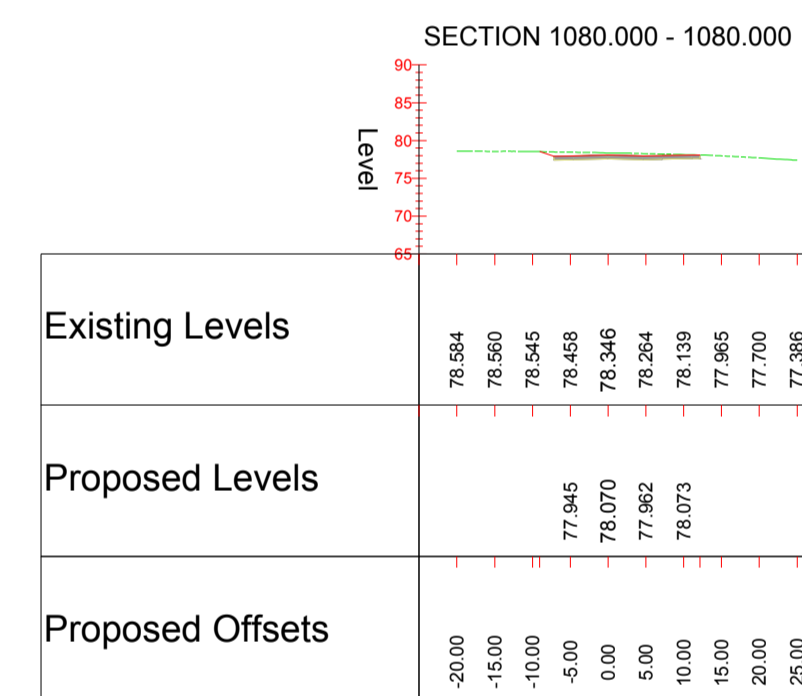
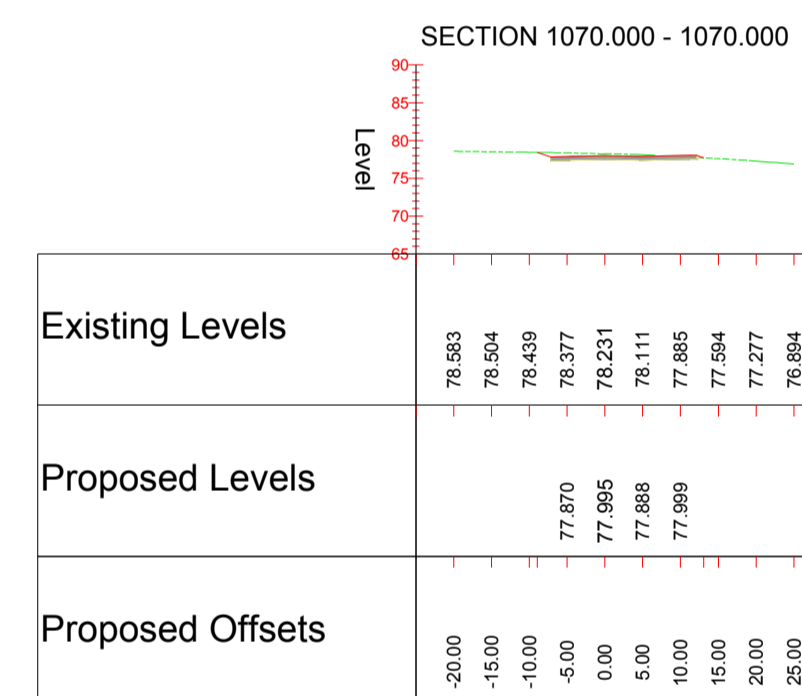
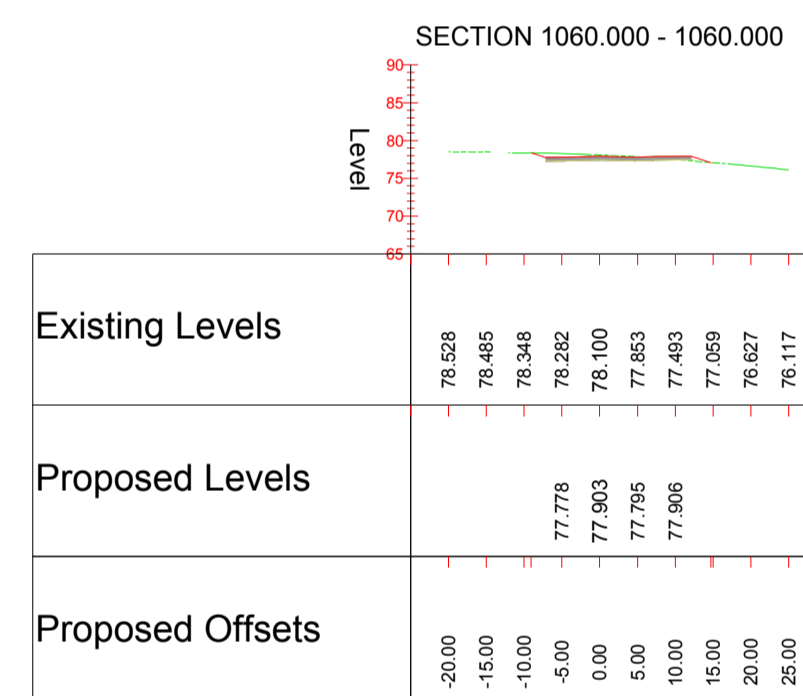
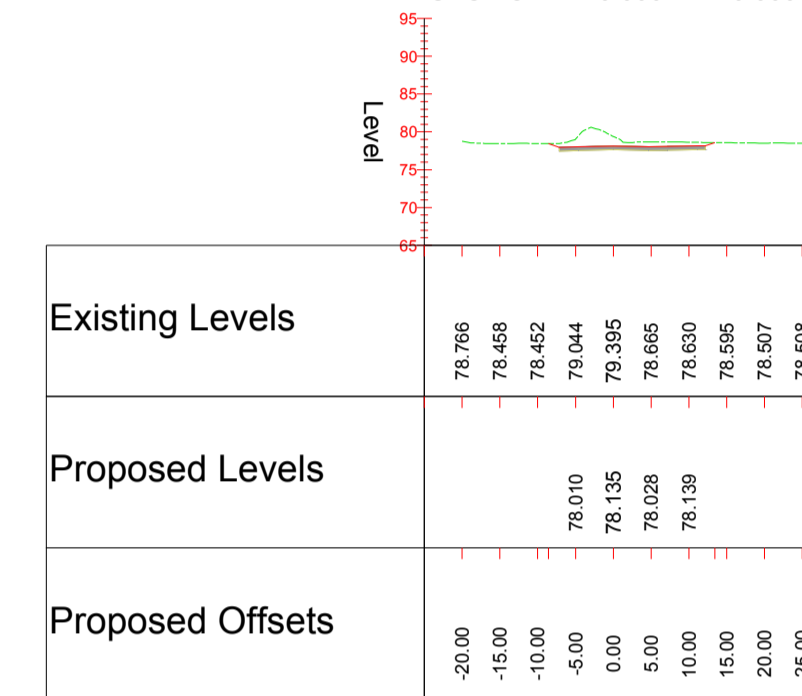
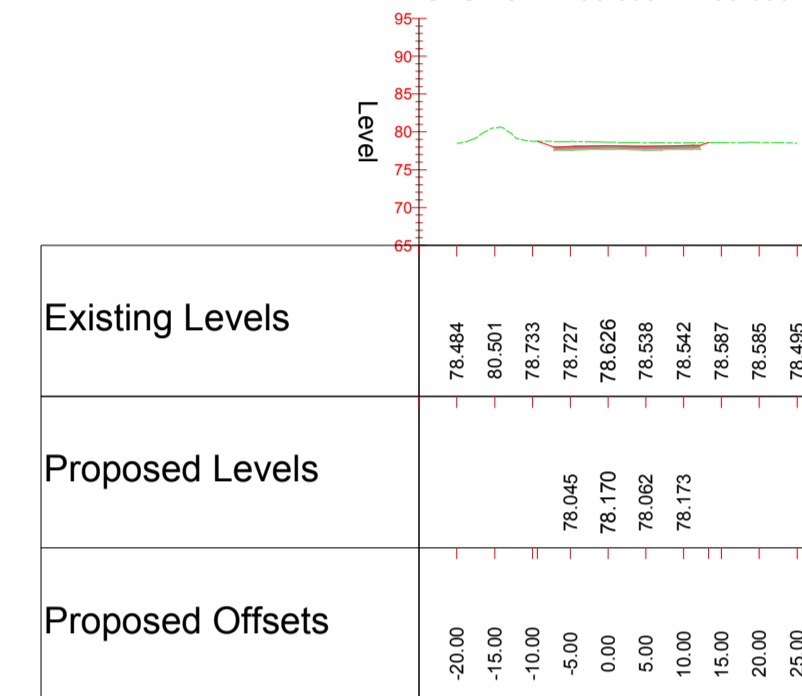
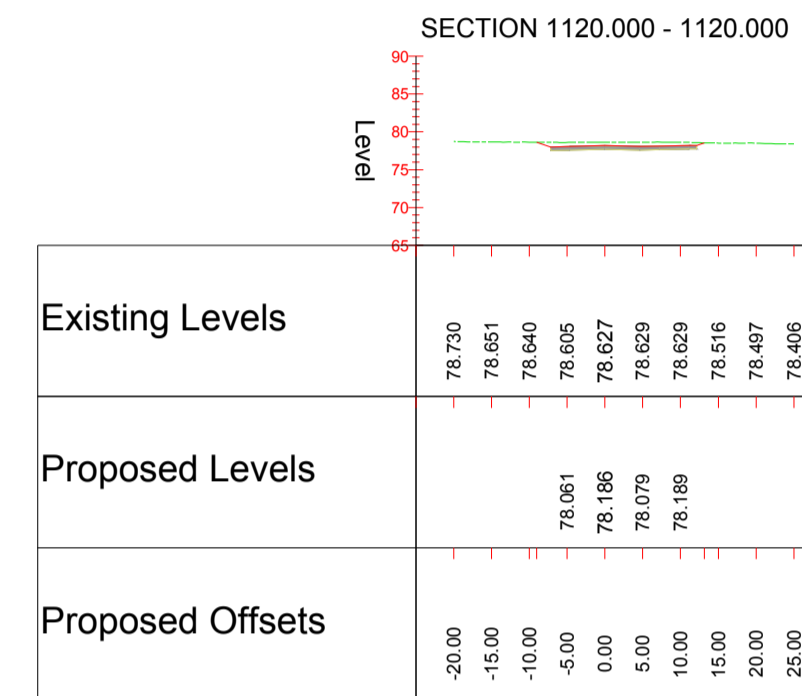
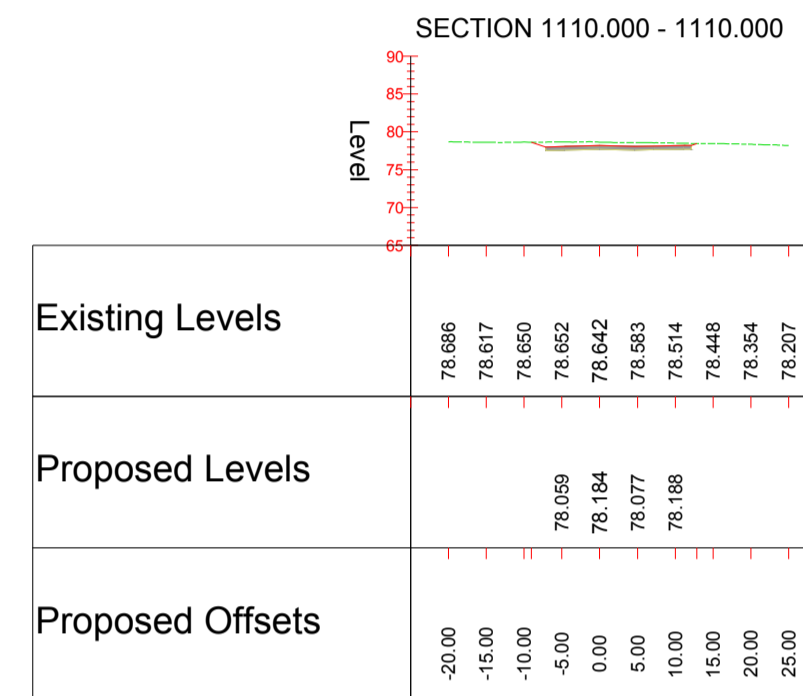
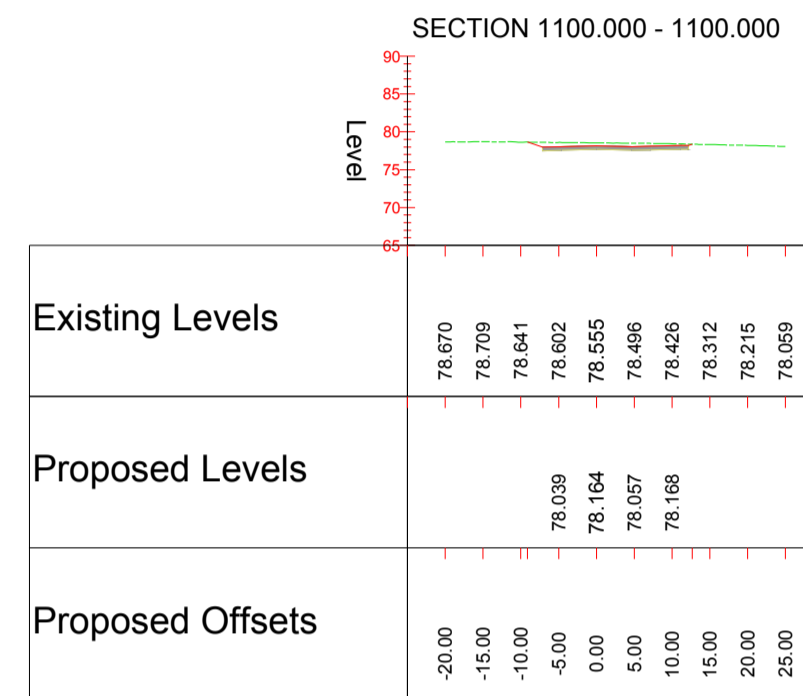
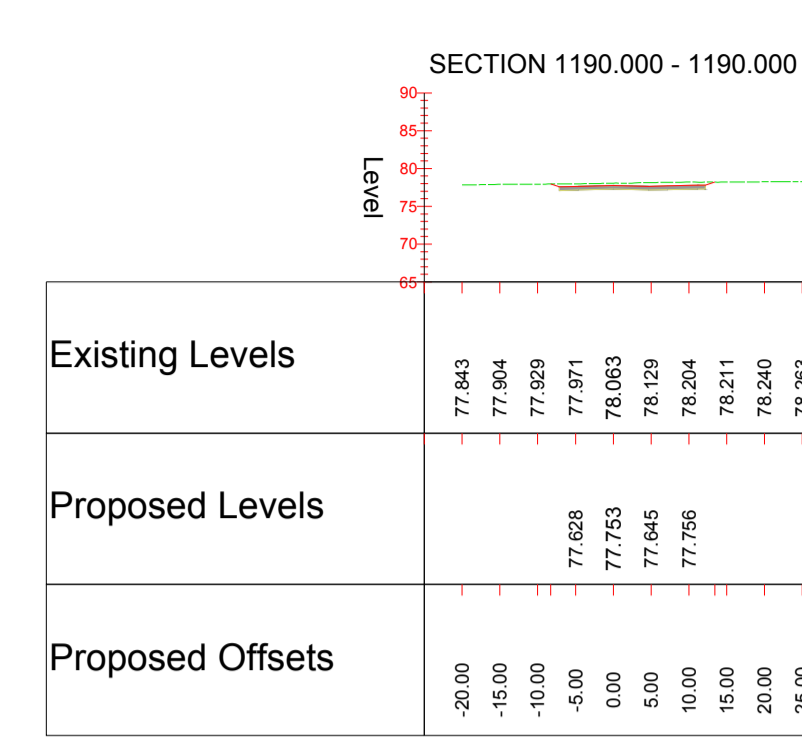
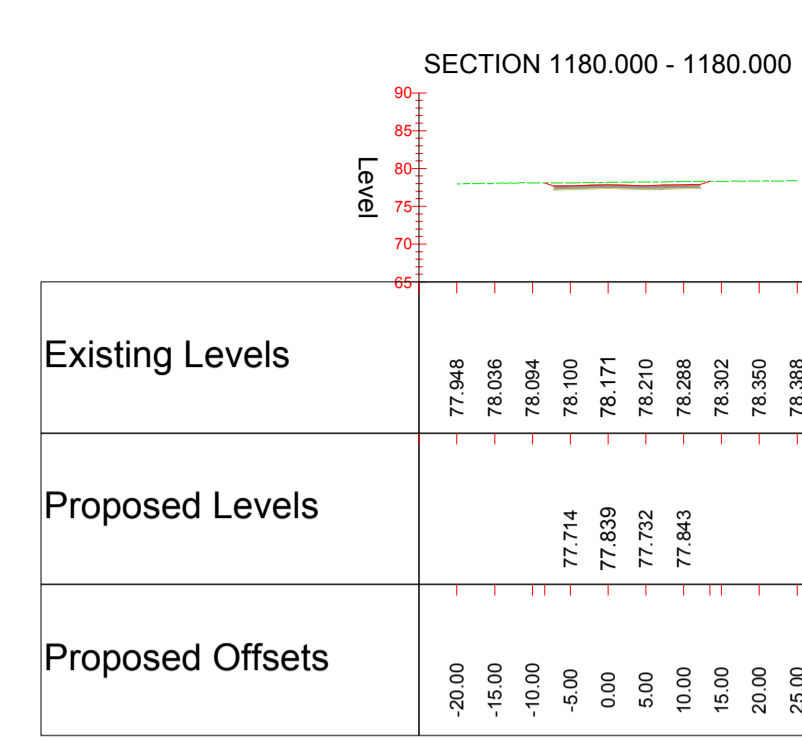
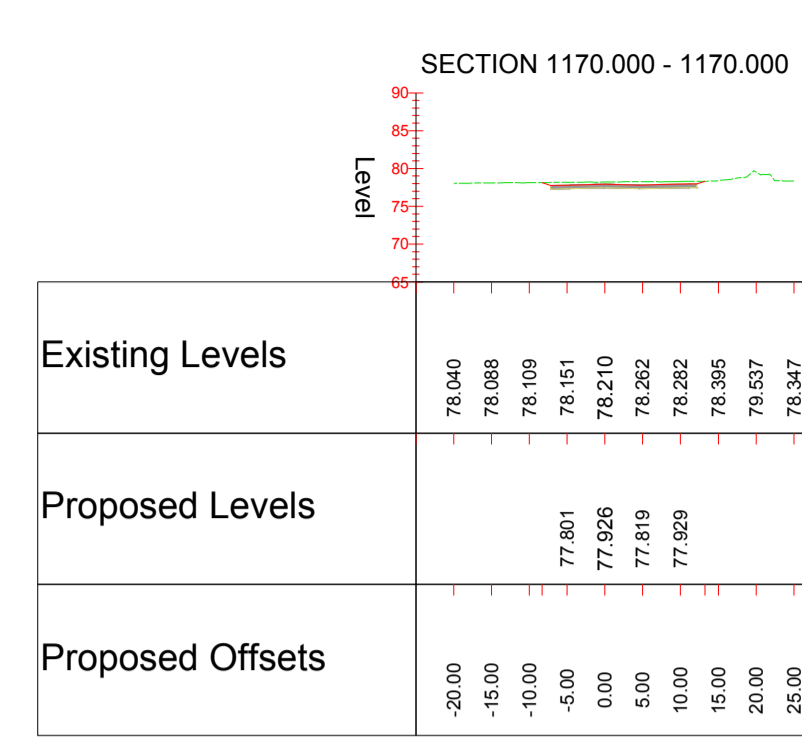
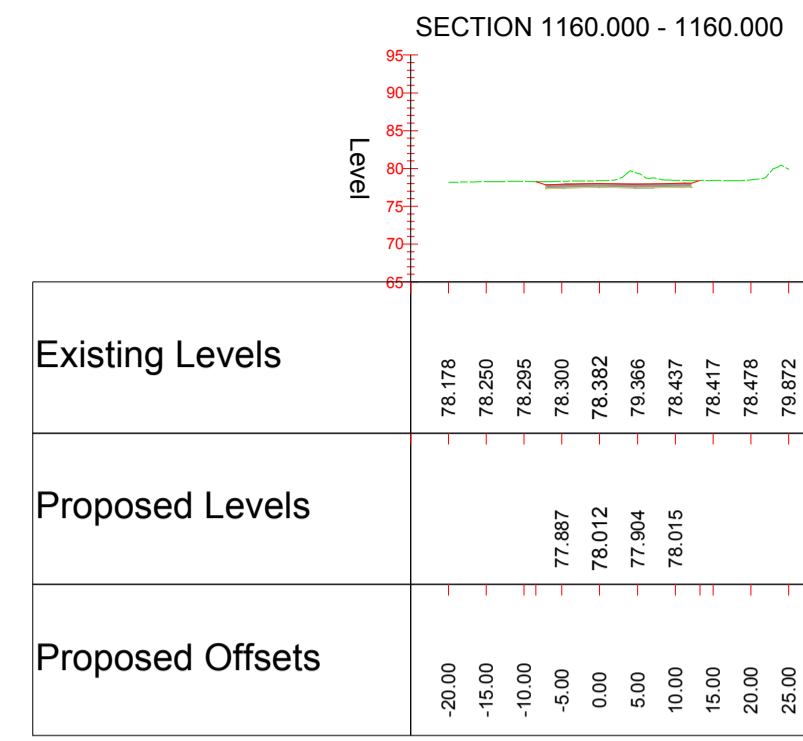
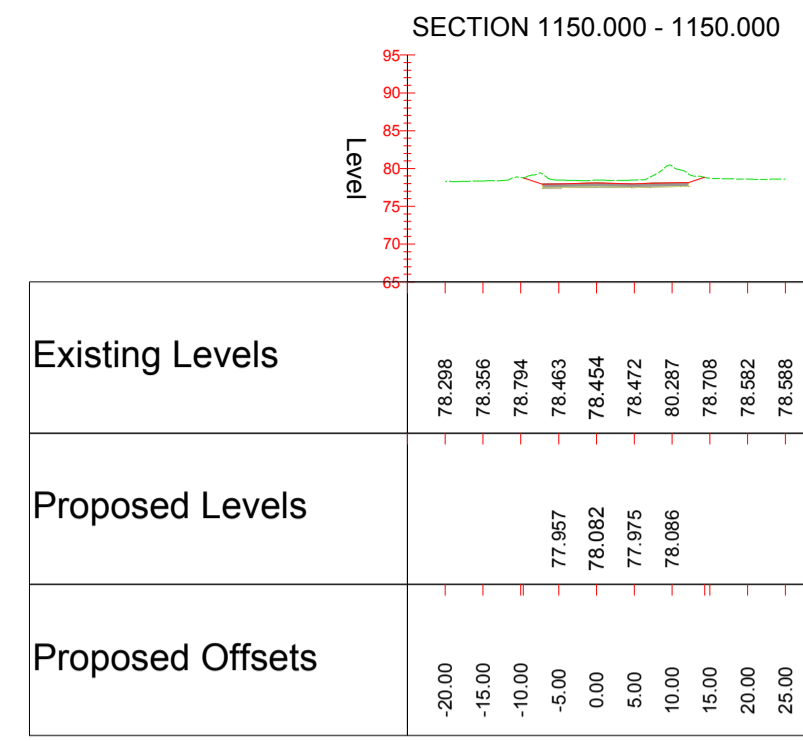
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Client		WEST OF ENGLAND		Drawing Title		A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 019		Project Ref. No. 0000000	
Original Size		A1		Date		05/02/18		Date	
Drawing Number		Woe		Originator		ATK		Volume	
HA PIN		WP1		Checked		AH		Authorised	
Location		Type		Role		Number		Revision	
								P1	

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WEST OF ENGLAND

CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION			
NONE			
MAINTENANCE/CLEANING			
NONE			
DECOMMISSIONING/DEMOLITION			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF

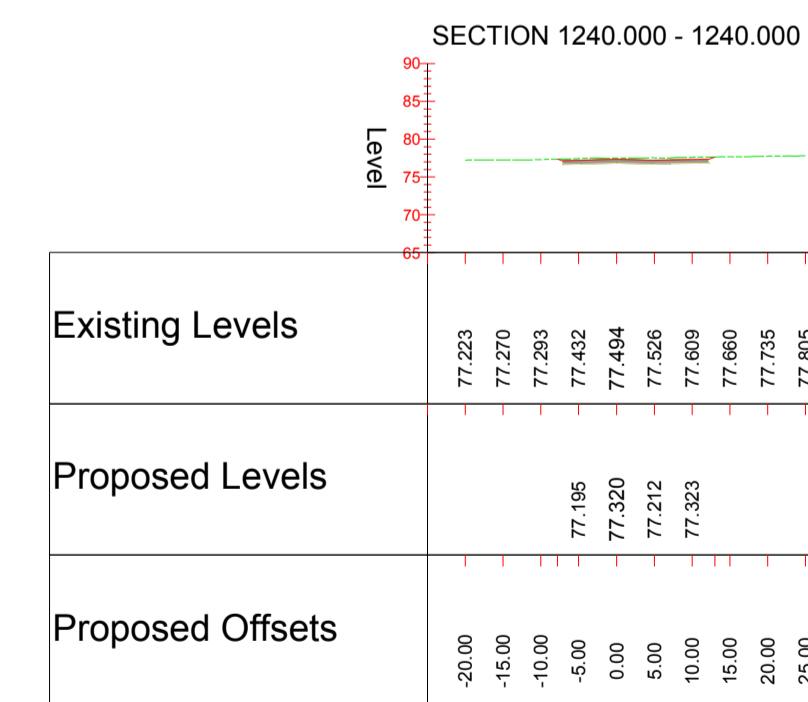
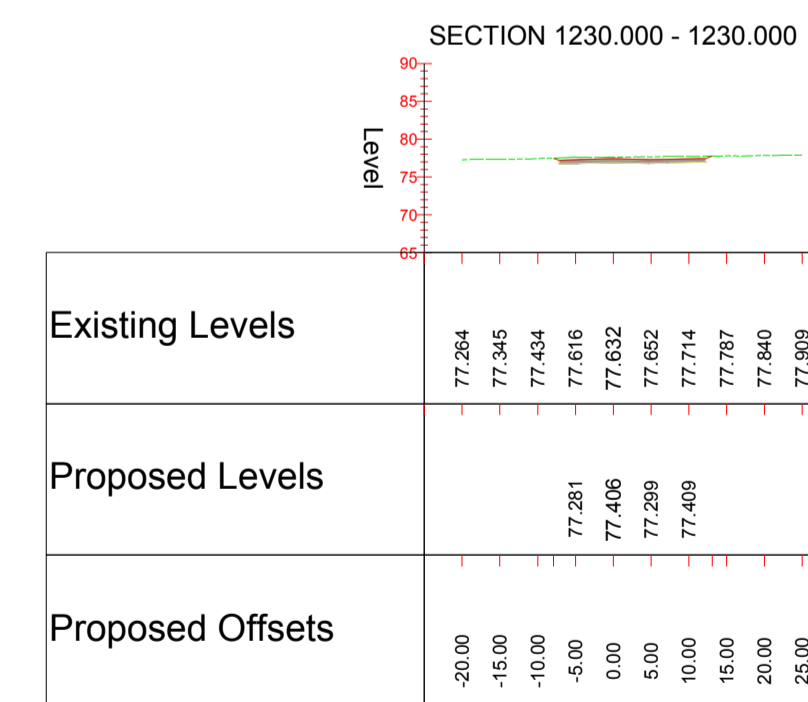
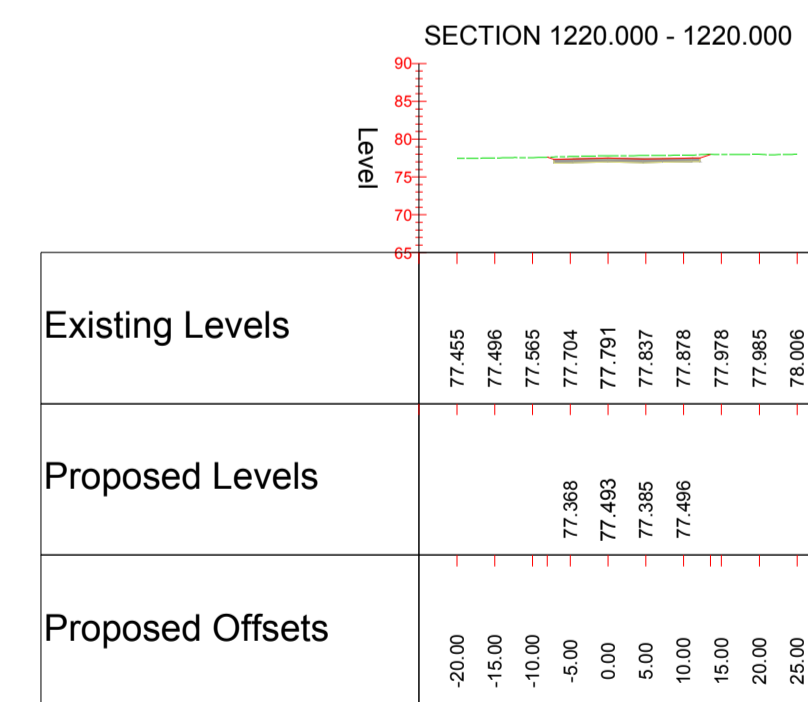
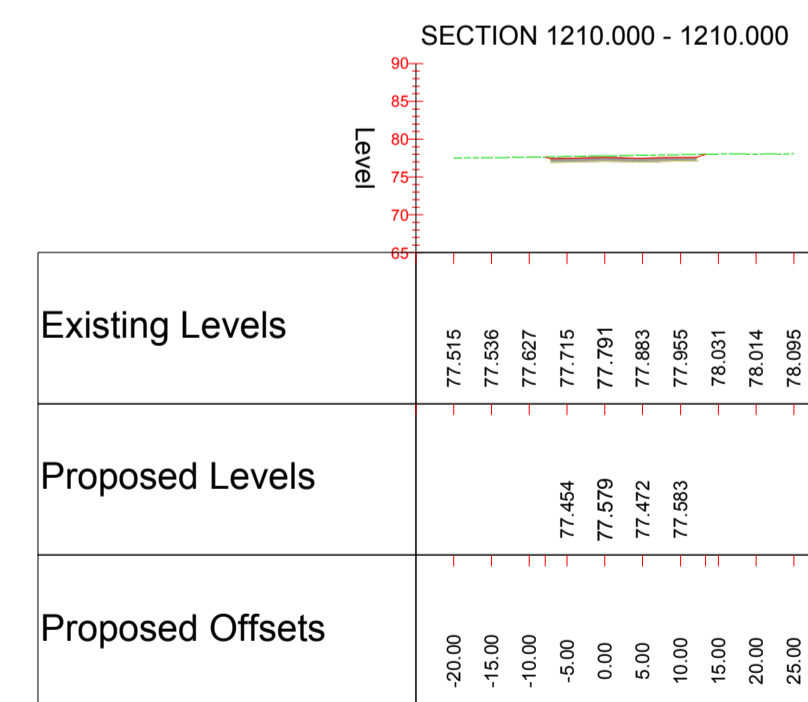
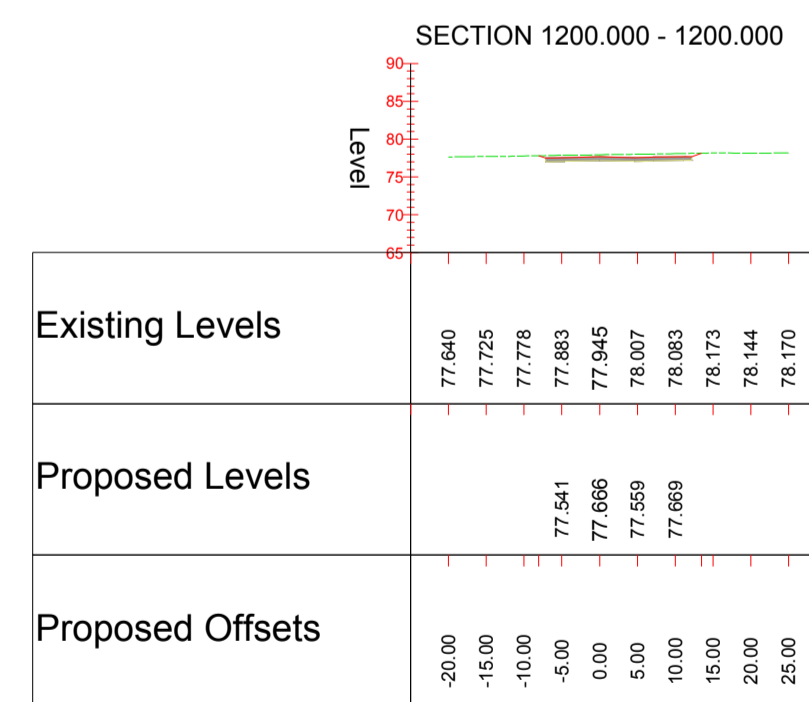
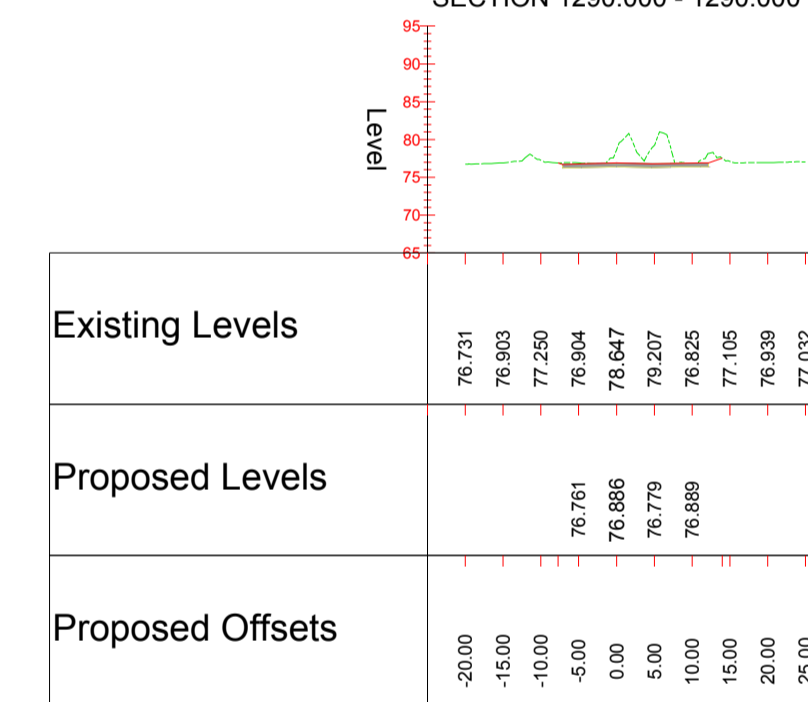
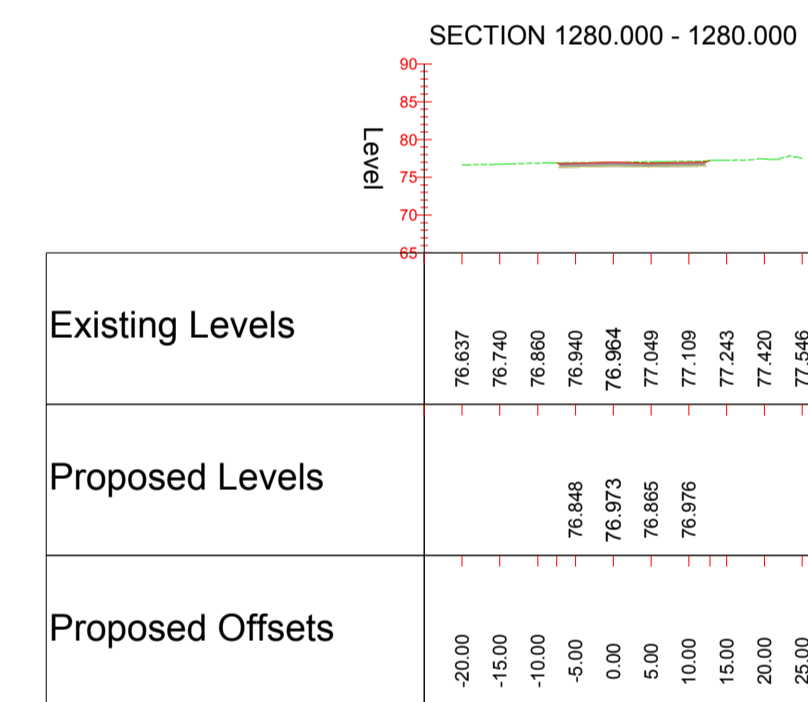
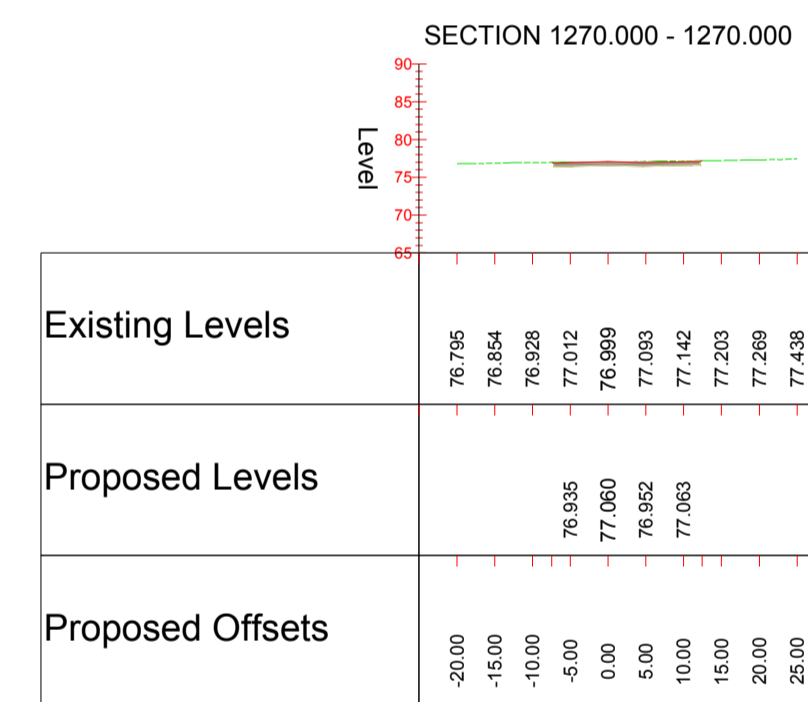
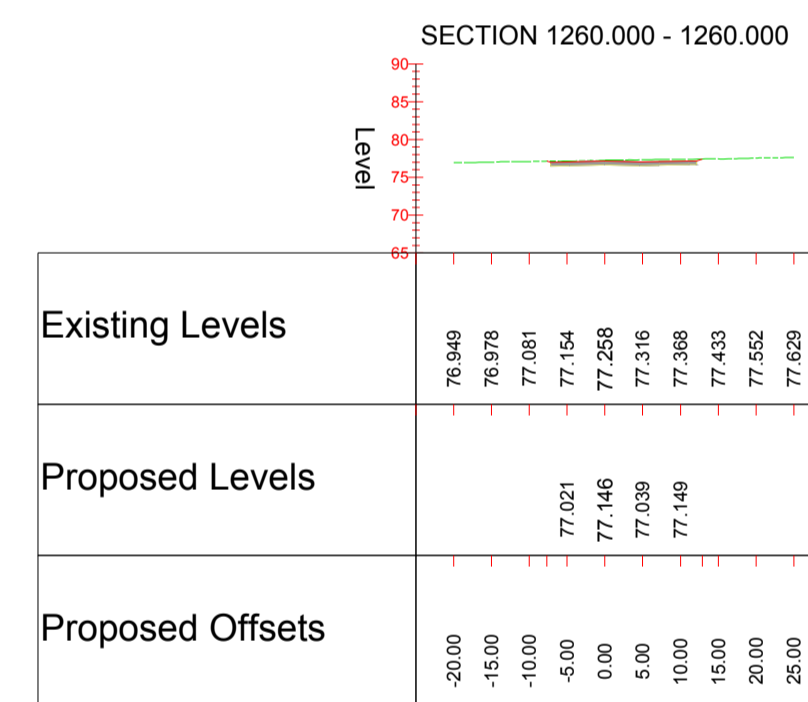
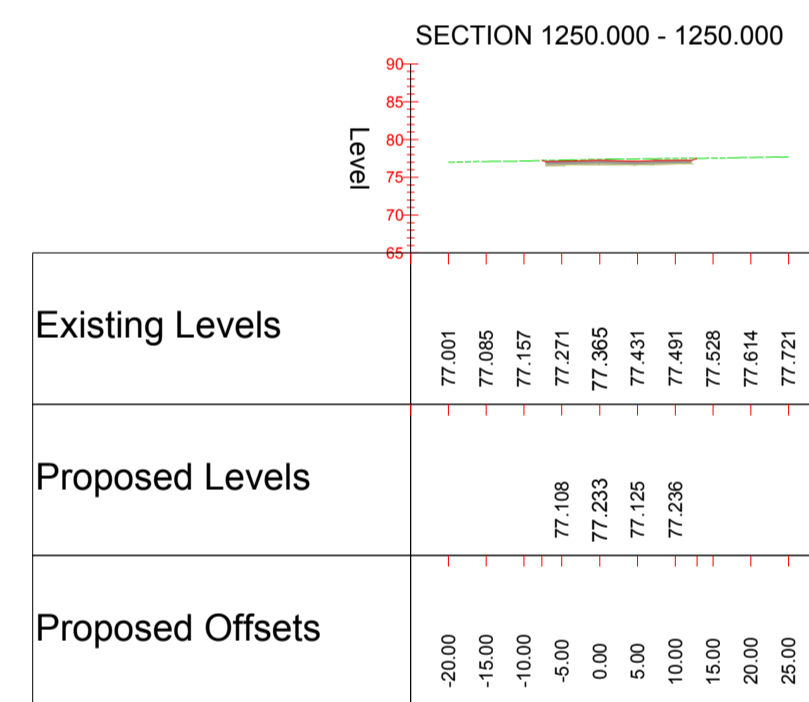
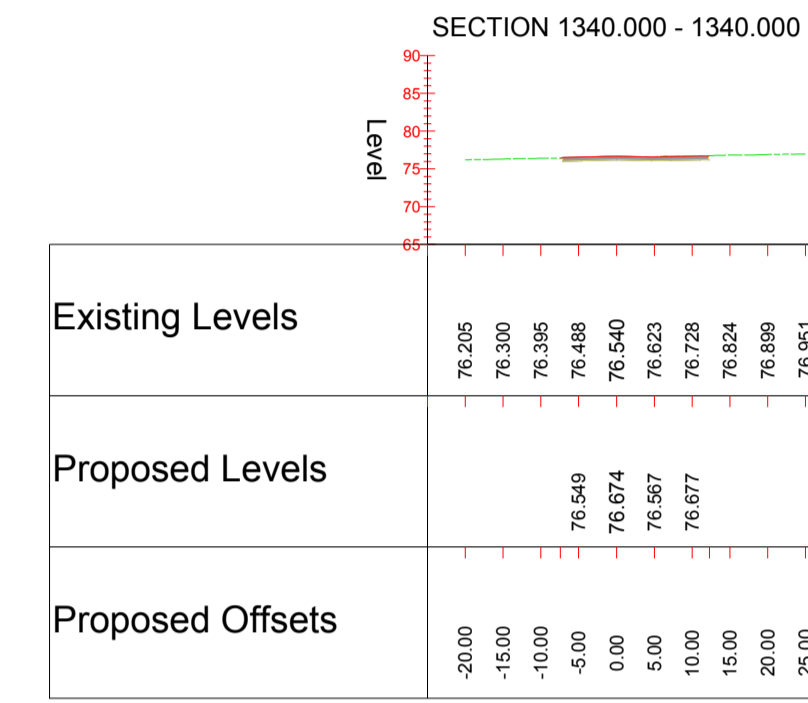
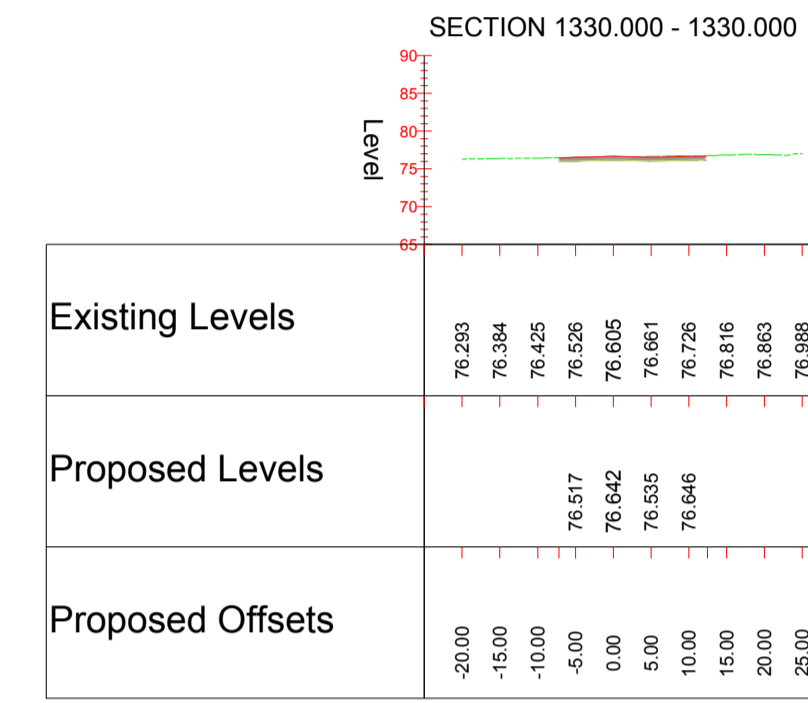
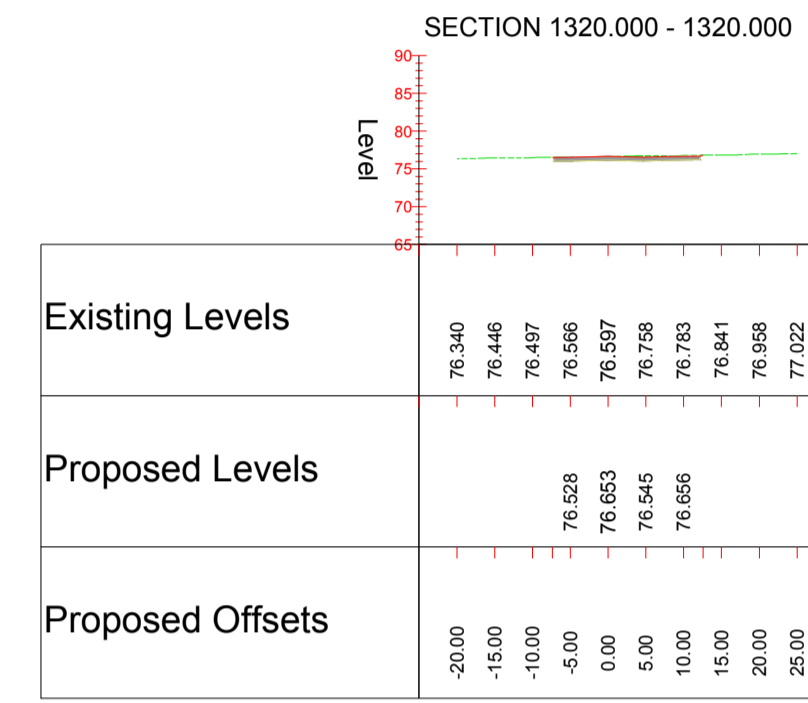
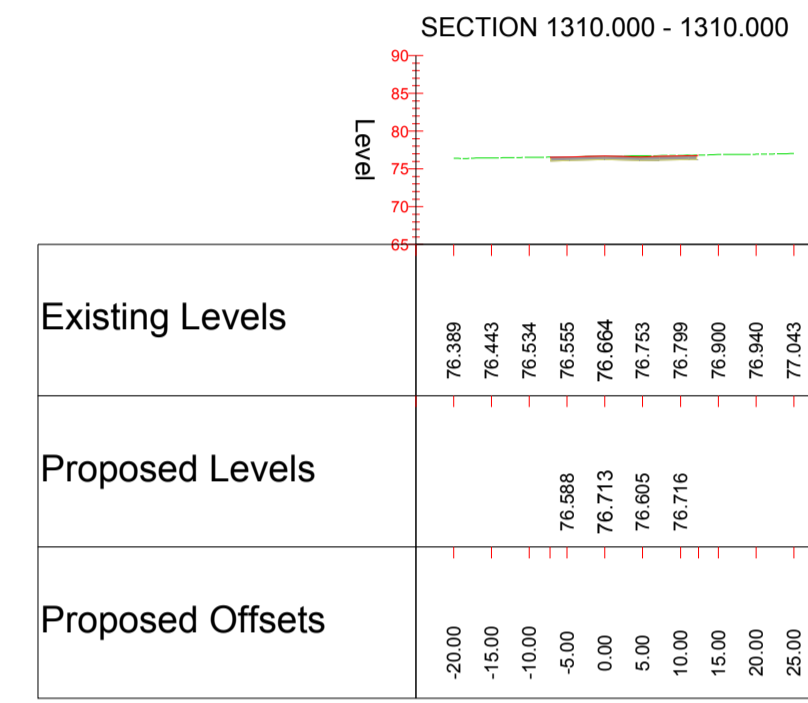
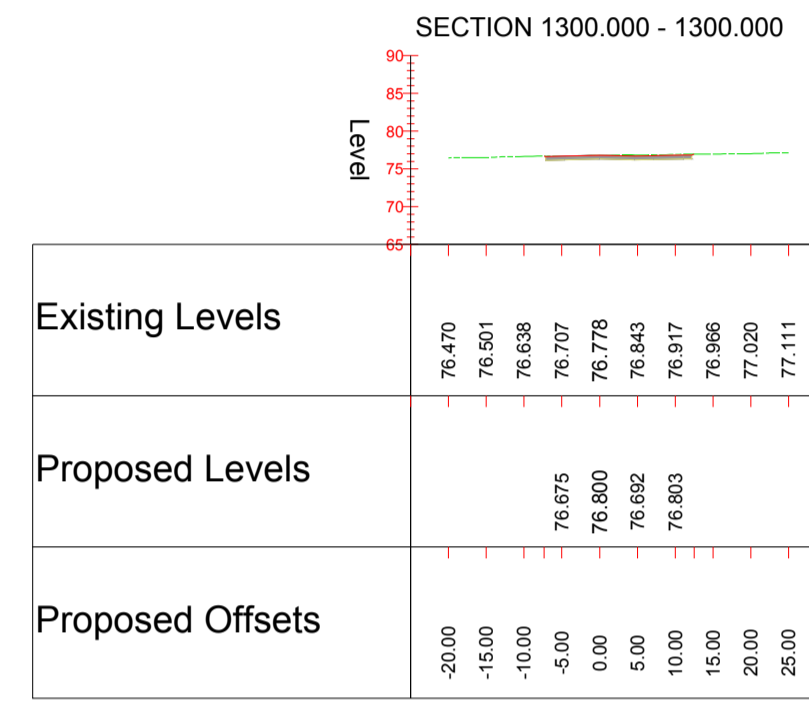
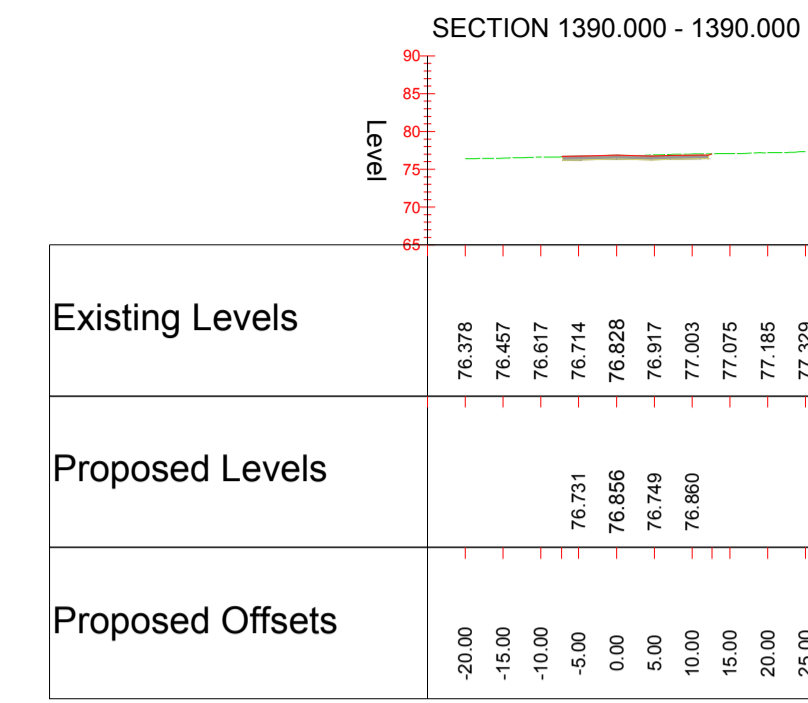
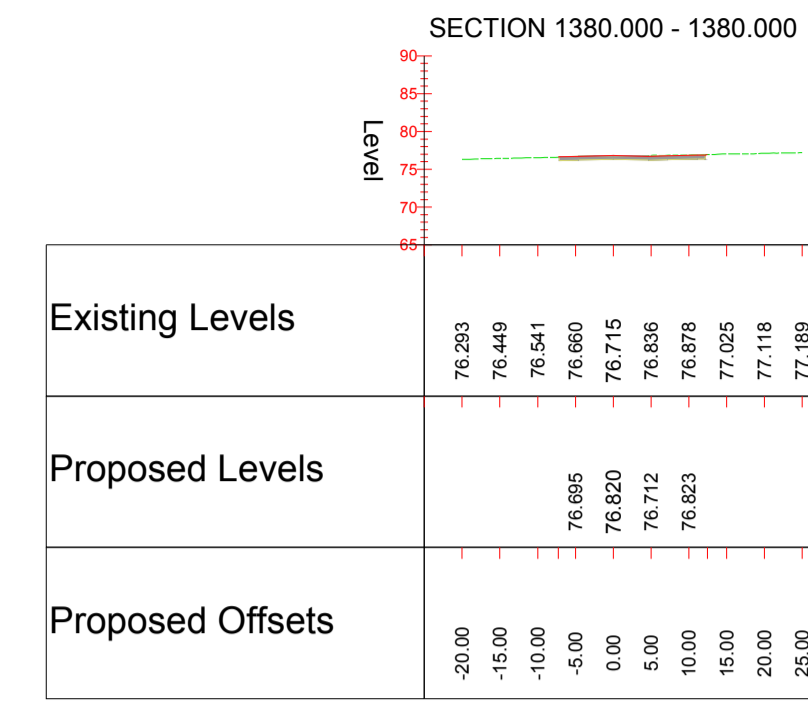
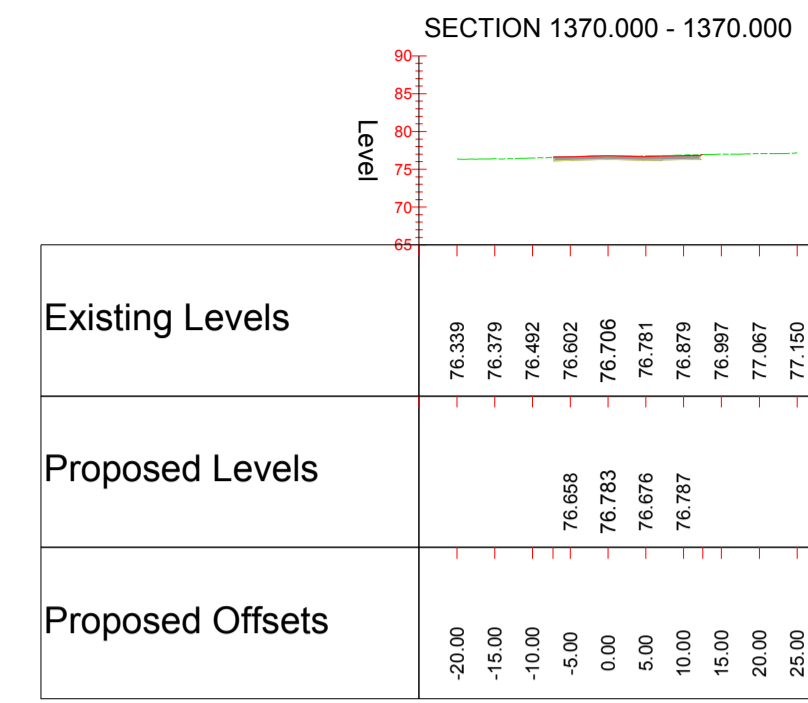
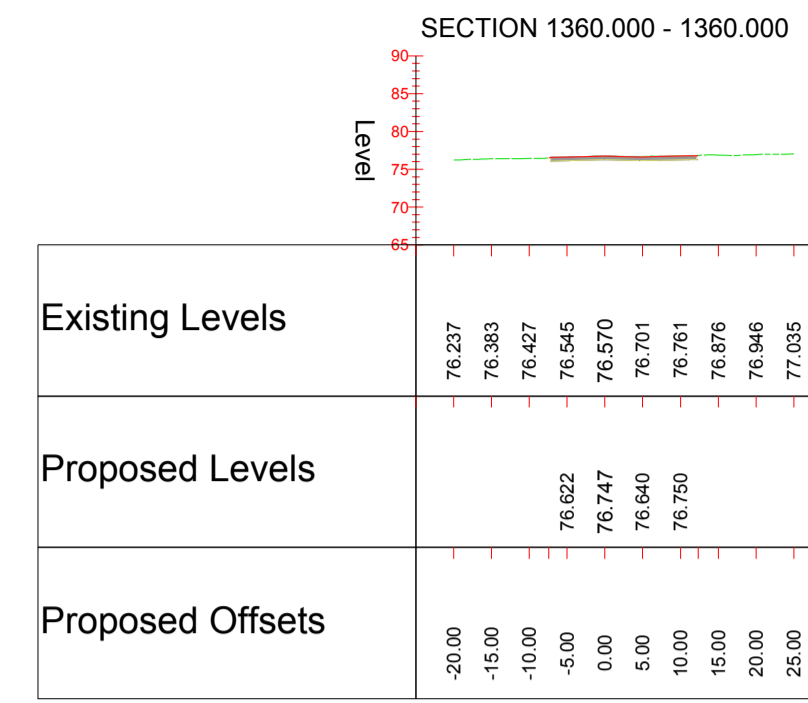
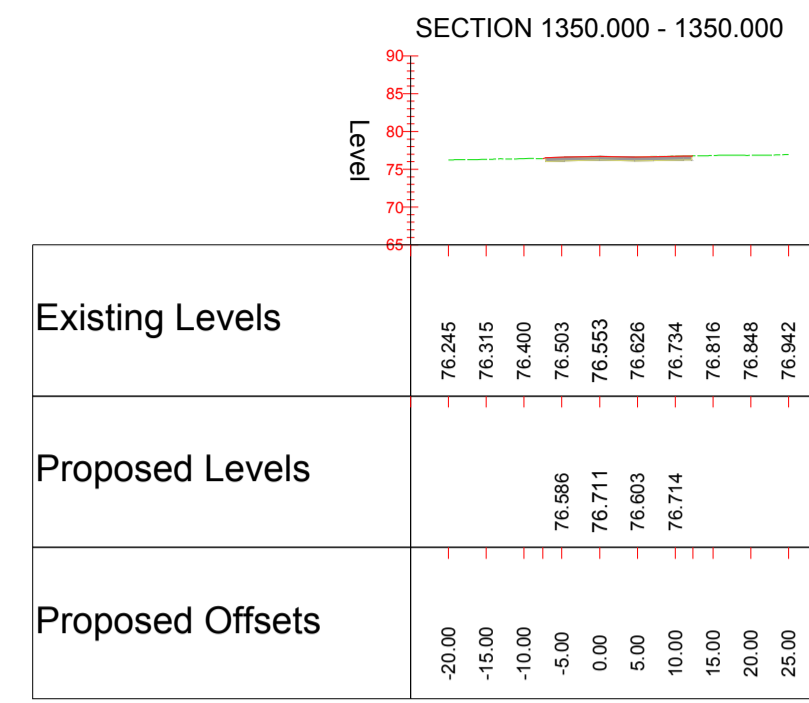
Drawing Status	FOR INFORMATION
Suitability	S2
Project Title	WEST OF ENGLAND WP1
Drawing Title	A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 0/19
Scale	1:1000
Designed	EC
Drawn	AF
Checked	AH
Authorised	
Original Size	A1
Date	05/02/18
Date	05/02/18
Date	05/02/18
Drawing Number	Woe
HA PIN	ATK
Volume	HGN
Project Ref. No.	0000000
Revision	
Number	P1

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CROSS SECTIONS  
Scale 1:1000



Key:

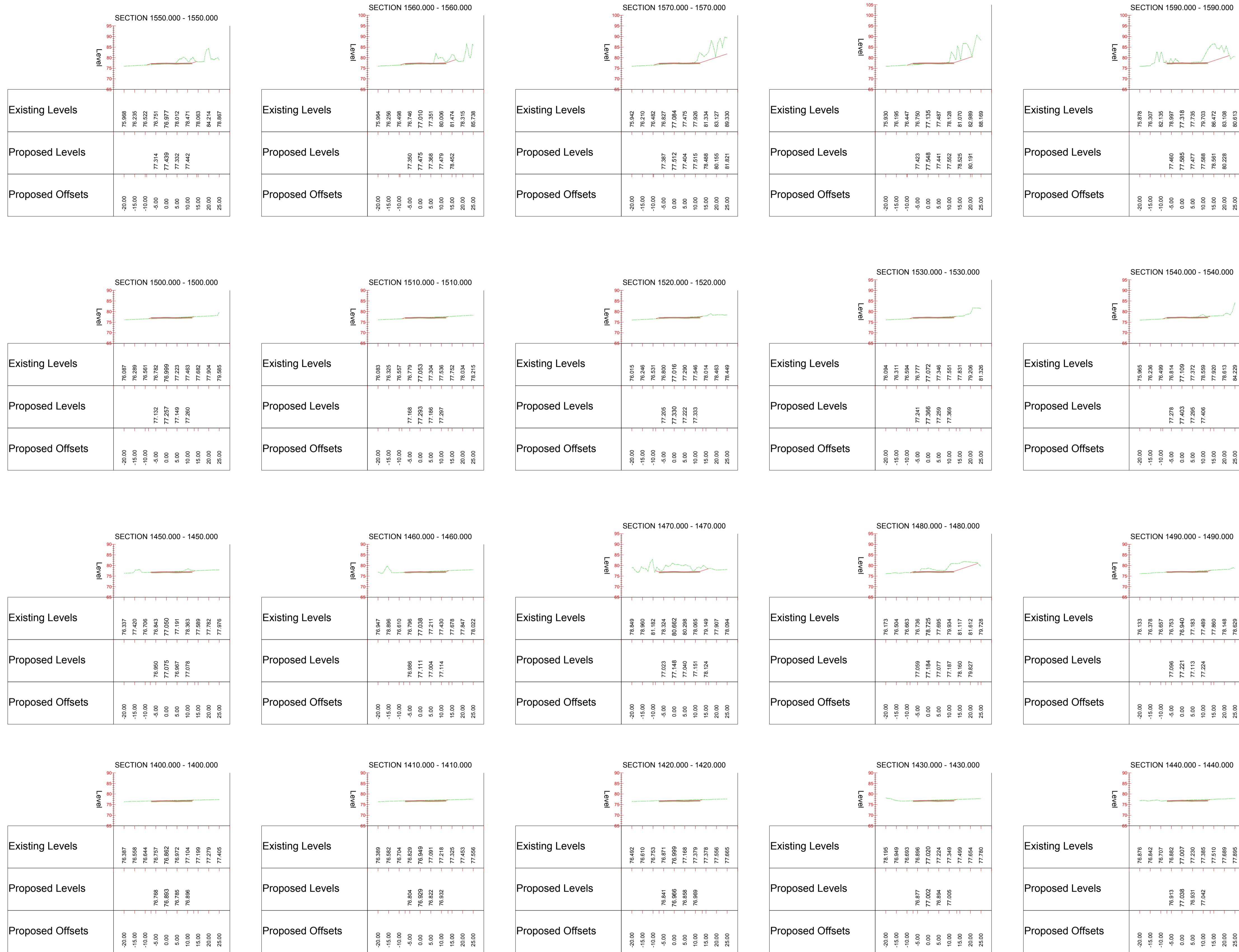
Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION		
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:		
CONSTRUCTION	NONE	
MAINTENANCE/CLEANING	NONE	
DECOMMISSIONING/DEMOLITION	NONE	
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement		
Rev.	Date	Description
P1	05.02.18	DRAWING CREATED
		By
		Chk'd
		App'd

Drawing Status		FOR INFORMATION	
Sustainability		S2	
Client		WEST OF ENGLAND	
Project Title		WEST OF ENGLAND WP1	
Drawing Title		A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 1/19	
Scale	1:1000	Designed	EC
Original Size	A1	Date	05/02/18
Drawing Number	HA PIN	Originator	Woe
		Volume	ATK - HGN -
		Revision	WP1 - DR - D - 6010
Project Ref. No.	0000000	Authorised	P1
Date	05/02/18	Checked	AH
Date	05/02/18	Drawn	
Date	05/02/18	Checked	
Date	05/02/18	Authorised	

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WEST OF ENGLAND		WEST OF ENGLAND	

CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
<b>CONSTRUCTION</b>			
NONE			
<b>MAINTENANCE/CLEANING</b>			
NONE			
<b>DECOMMISSIONING/DEMOLITION</b>			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			

Rev.	Date	Description	By	Chkd	App'd
P1	05.02.18	DRAWING CREATED		AF	

Drawing Status: **FOR INFORMATION**

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Client: **WEST OF ENGLAND**

Suitability: **S2**

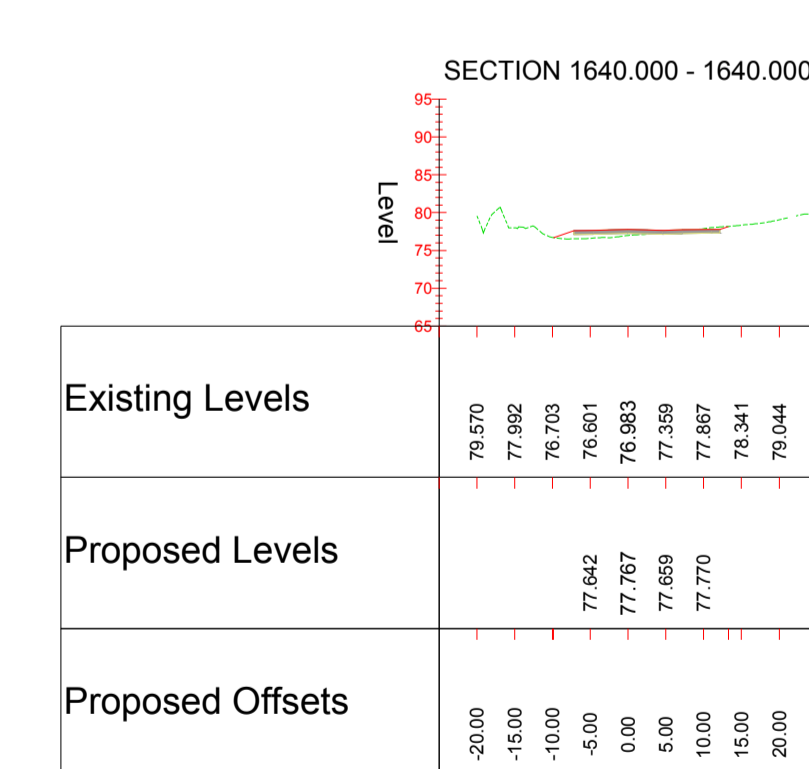
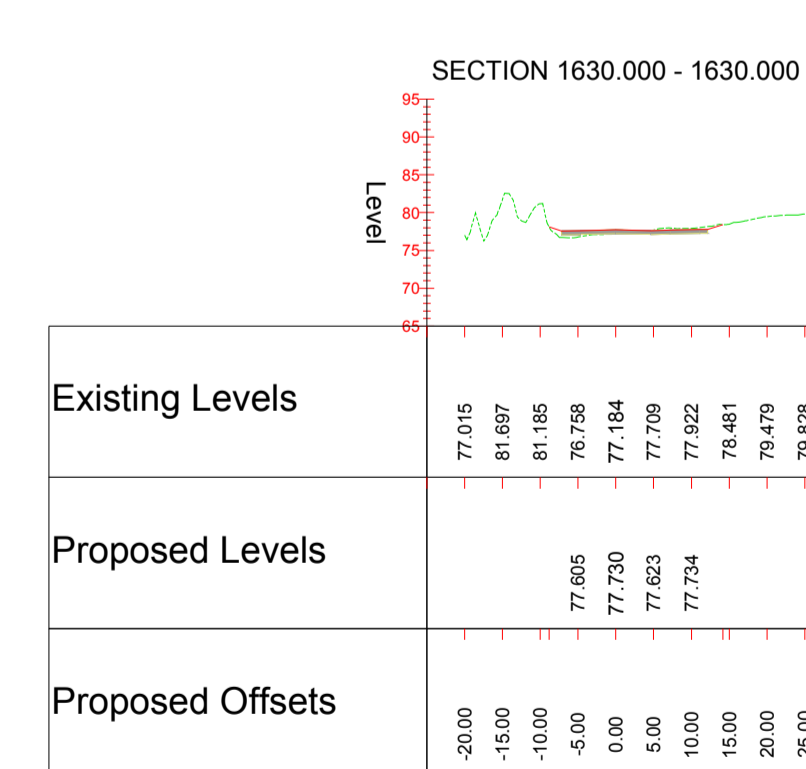
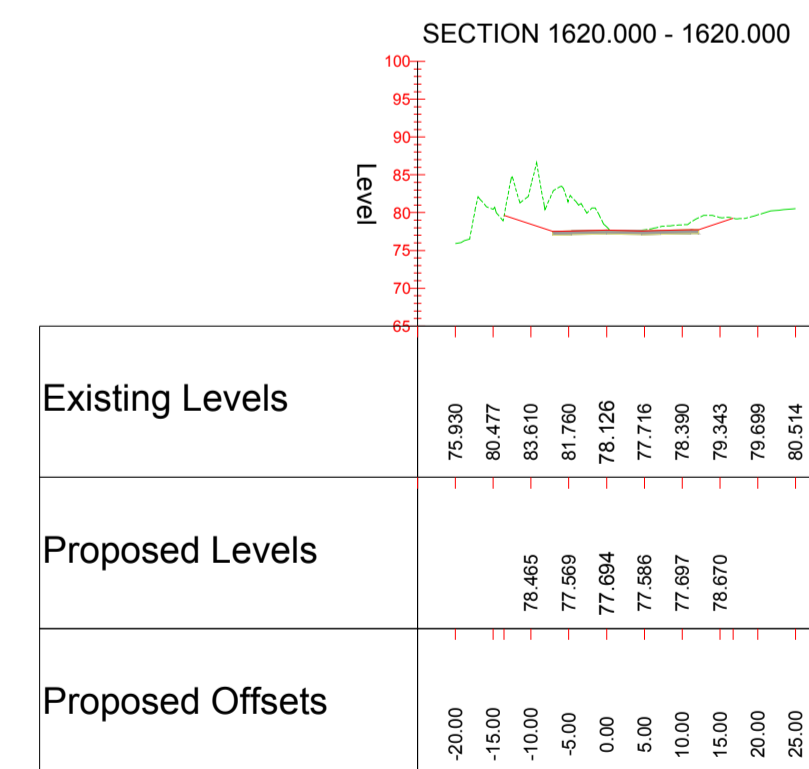
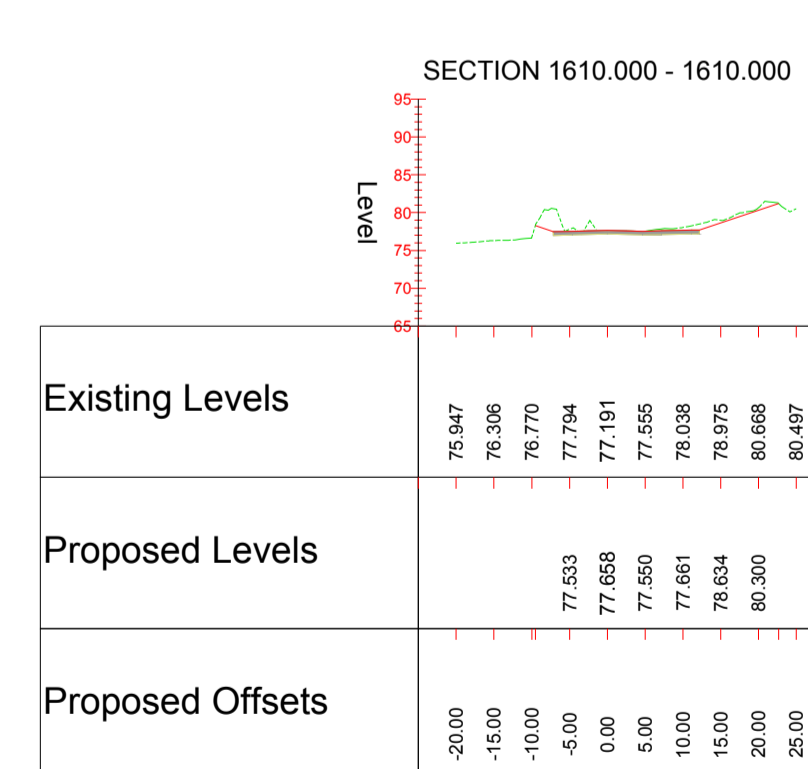
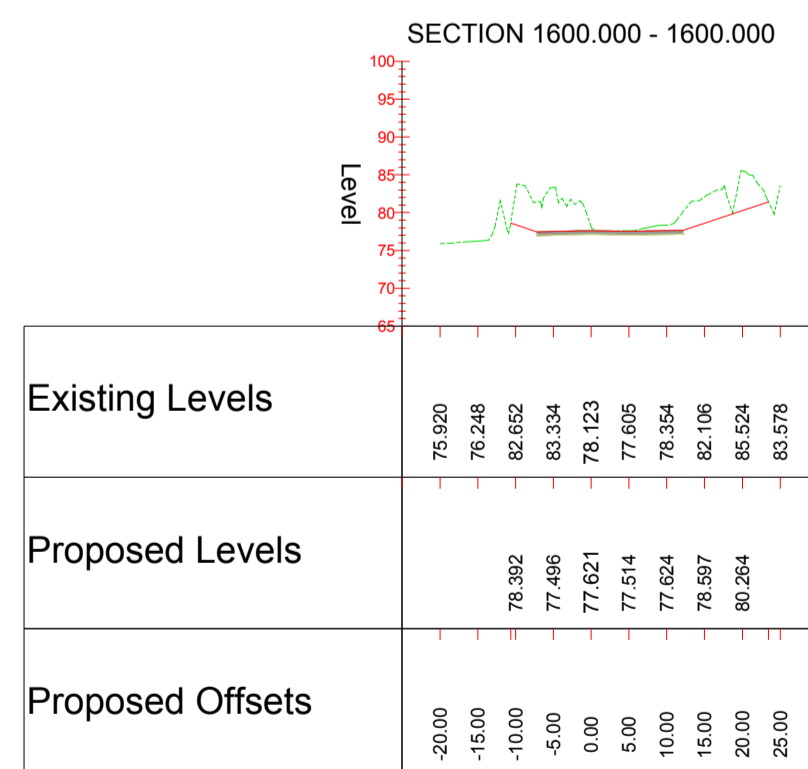
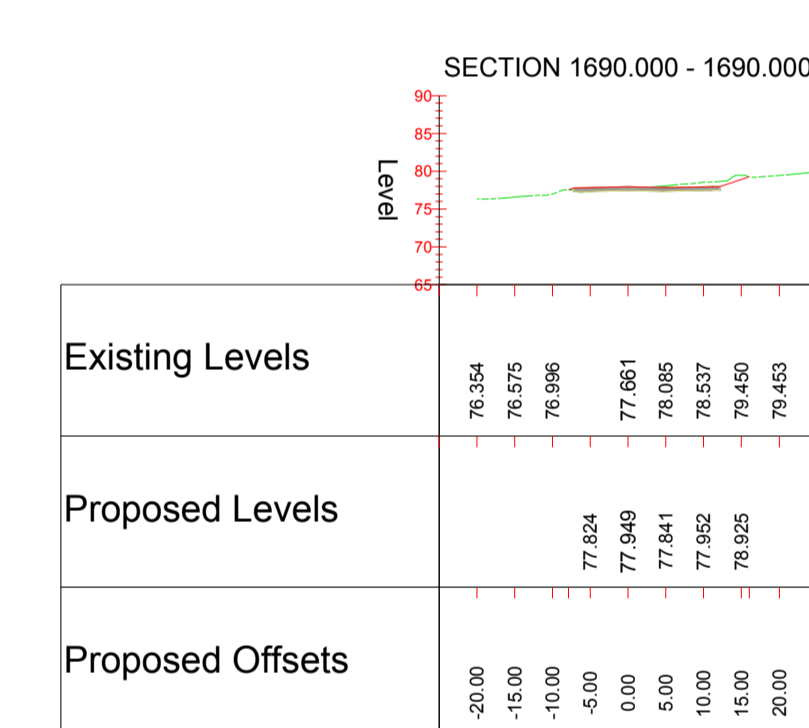
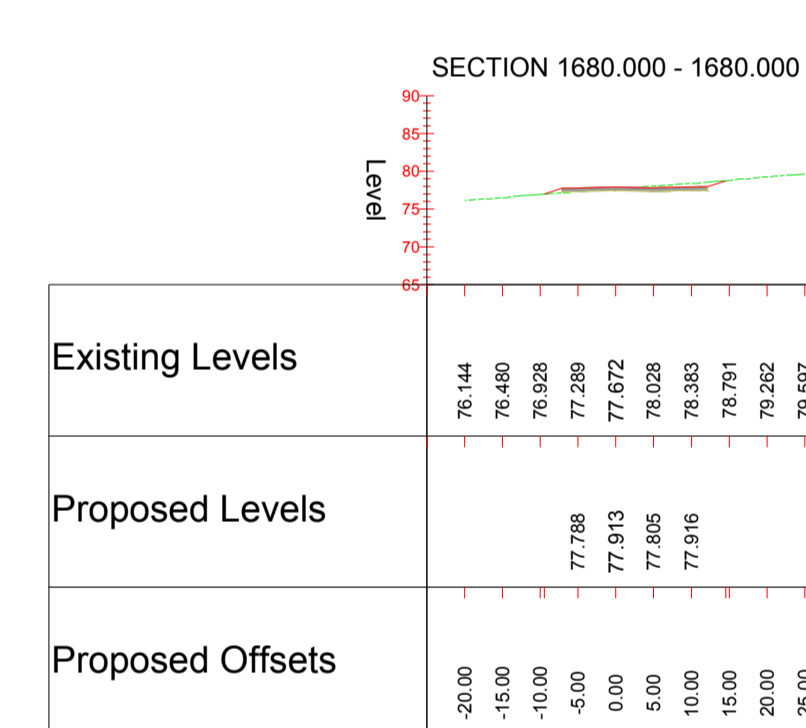
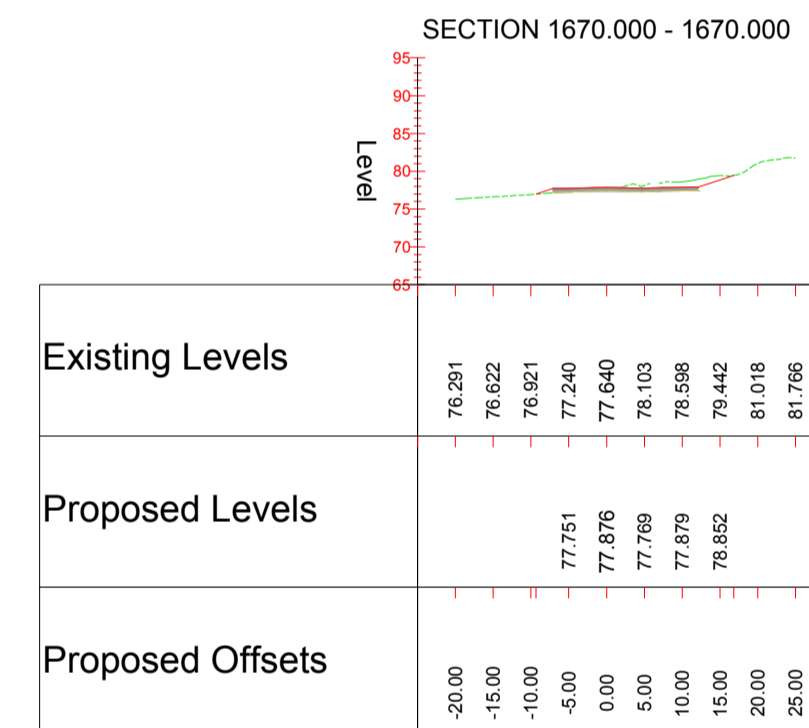
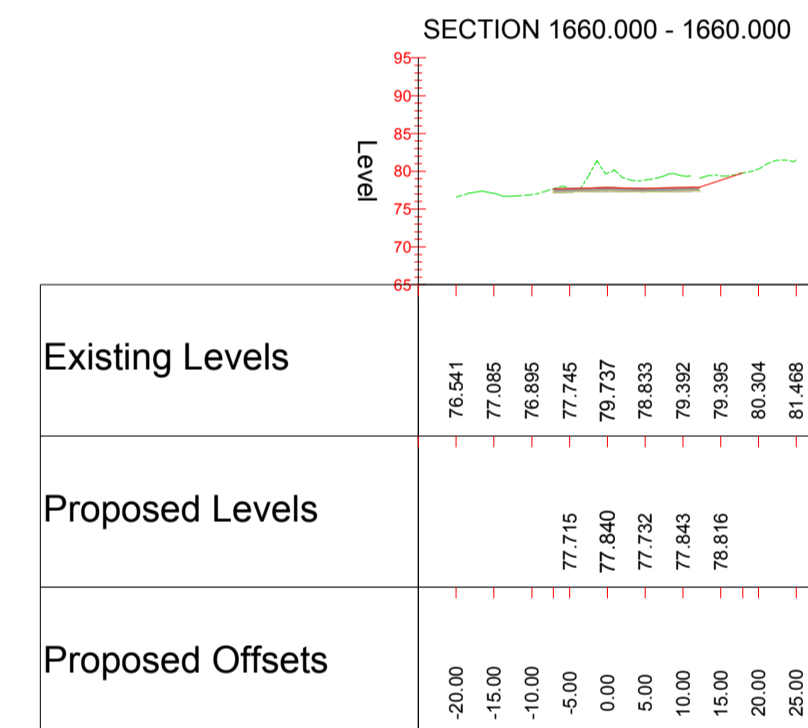
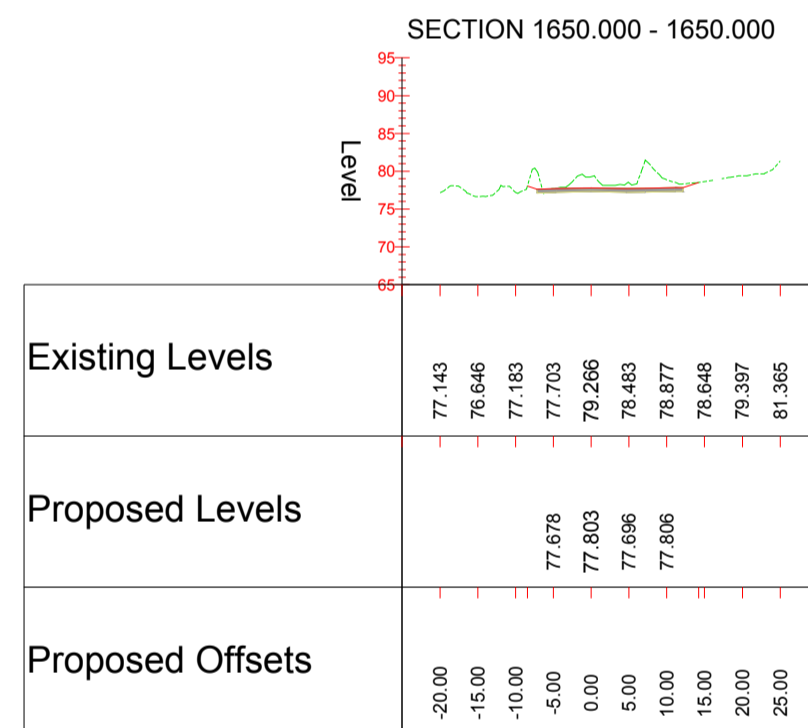
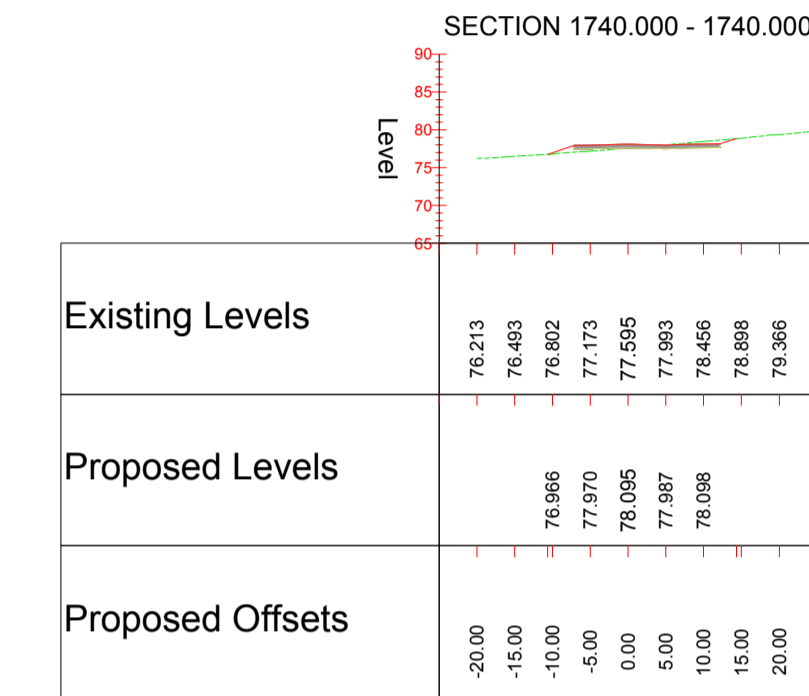
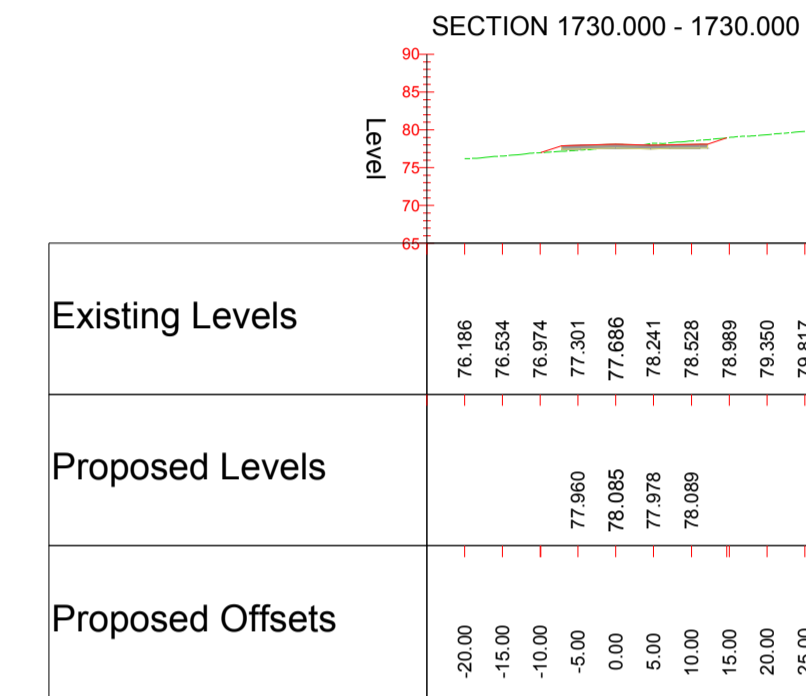
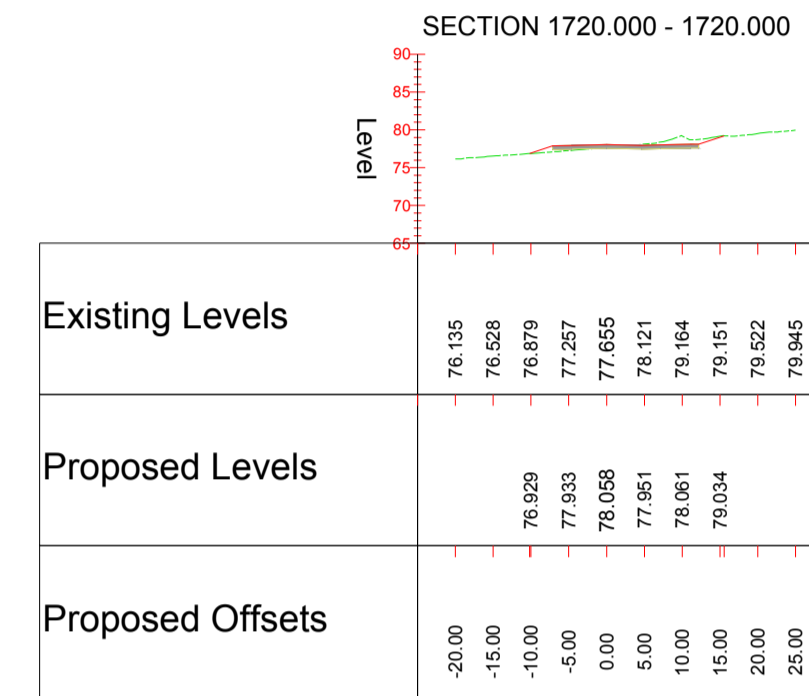
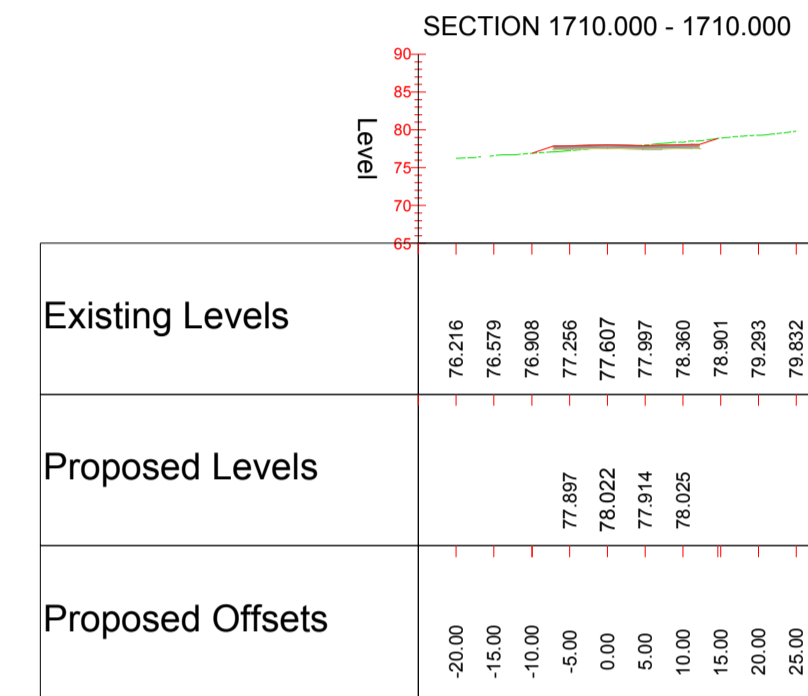
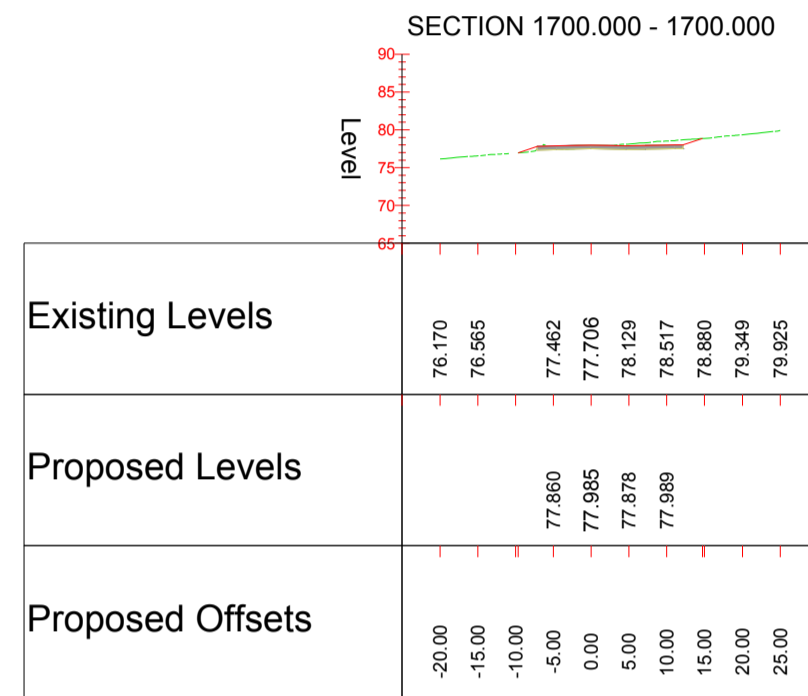
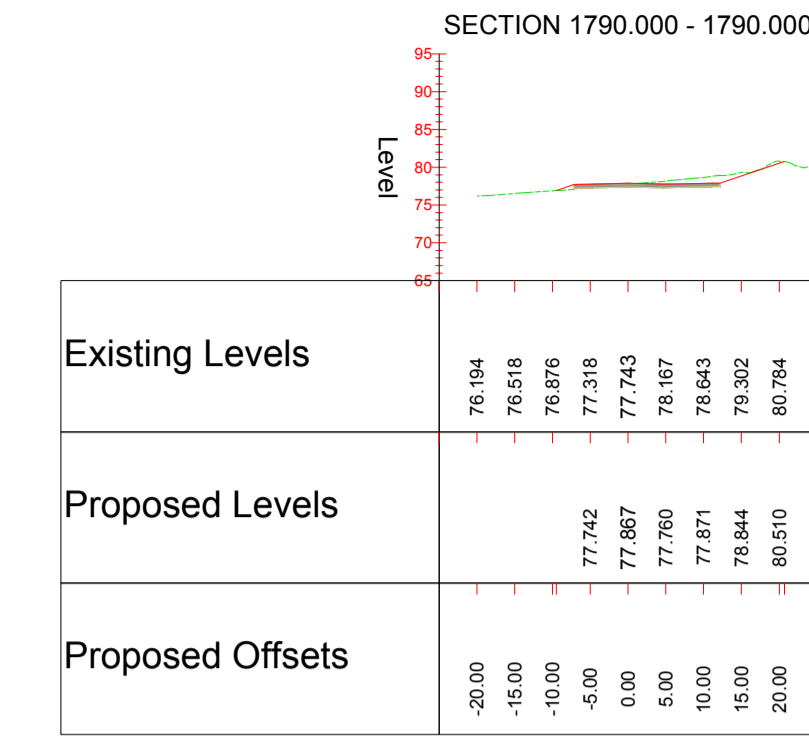
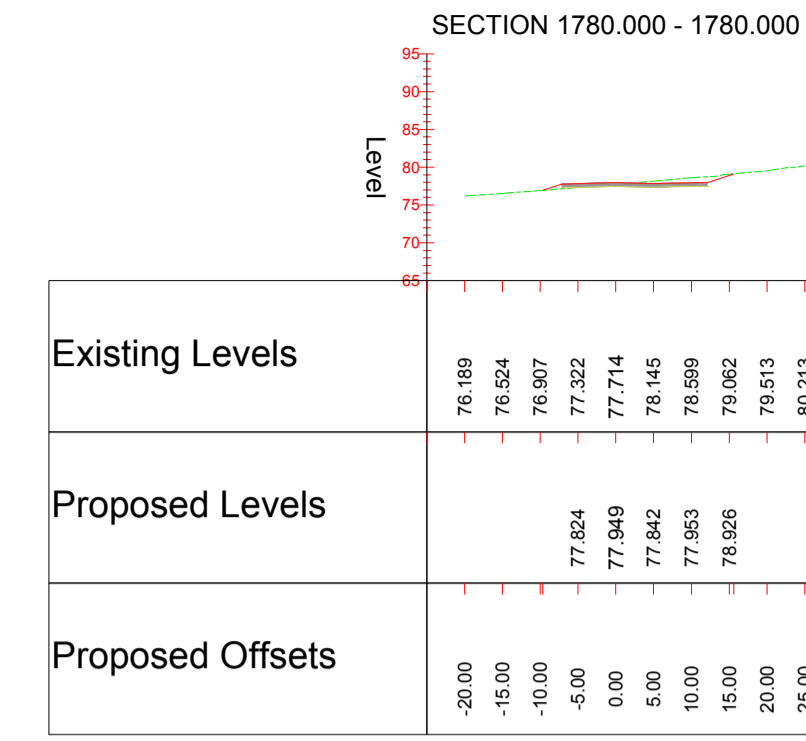
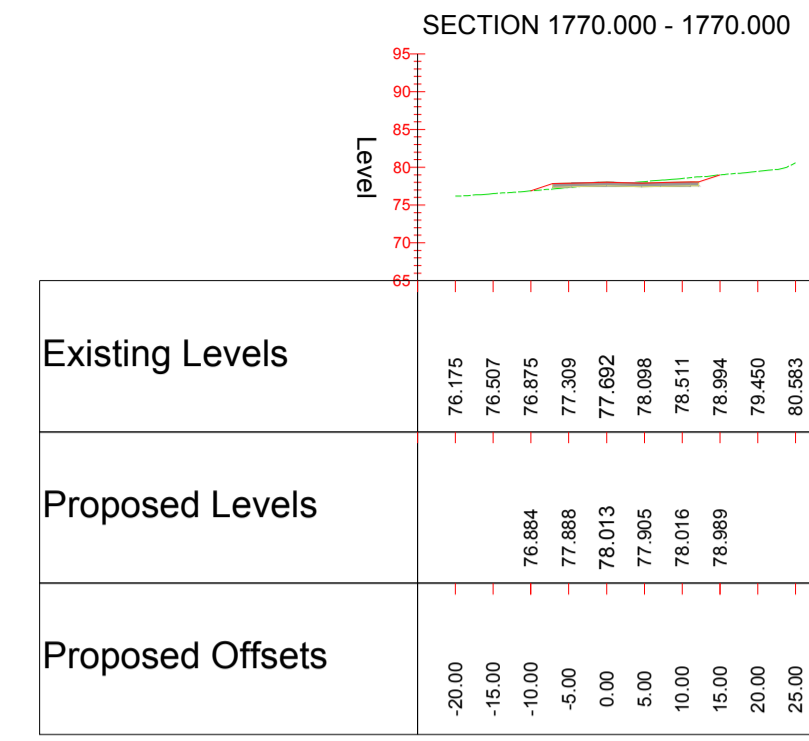
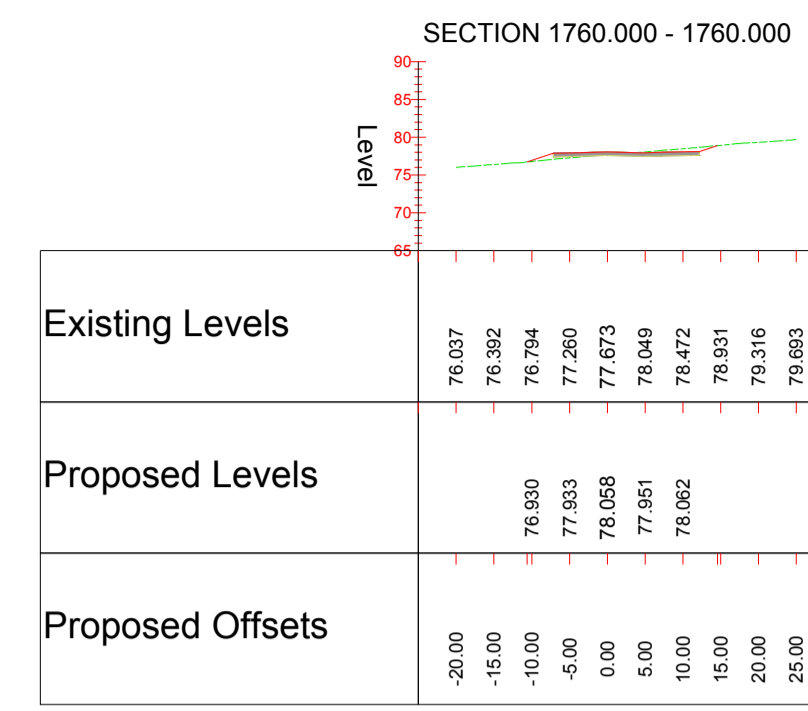
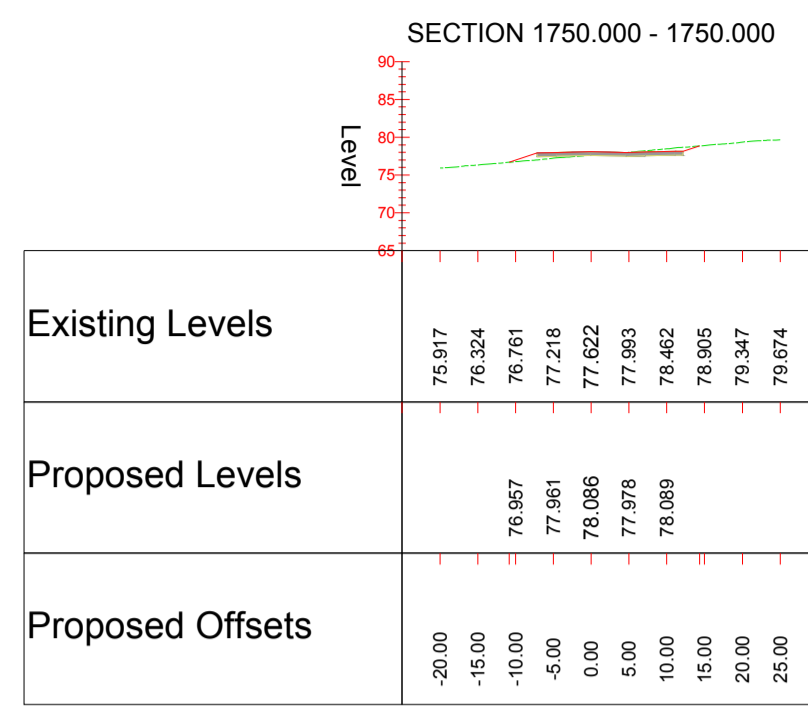
Project Title: **WEST OF ENGLAND WP1**

Drawing Title: **A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 8/19**

Scale: 1:1000	Designed: EC	Drawn: AH	Checked: AH	Authorised:
Original Size: A1	Date: 05/02/18	Date: 05/02/18	Date: 05/02/18	Date:
Drawing Number: Woe WP1	Originator: ATK	Volume: HGN	Project Ref. No.: 0000000	Revision: P1



CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION			
NONE			
MAINTENANCE/CLEANING			
NONE			
DECOMMISSIONING/DEMOLITION			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			

P1	05.02.18	DRAWING CREATED	AF		
Rev.	Date	Description	By	Chkd	App'd

Drawing Status: **FOR INFORMATION**

Subsidiary: **S2**

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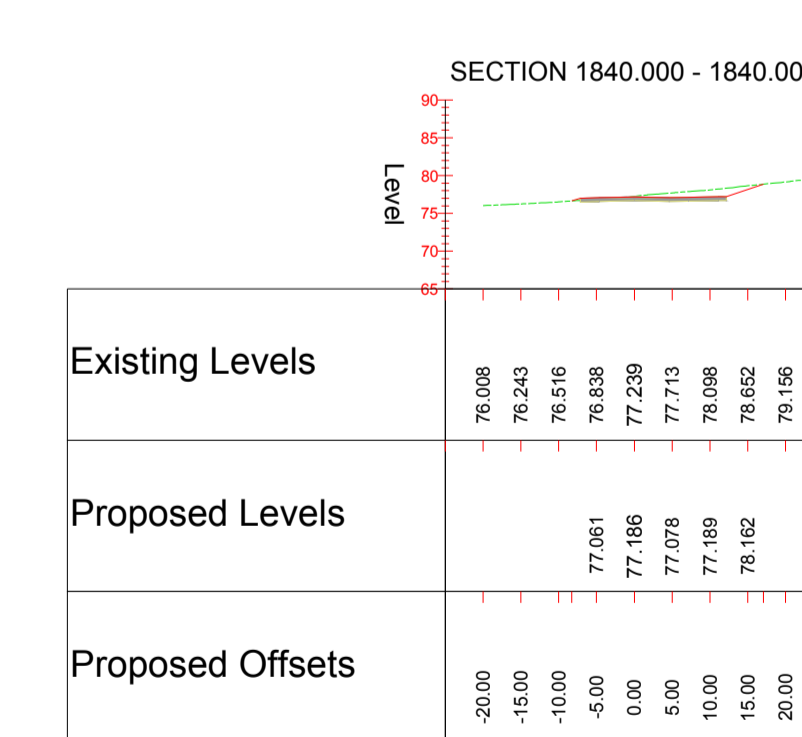
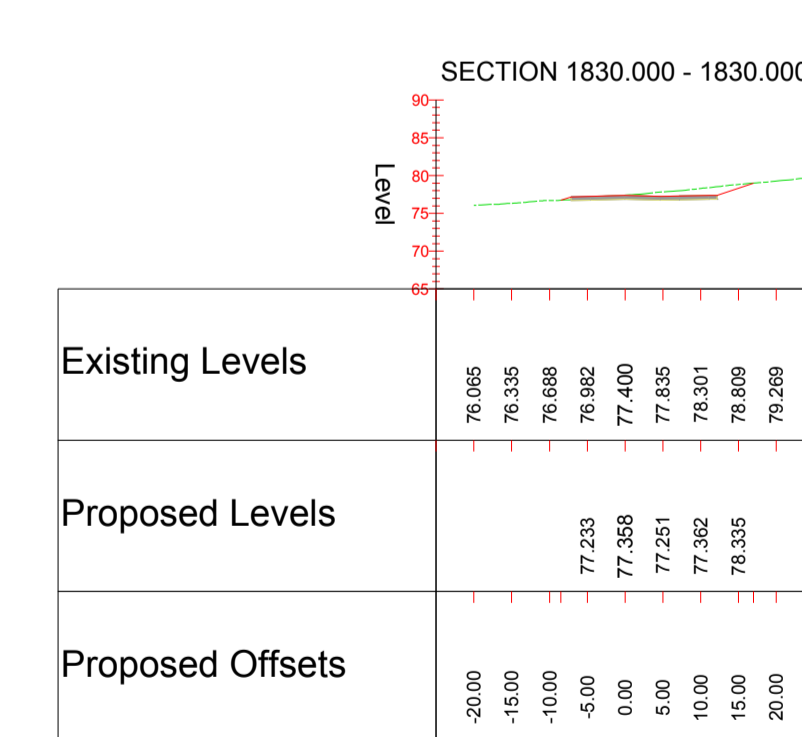
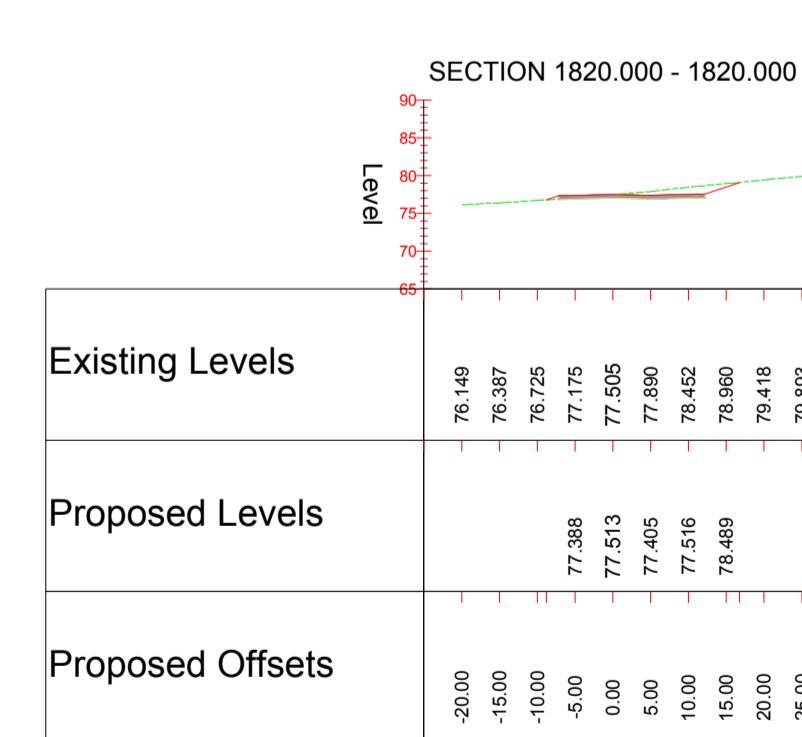
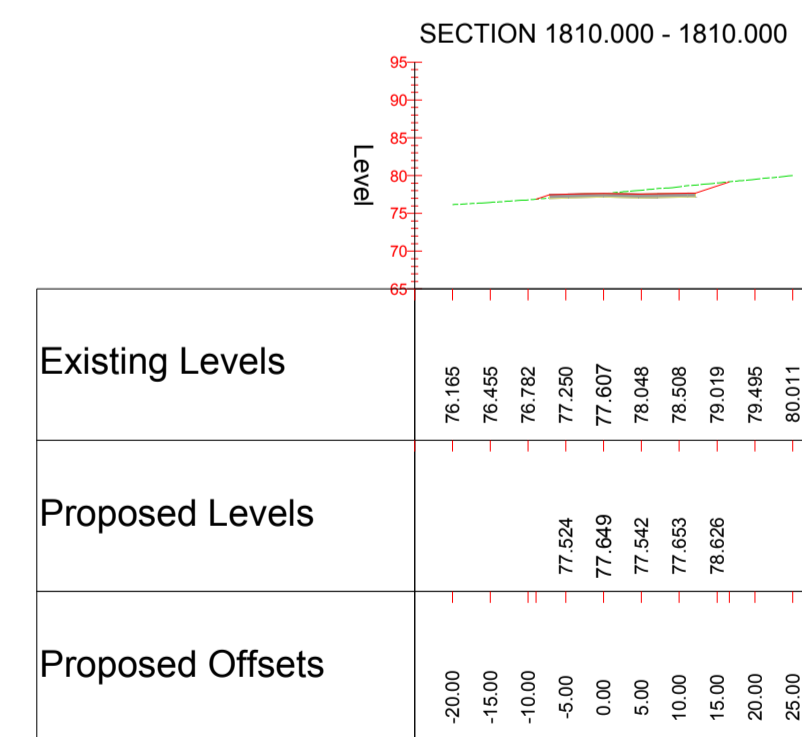
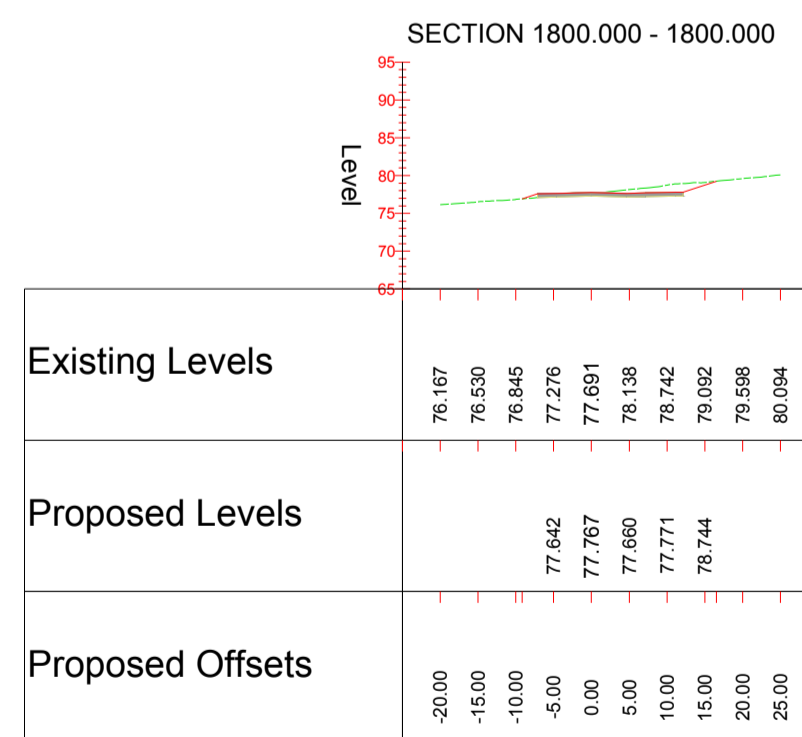
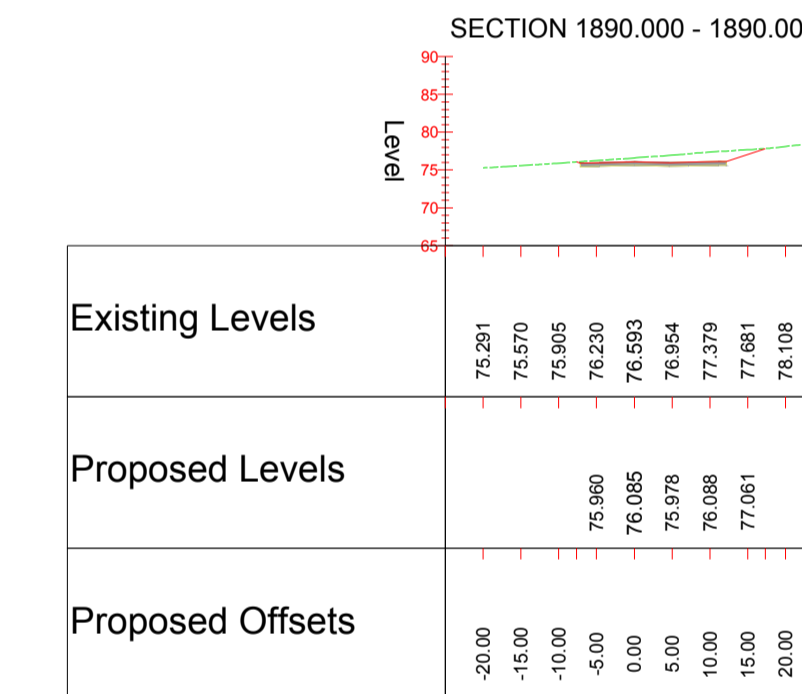
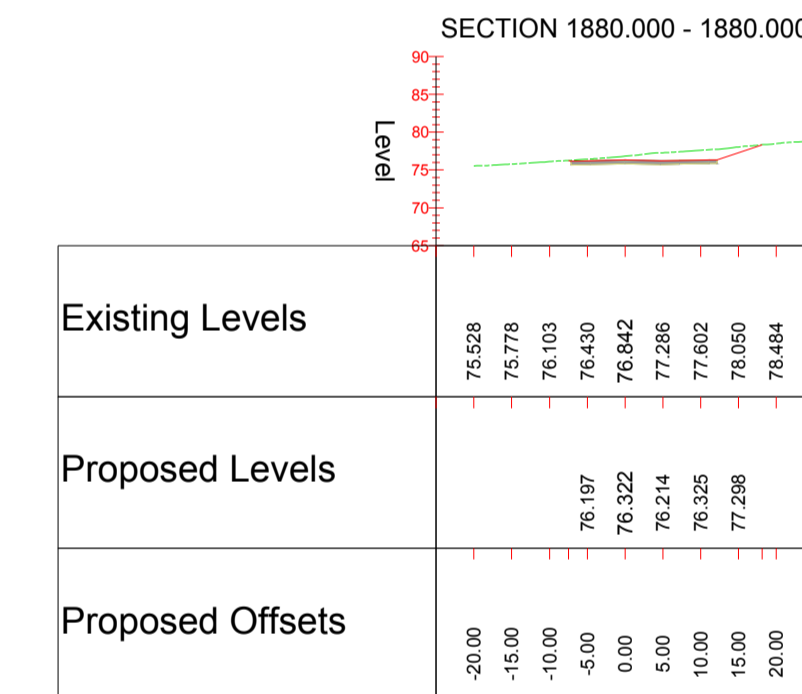
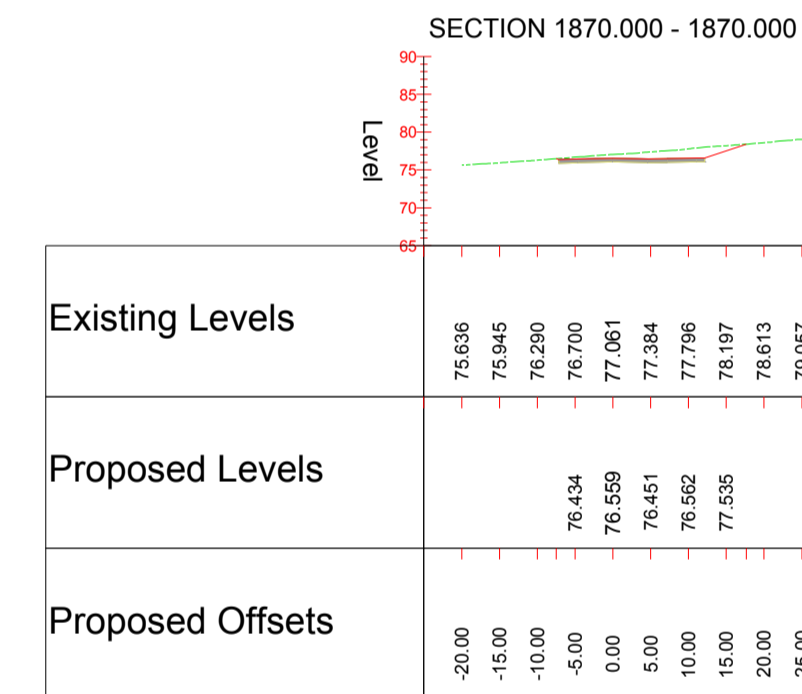
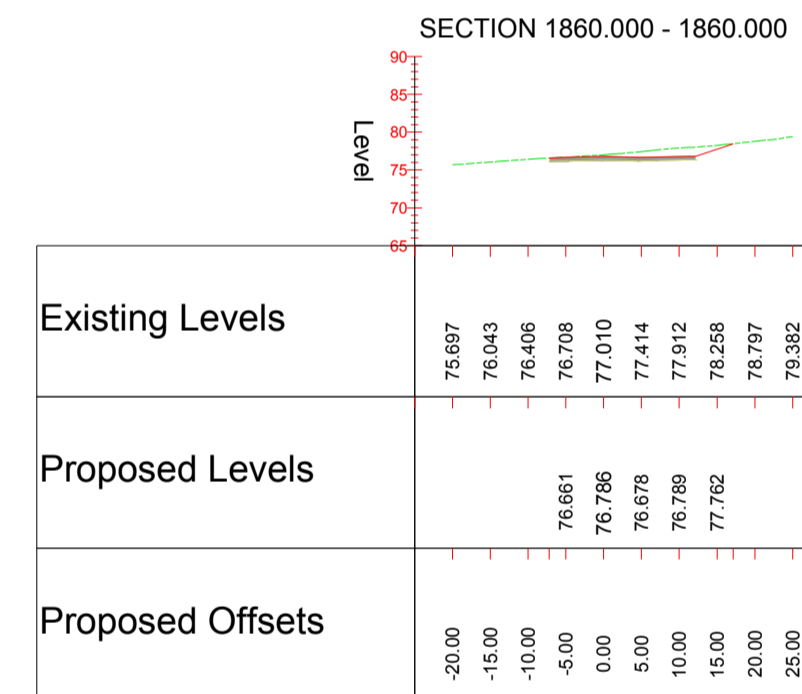
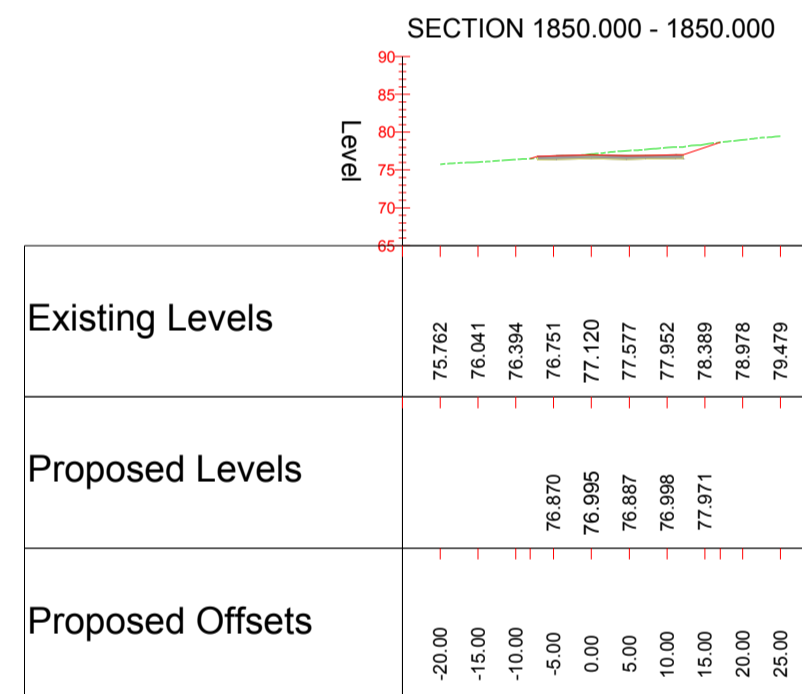
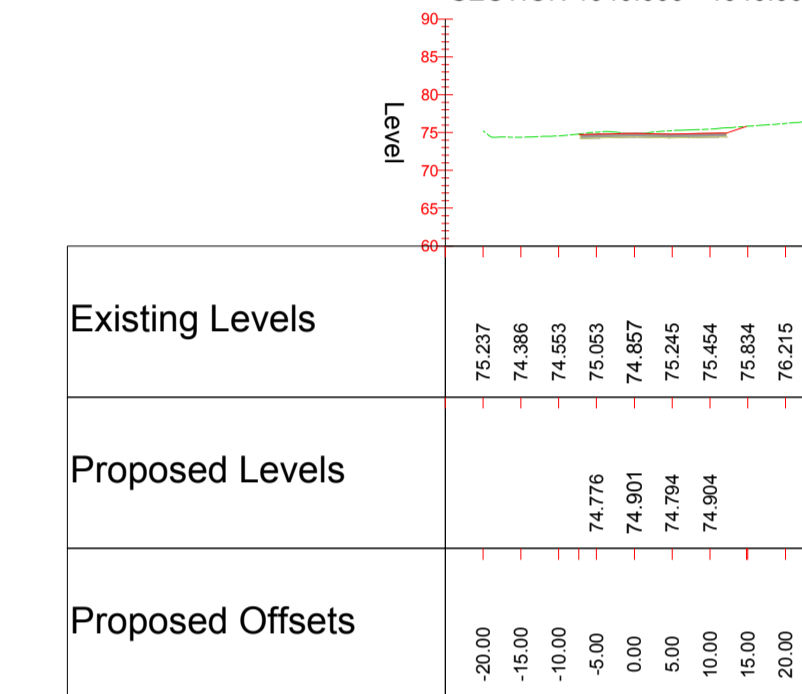
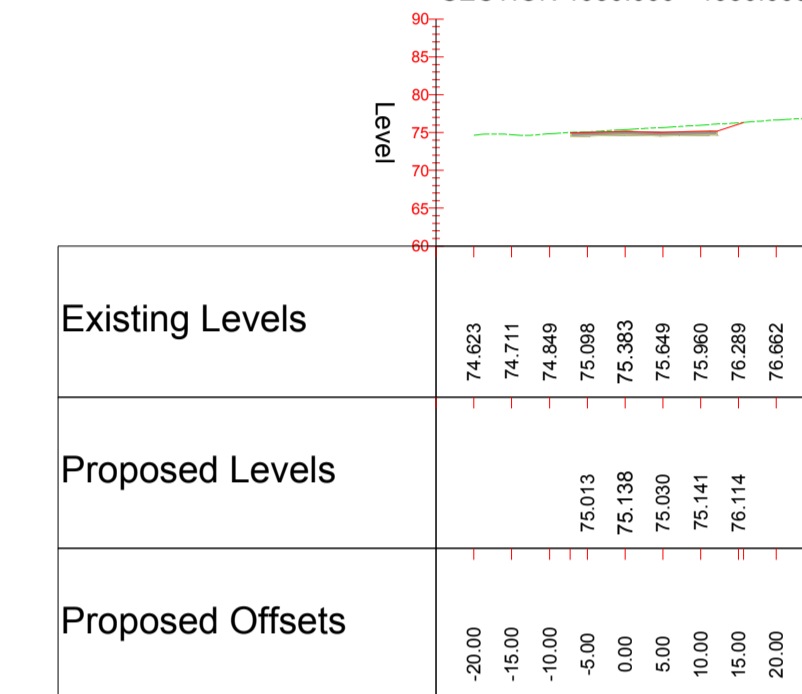
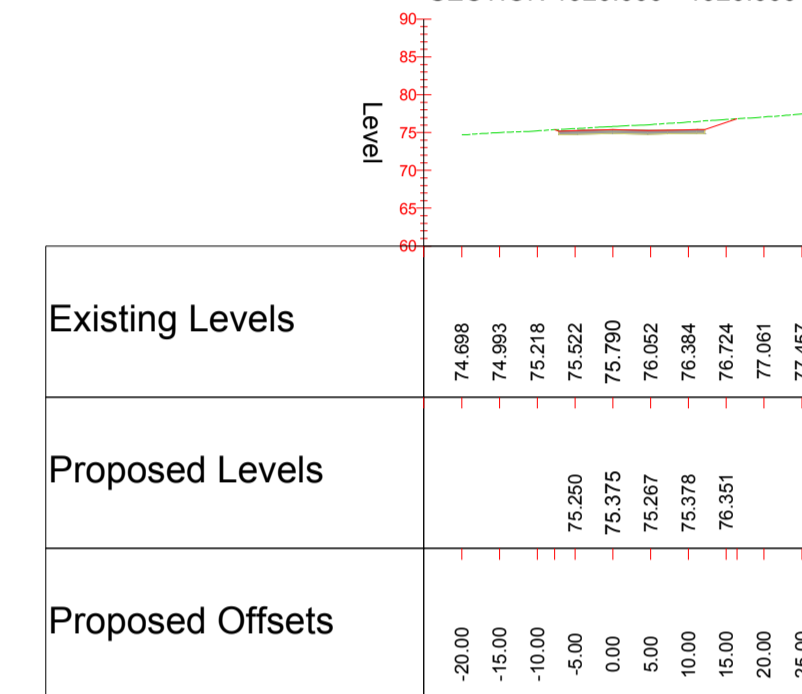
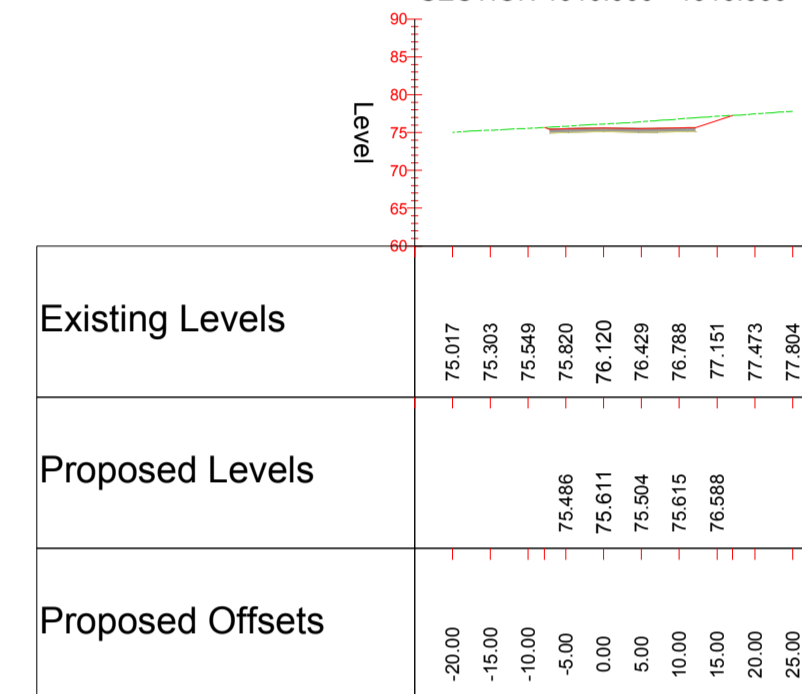
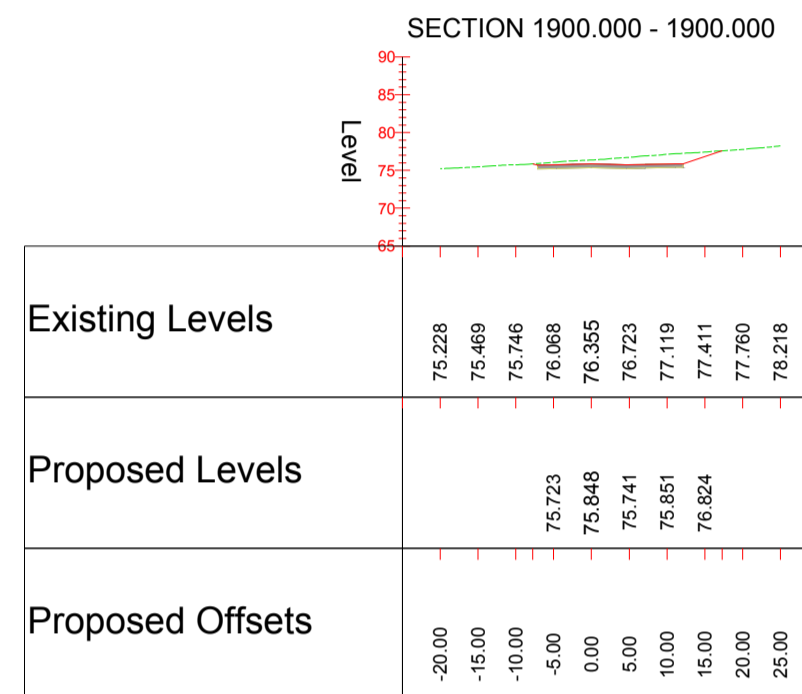
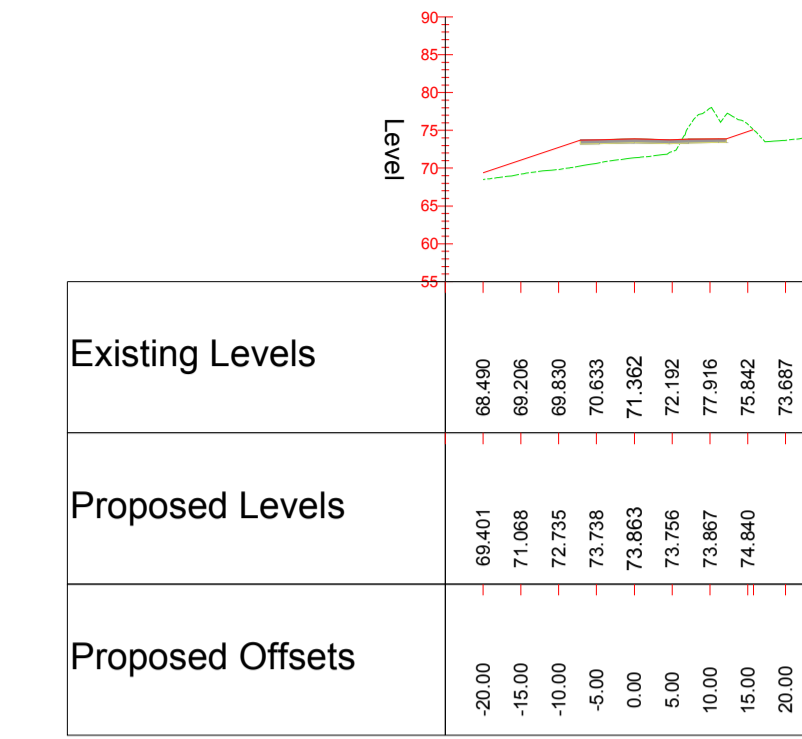
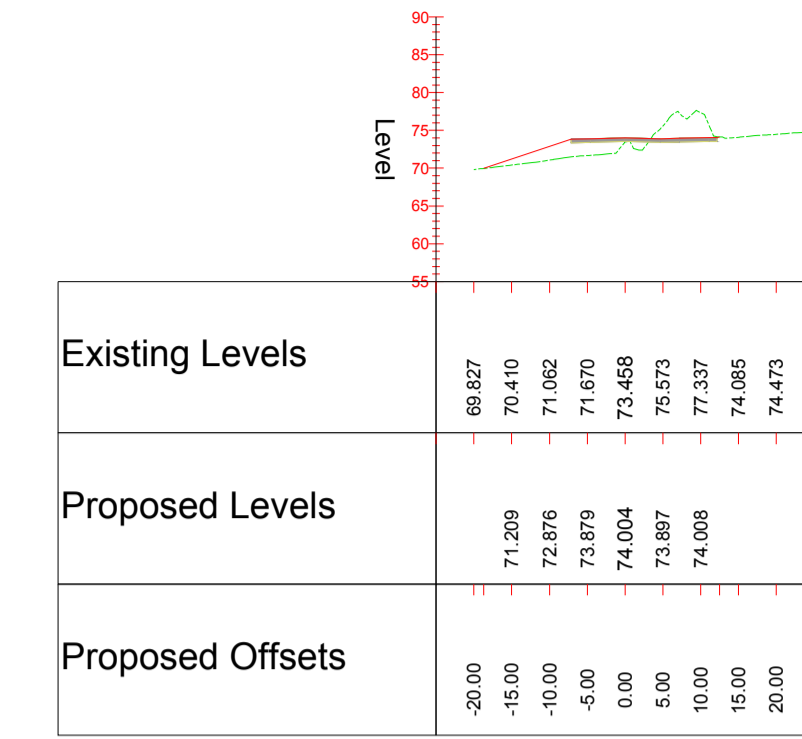
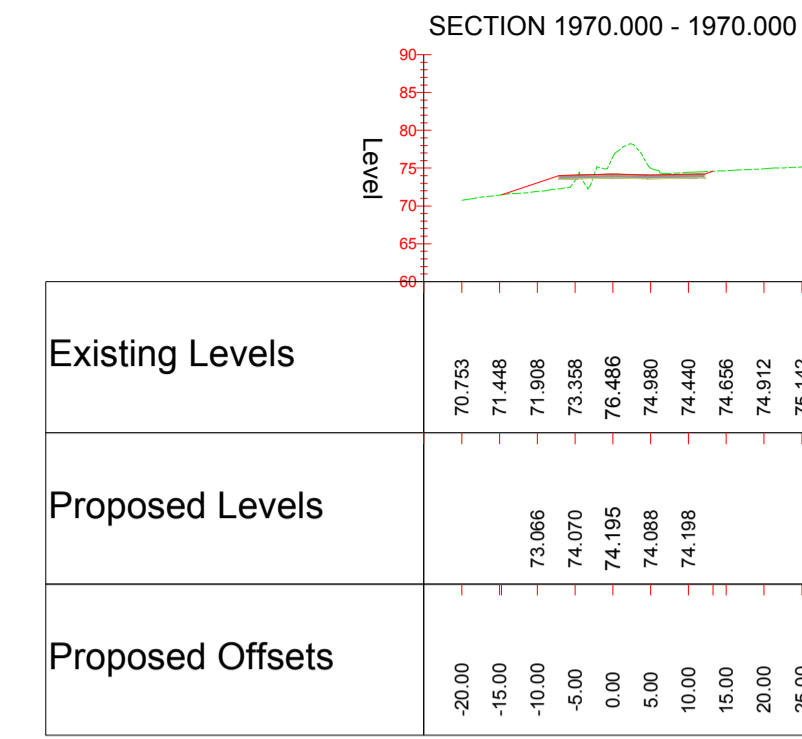
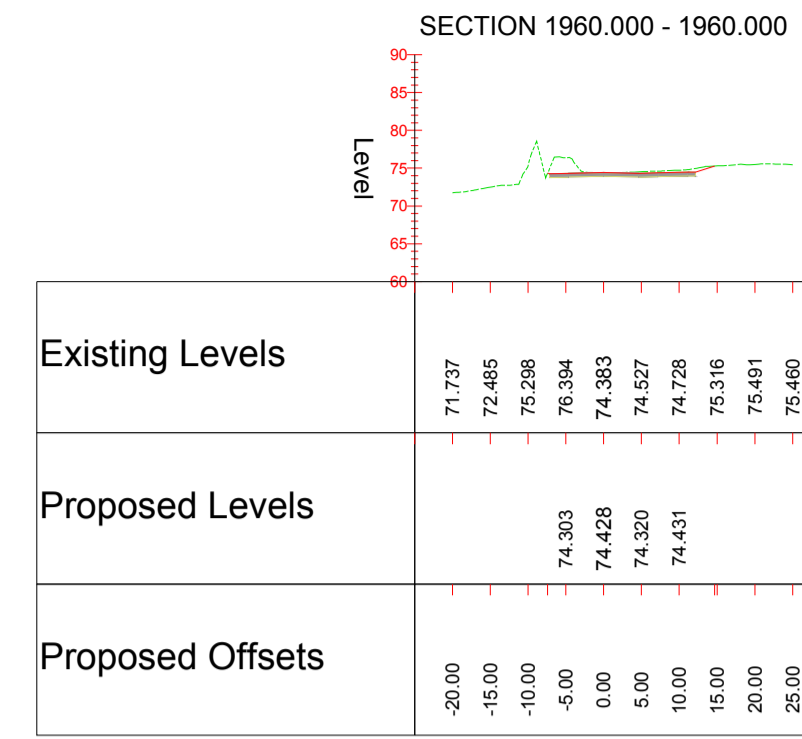
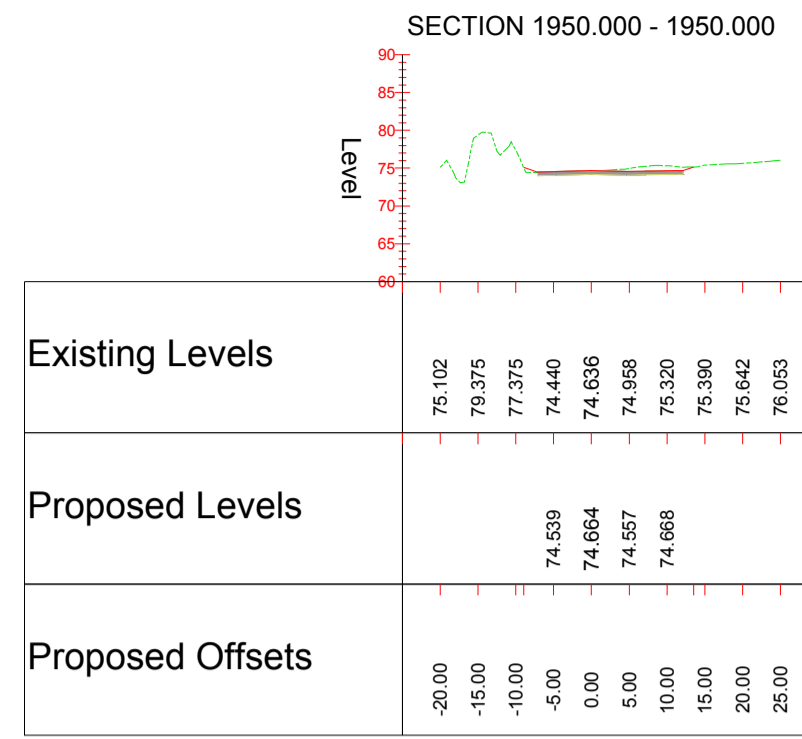
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Client: **WEST OF ENGLAND**

Project Title: <b>WEST OF ENGLAND WP1</b>					
Drawing Title: <b>A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 9/19</b>					
Scale: 1:1000	Designed: EC	Drawn: AH	Checked: AH	Authorised:	
Original Size: A1	Date: 05/02/18	Date: 05/02/18	Date: 05/02/18	Date:	
Drawing Number: Woe WP1	Originator: ATK	Volume: HGN	Project Ref. No.: 0000000	Revision: P1	
Location:	Type:	Role:	Number:		

CROSS SECTIONS  
Scale 1:1000



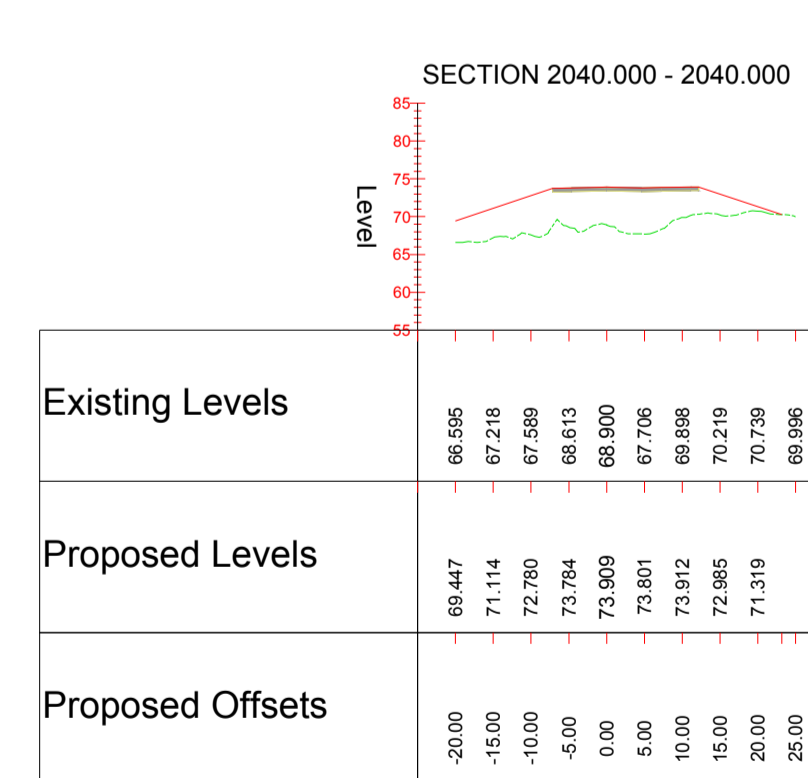
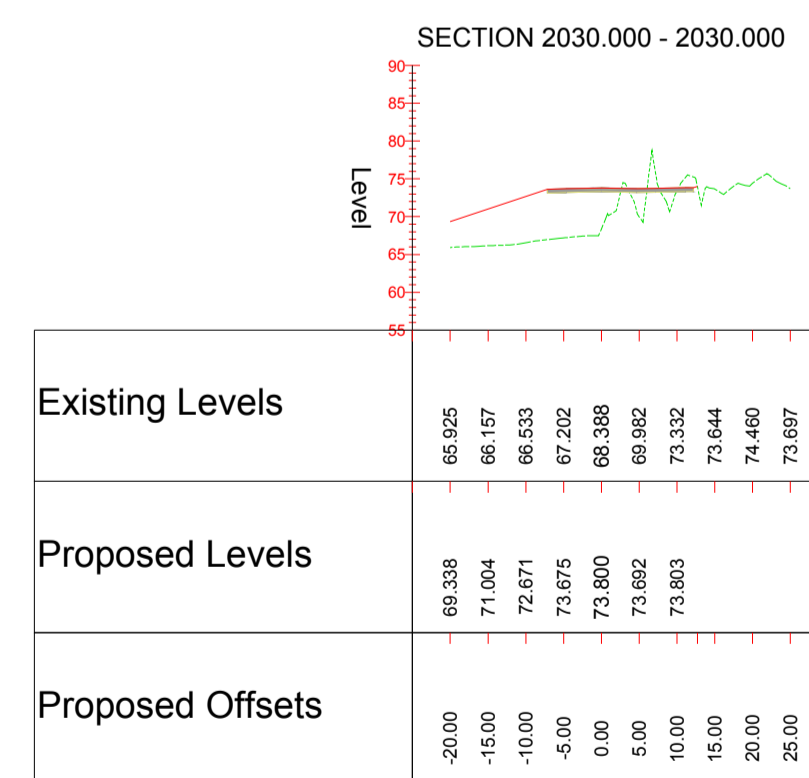
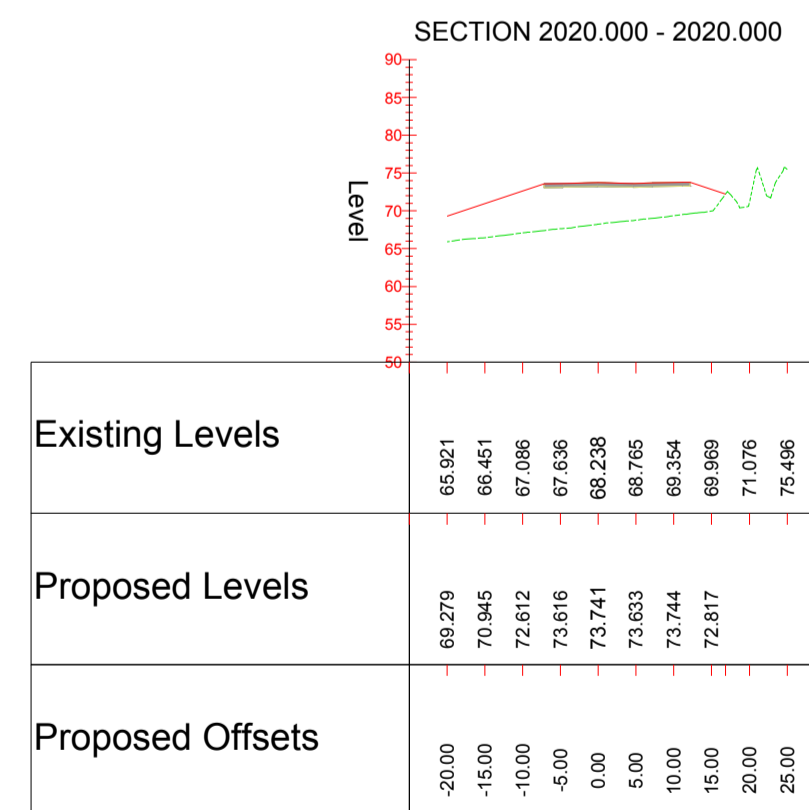
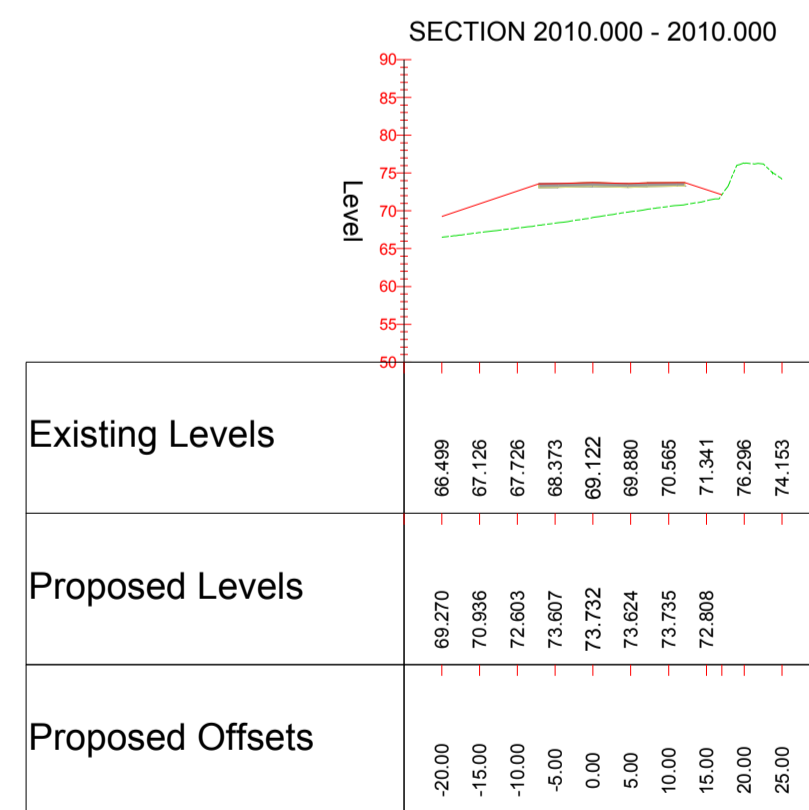
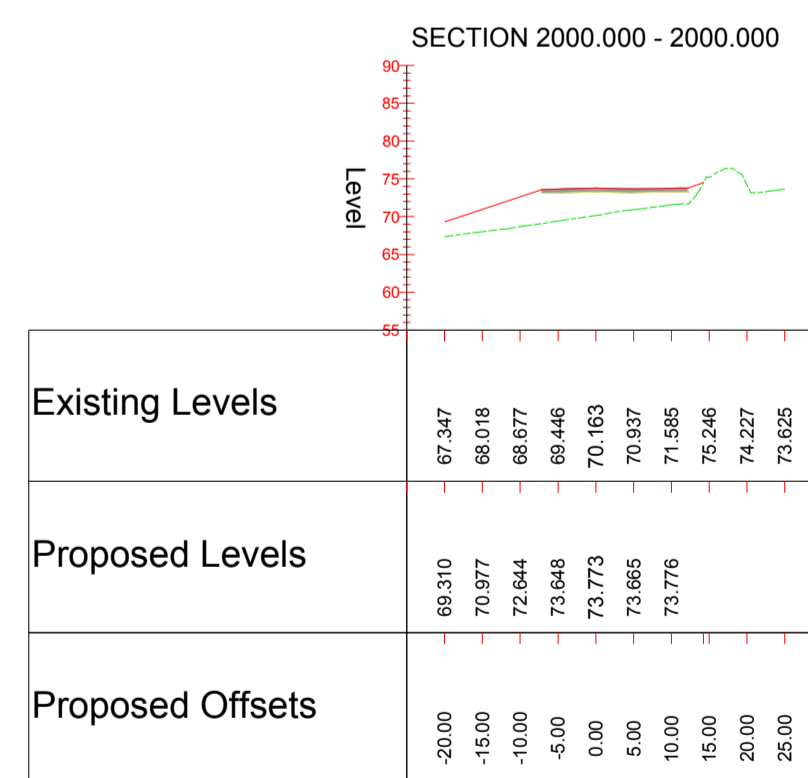
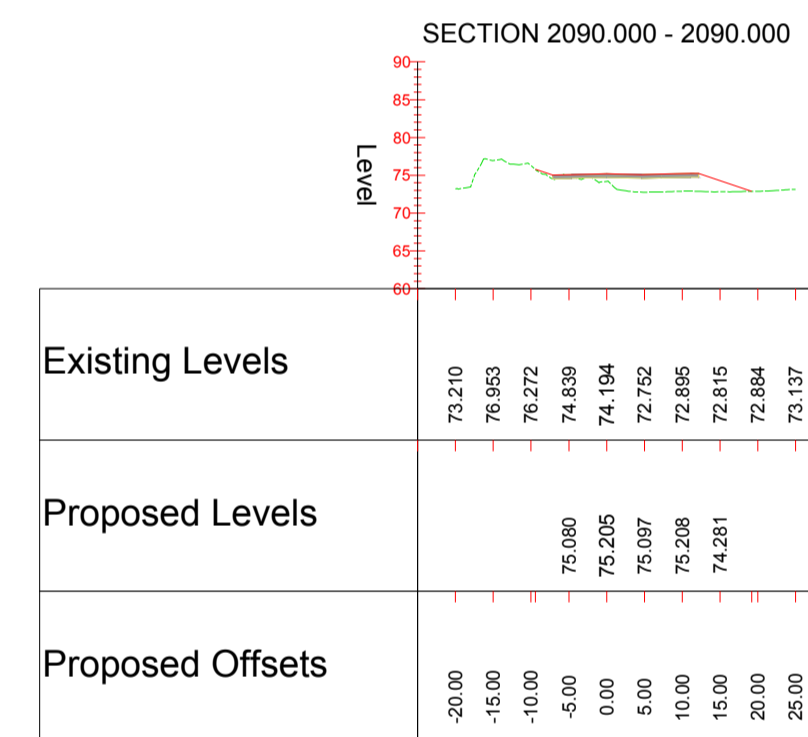
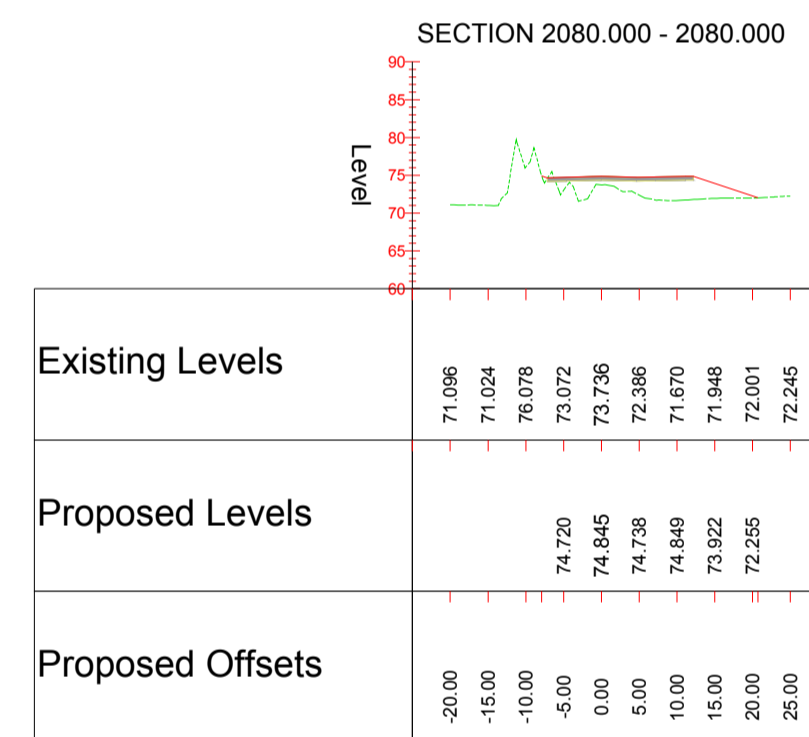
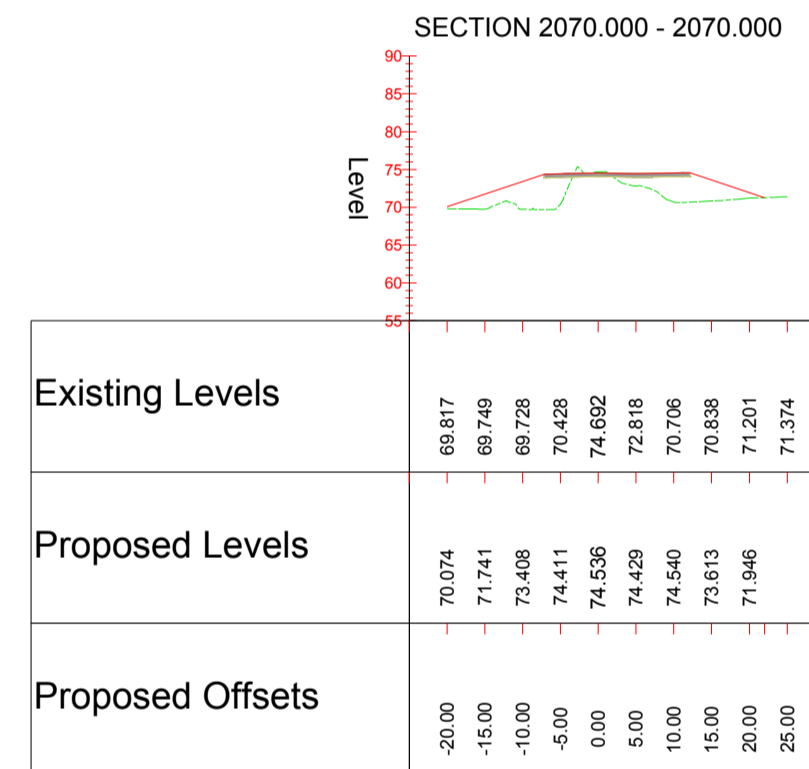
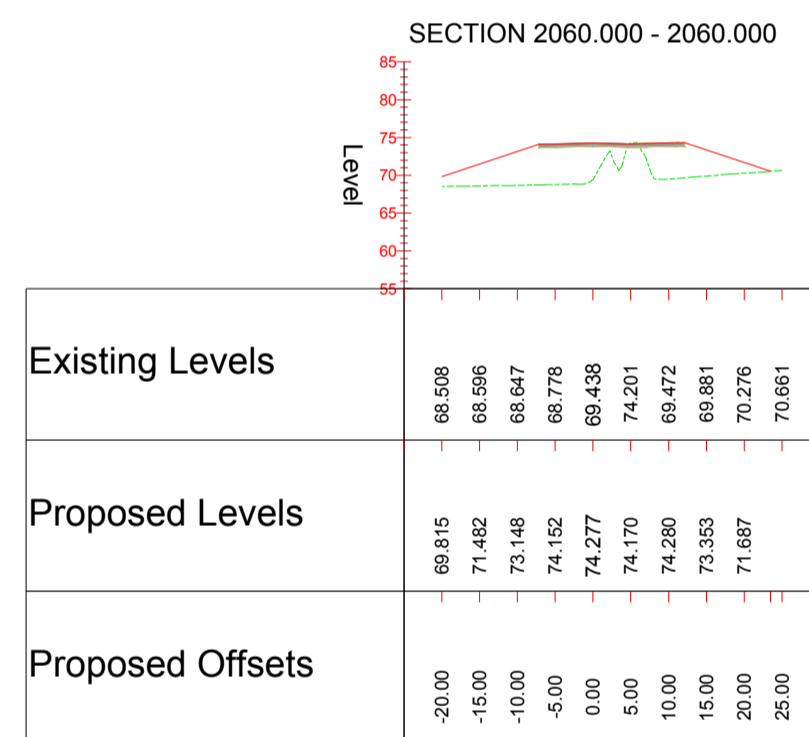
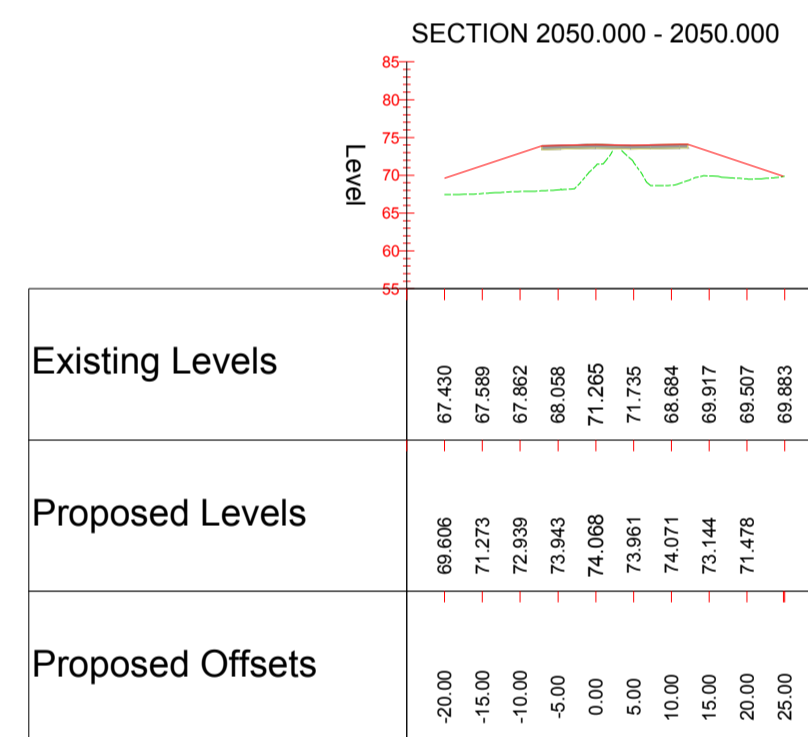
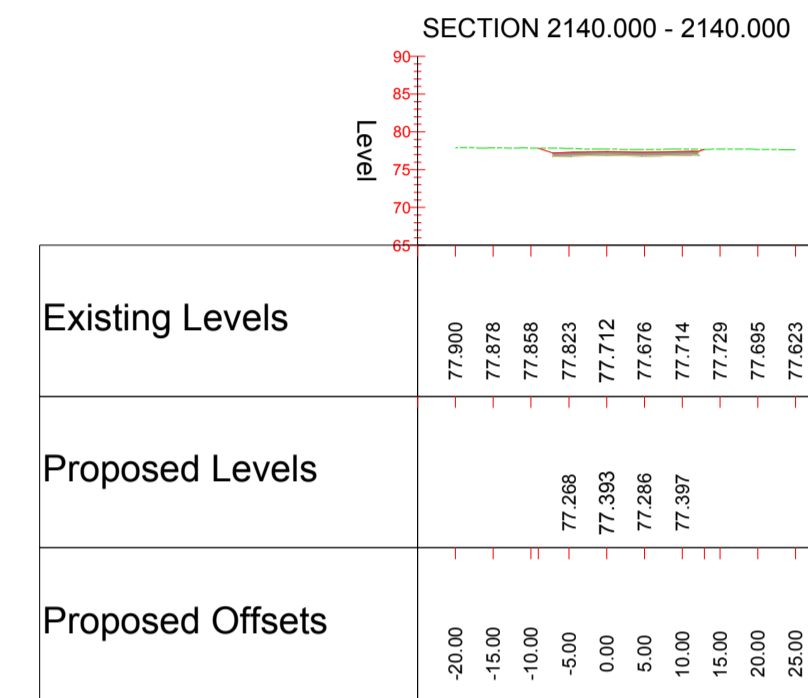
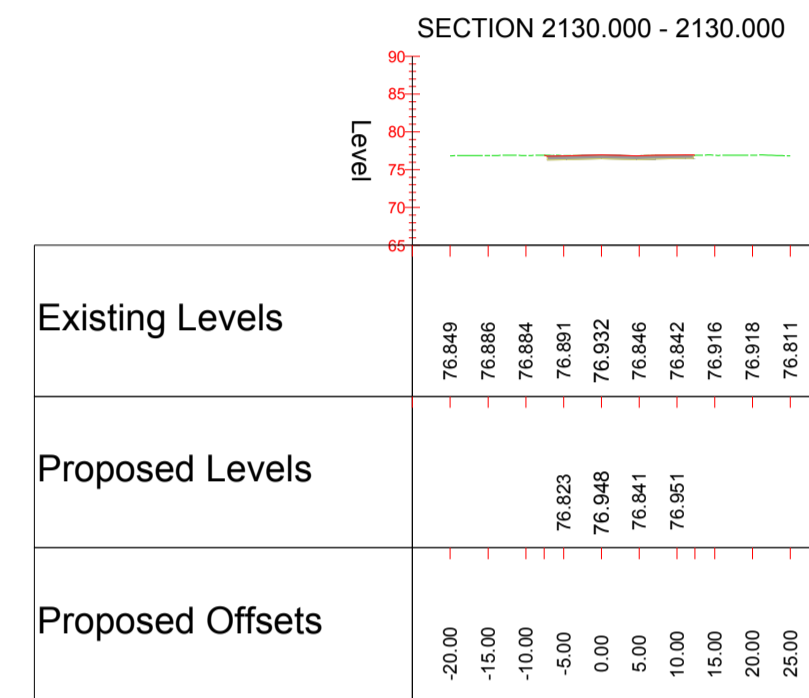
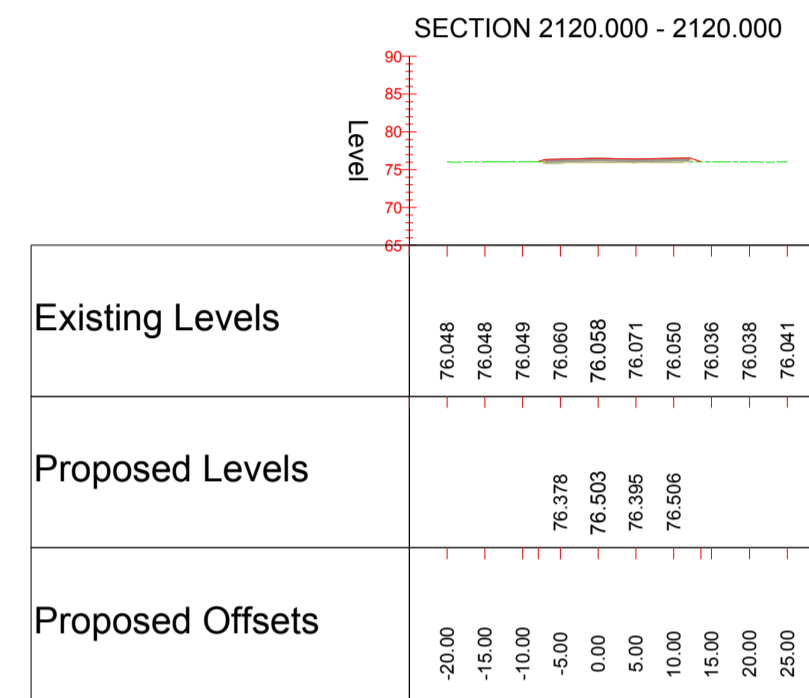
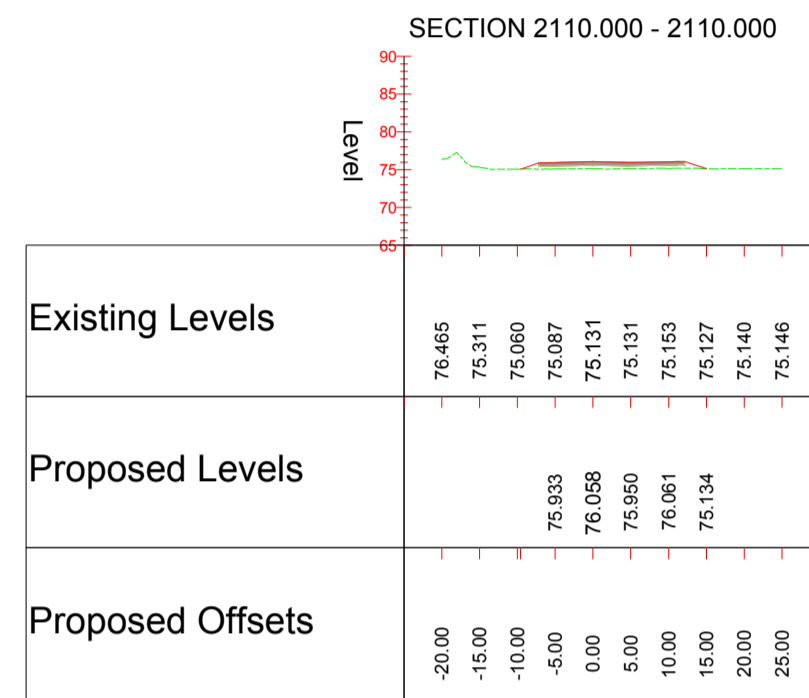
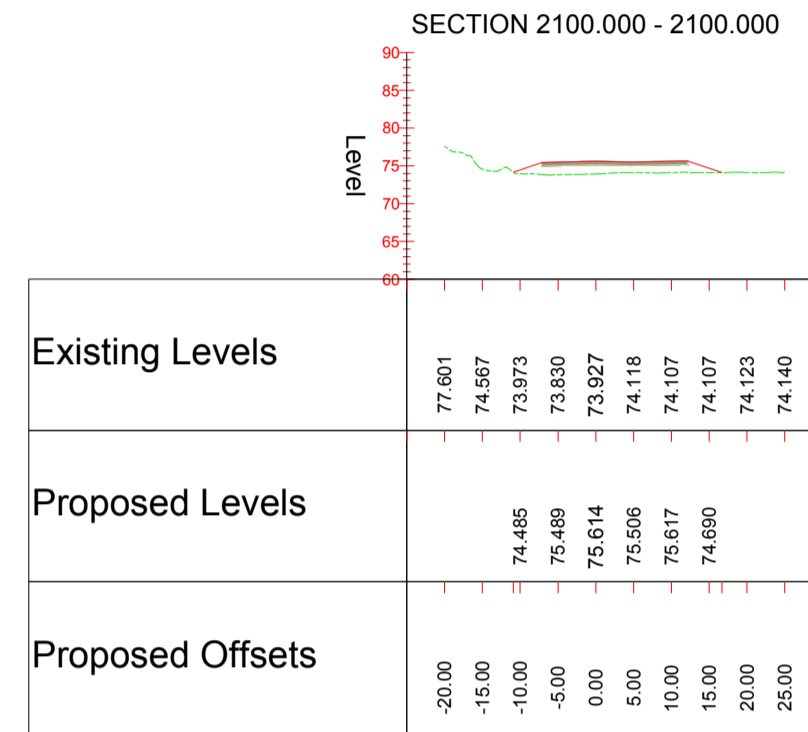
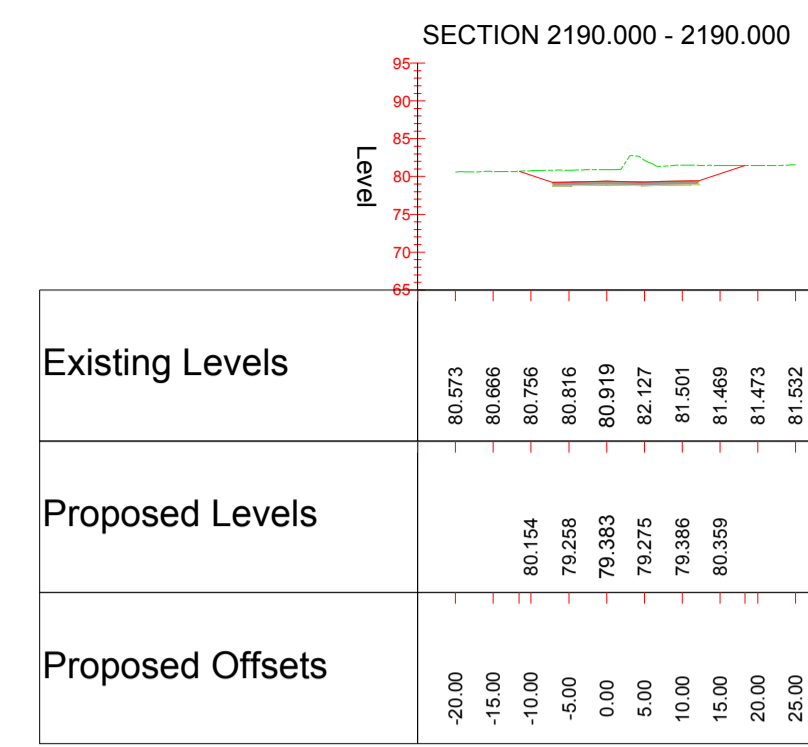
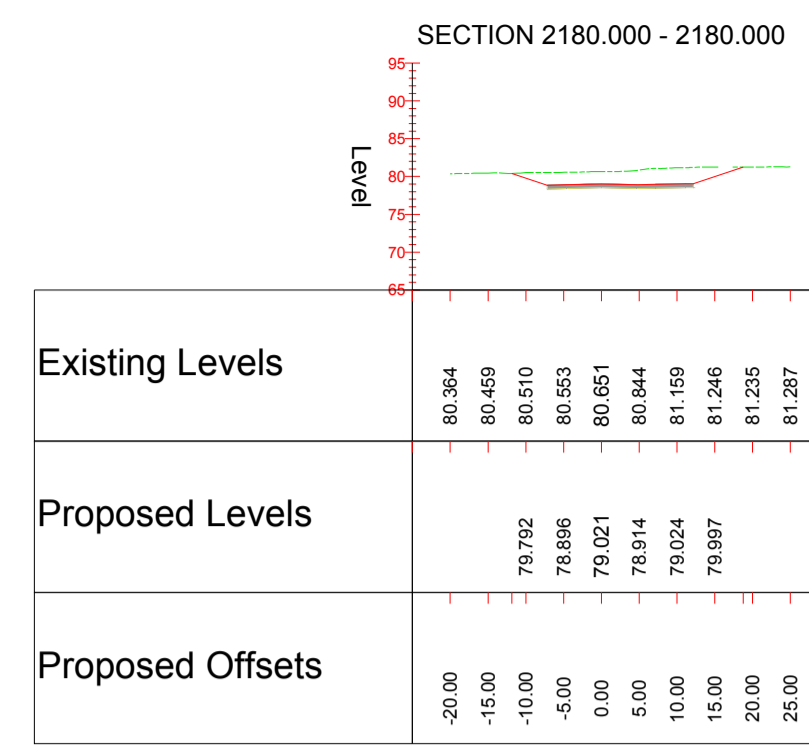
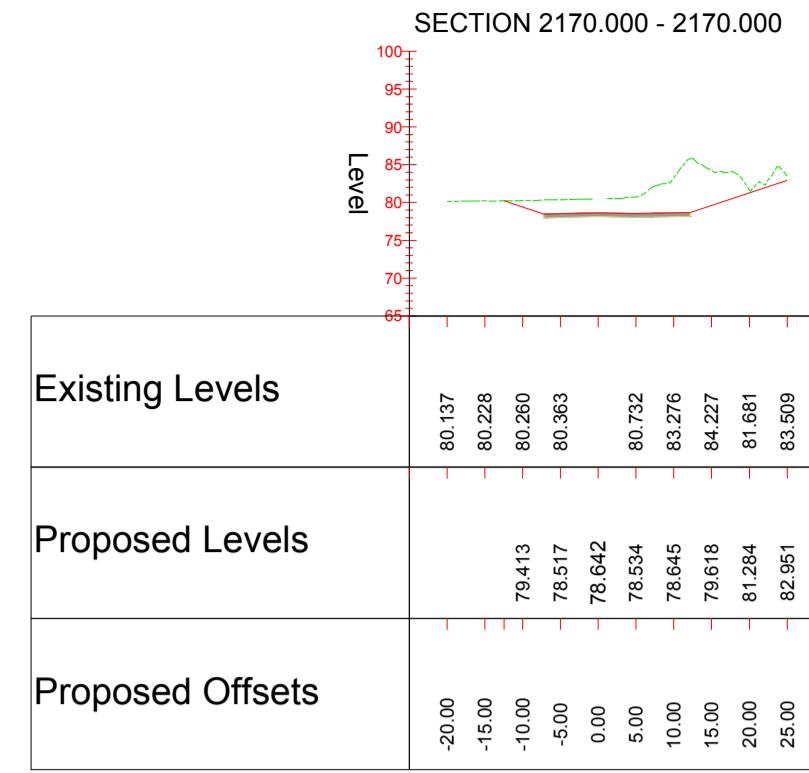
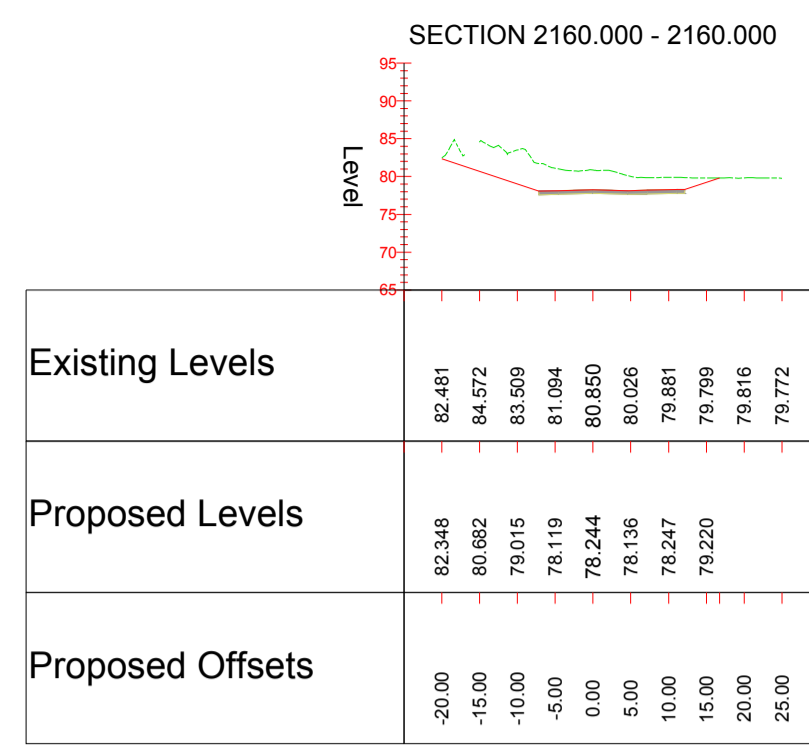
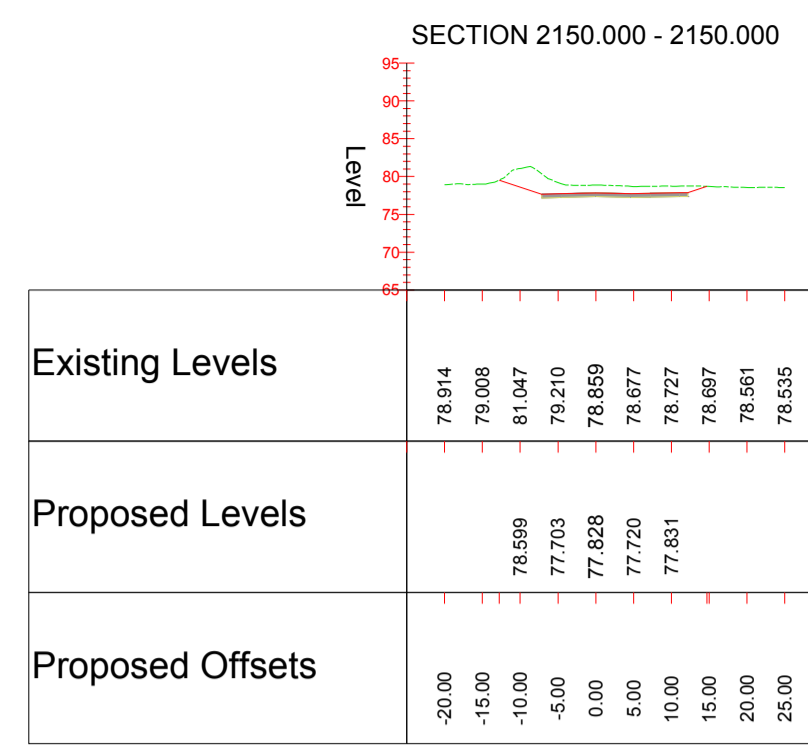
Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
<b>CONSTRUCTION</b>			
NONE			
<b>MAINTENANCE/CLEANING</b>			
NONE			
<b>DECOMMISSIONING/DEMOLITION</b>			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF
By	Chkd	App'd	

Drawing Status	Suitability	Project Title
FOR INFORMATION	S2	WEST OF ENGLAND WP1
		Drawing Title
The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 13 19
Copyright © Atkins Limited (2014)	Client	Scale
	WEST OF ENGLAND	1:1000
Original Size	Date	Designed
A1	05/02/18	EC
Drawing Number	HA PIN	Checked
Woe	Woe	AH
WP1	WP1	Authorised
Location	Type	Date
		05/02/18
Project Ref. No.	Revision	Project Ref. No.
0000000	P1	0000000

CROSS SECTIONS  
Scale 1:1000



Key:

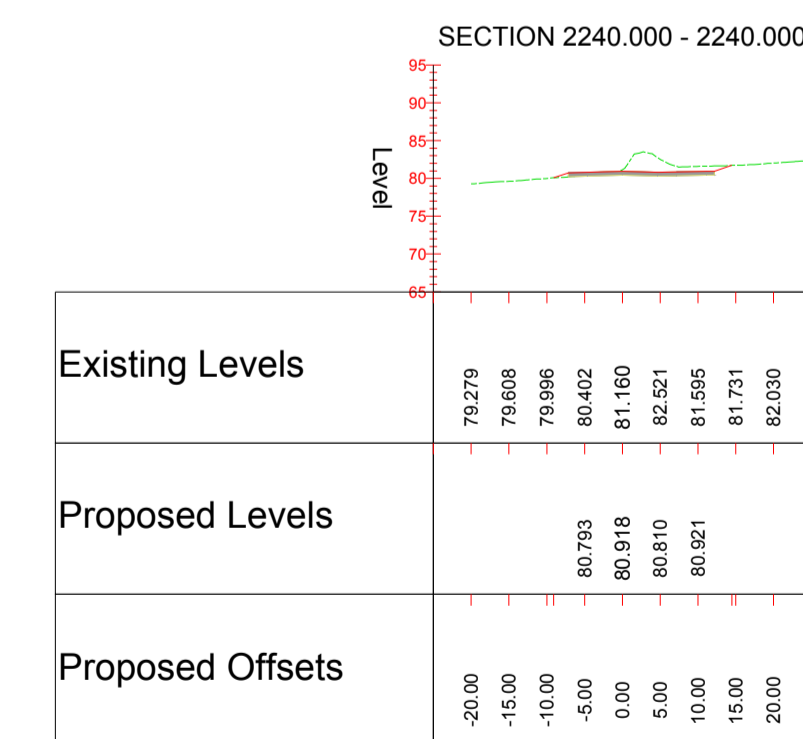
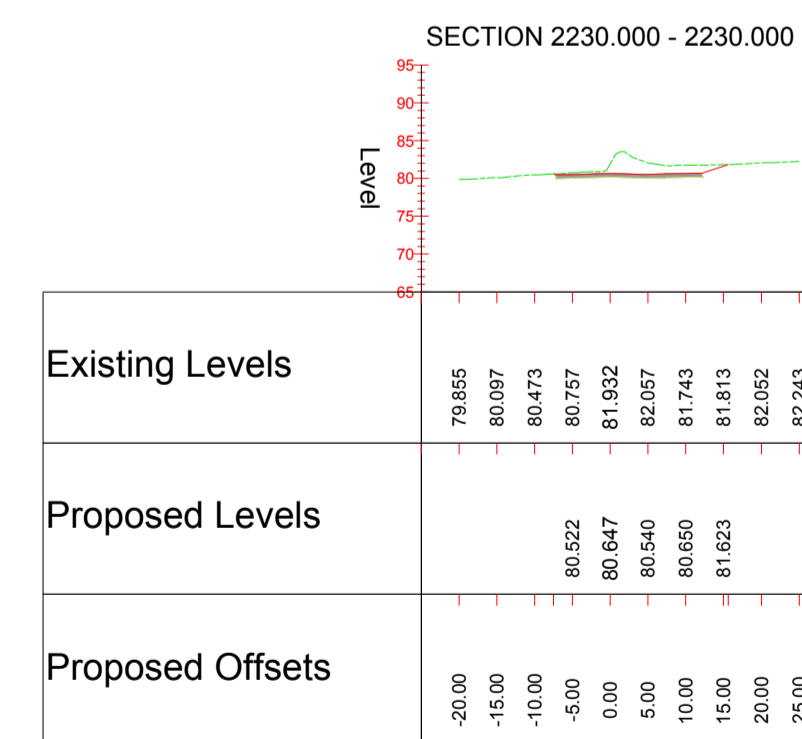
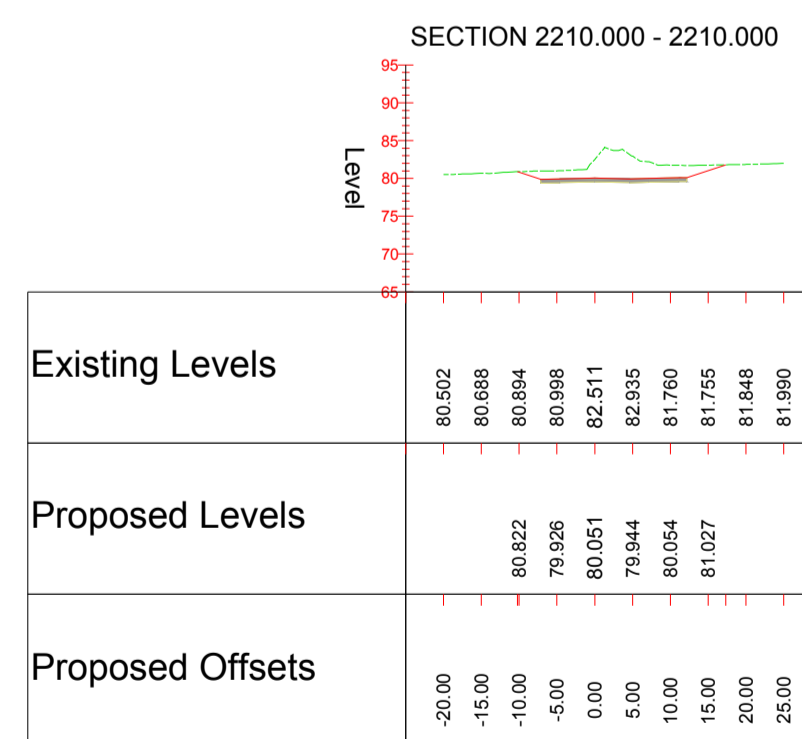
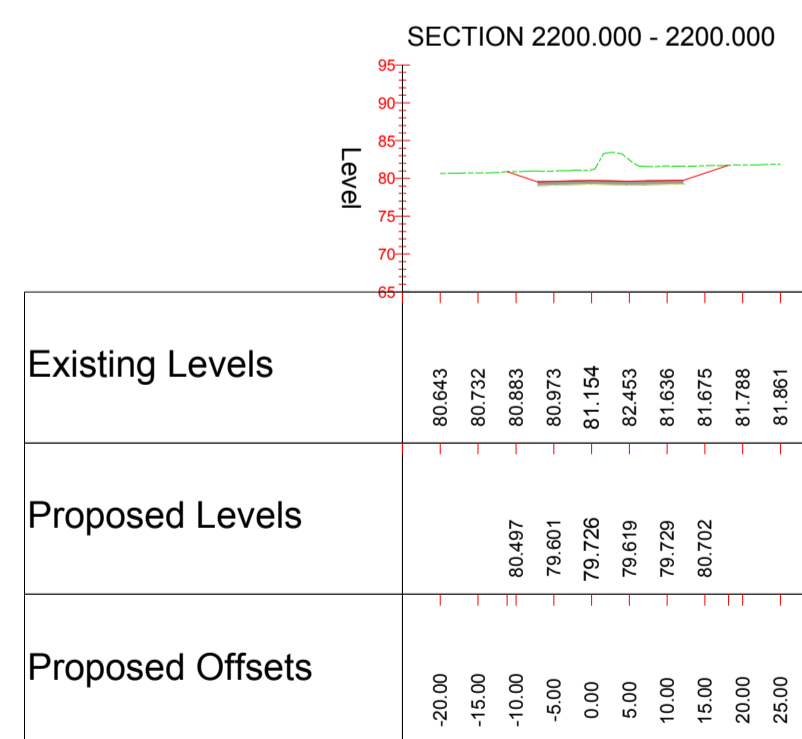
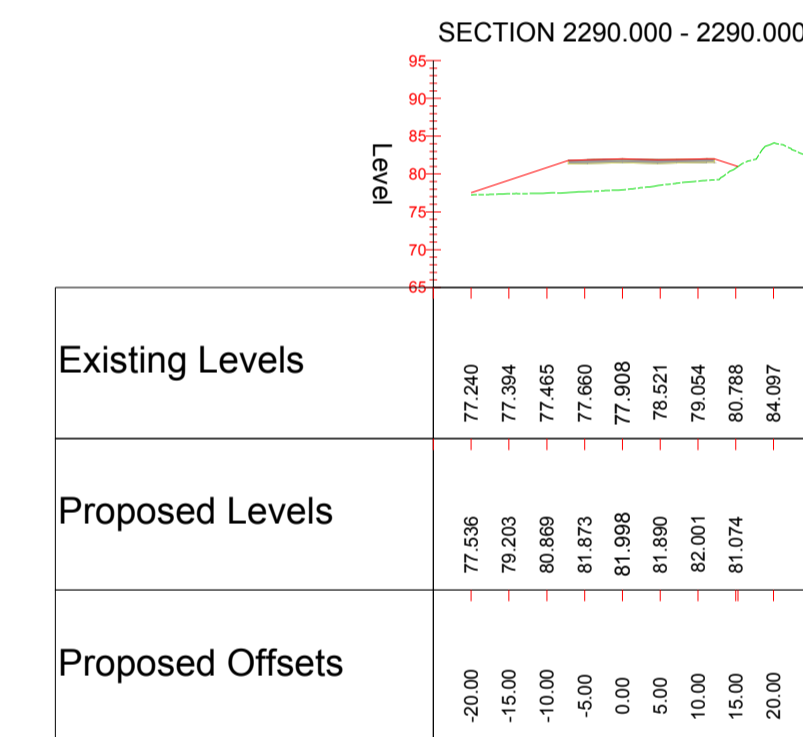
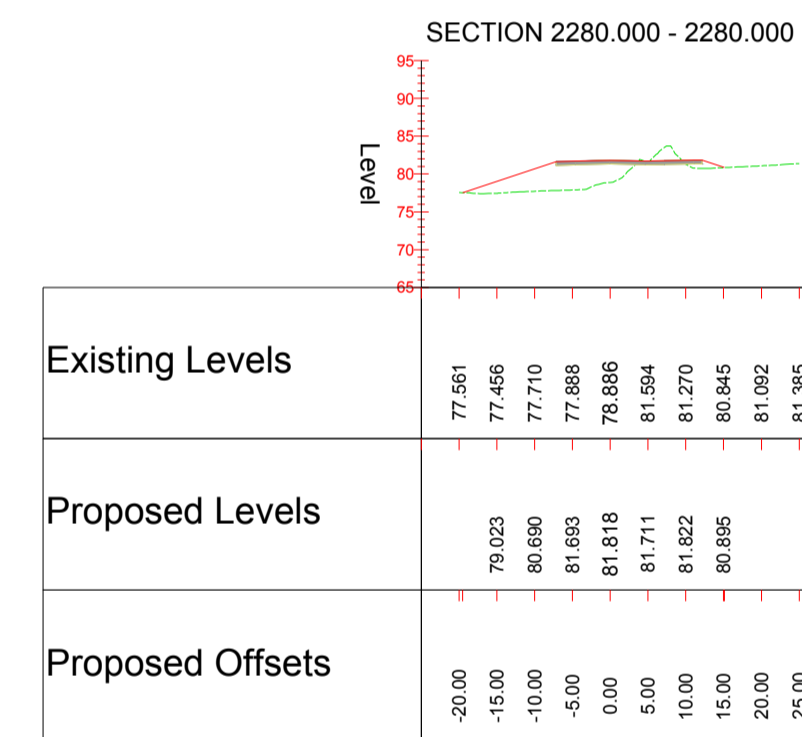
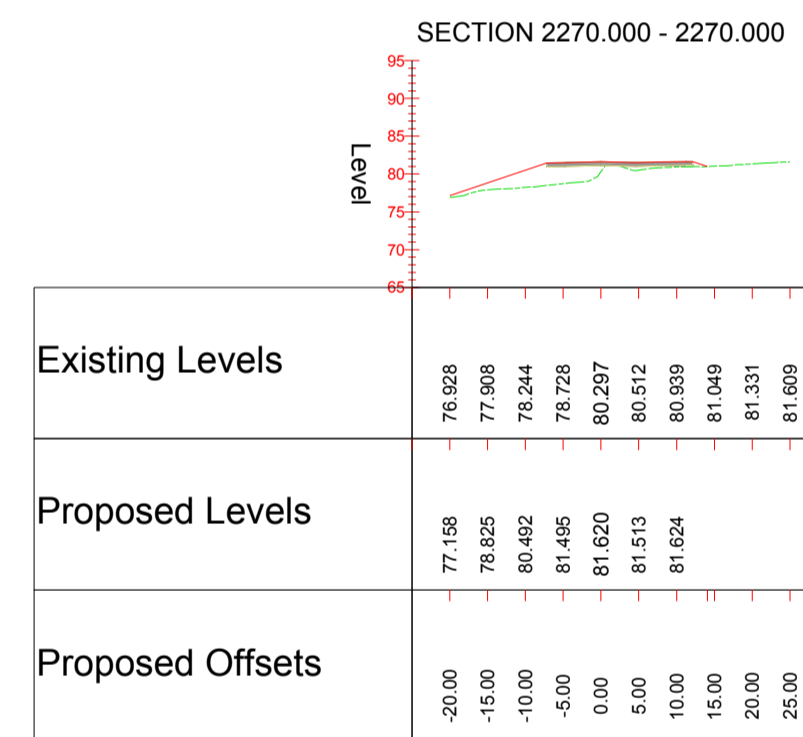
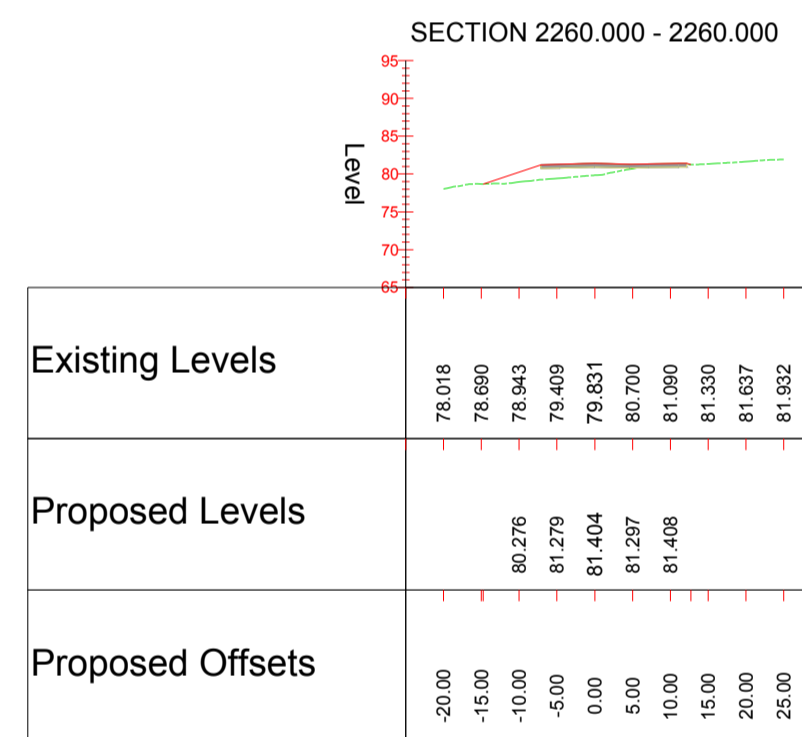
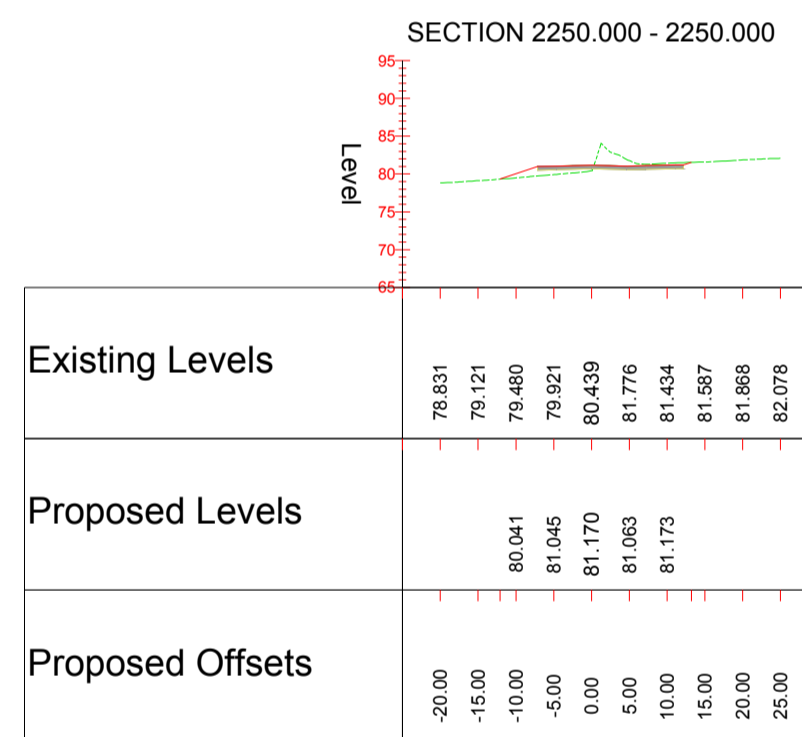
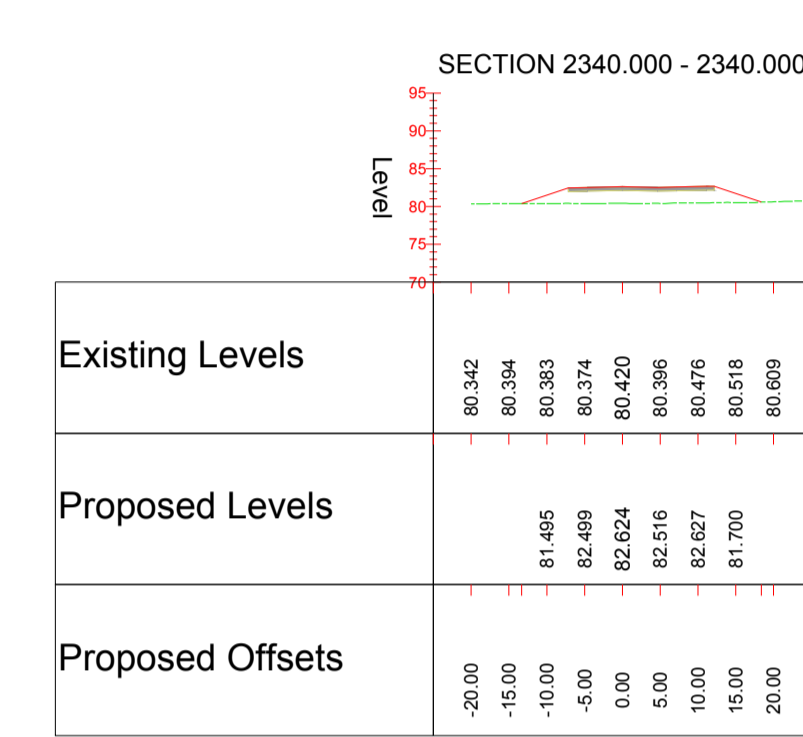
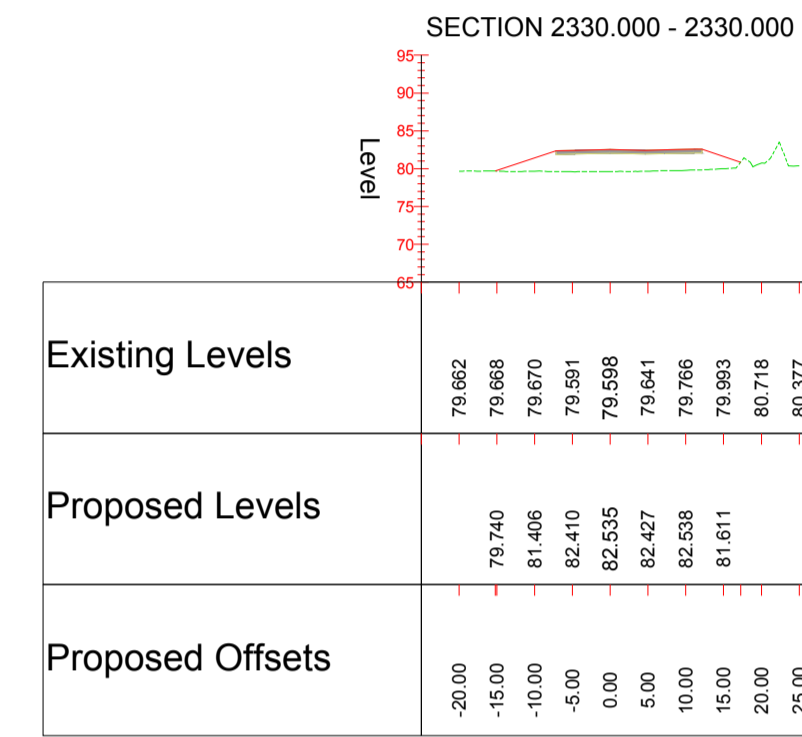
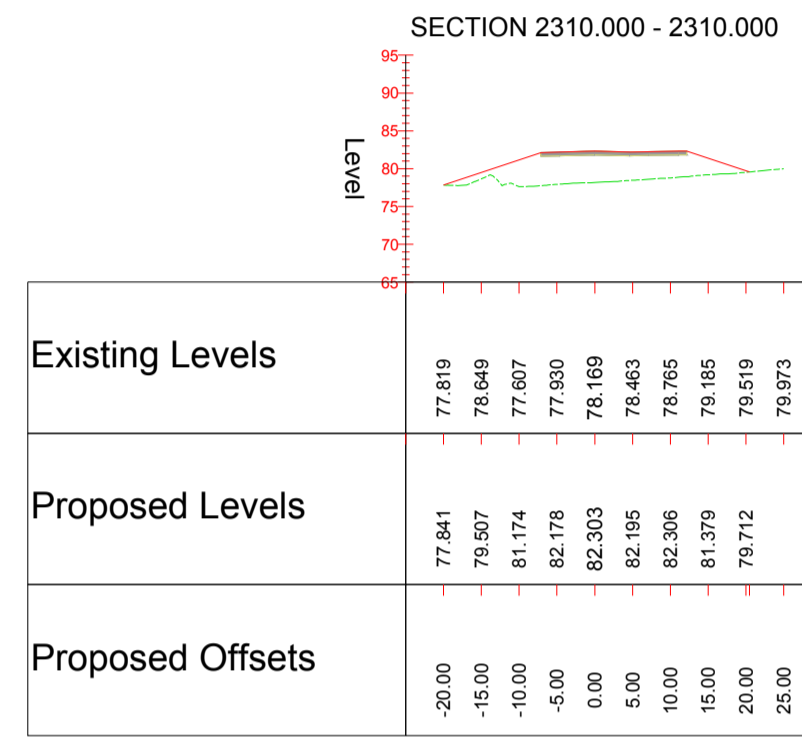
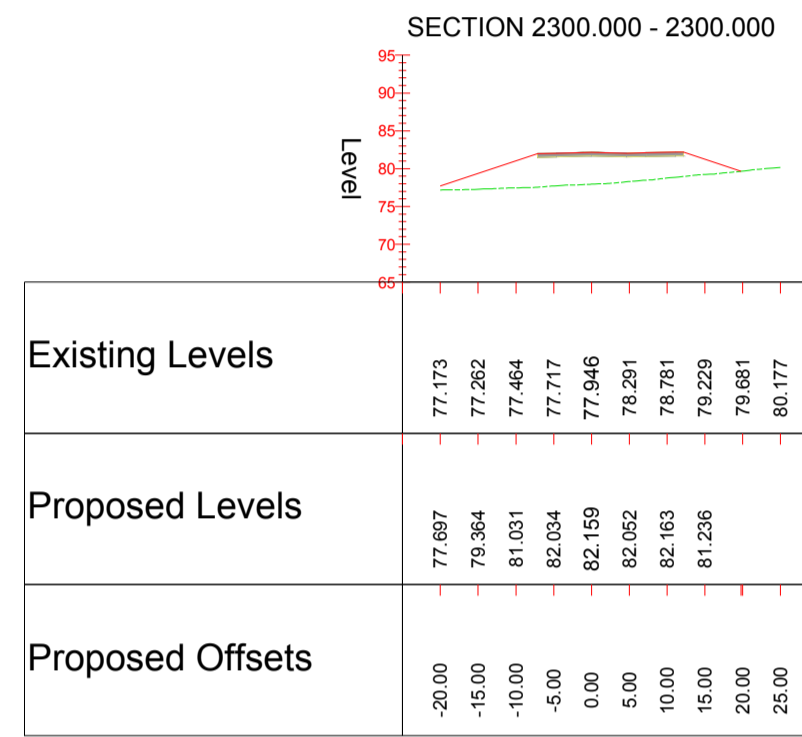
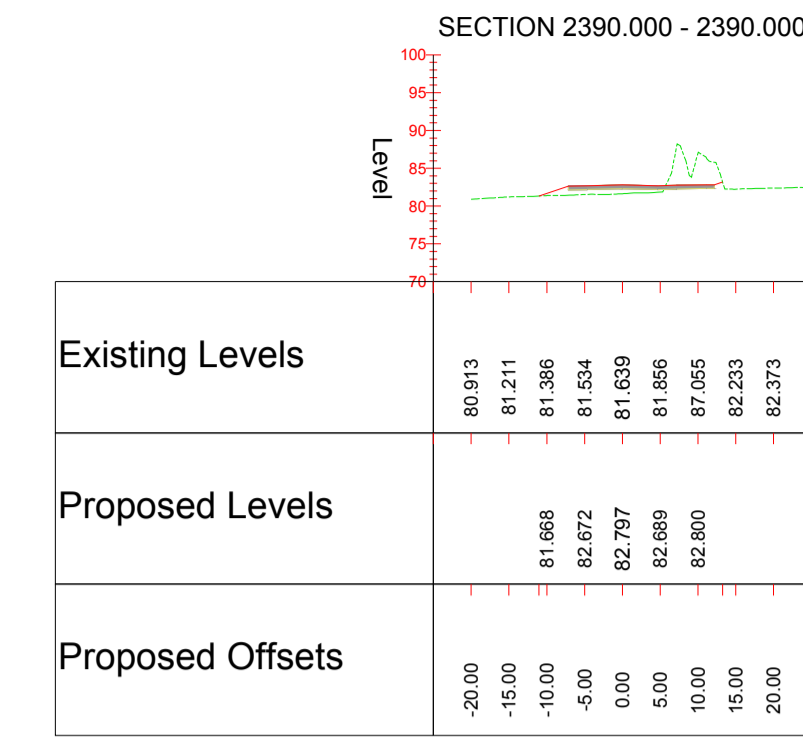
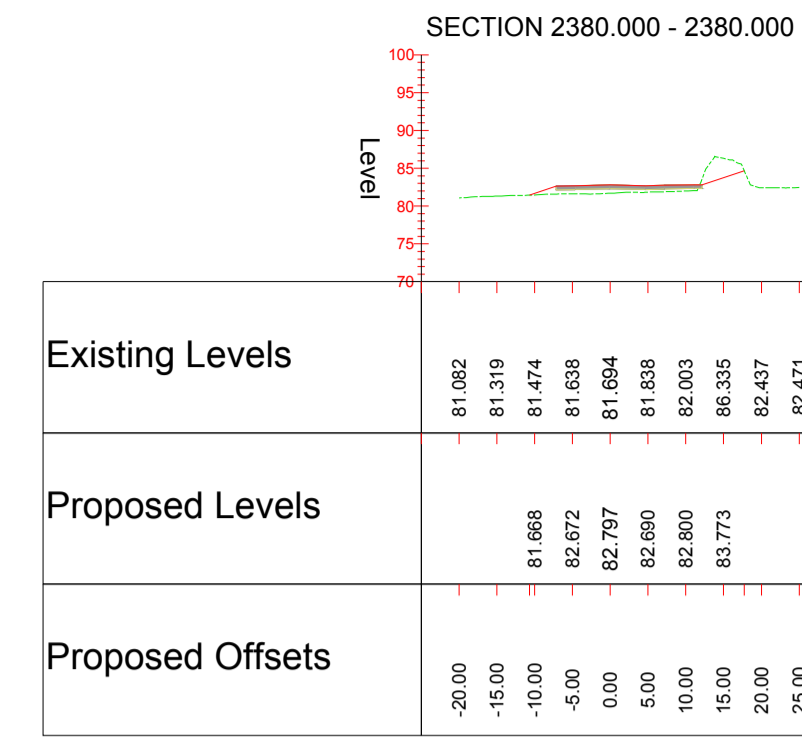
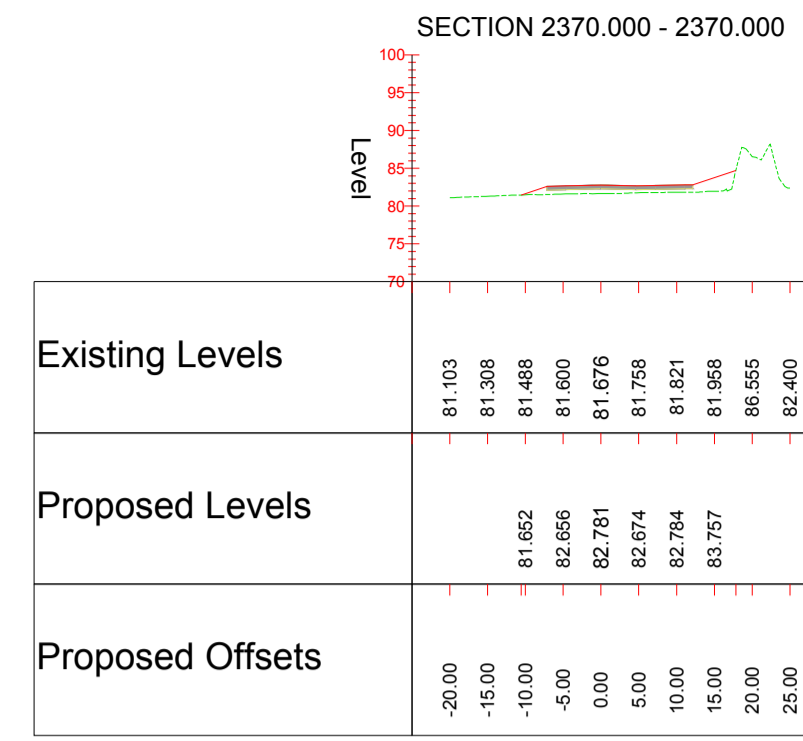
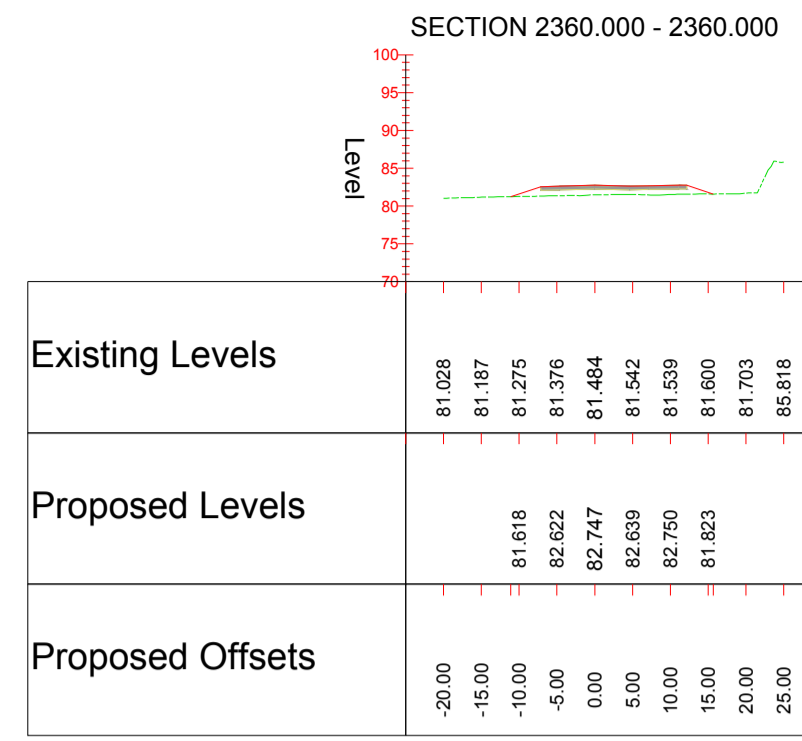
Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION					
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:					
CONSTRUCTION					
NONE					
MAINTENANCE/CLEANING					
NONE					
DECOMMISSIONING/DEMOLITION					
NONE					
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement					
Rev.	Date	Description	By	Chkd	App'd
P1	05.02.18	DRAWING CREATED		AF	

Drawing Status	FOR INFORMATION	Suitability	S2	Project Title	WEST OF ENGLAND WP1						
		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Drawing Title A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 1 OF 19							
Copyright	© Atkins Limited (2014)	Scale	1:1000	Designed	EC	Drawn	AF	Checked	AH	Authorised	
Client	WEST OF ENGLAND	Original Size	A1	Date	05/02/18	Date	05/02/18	Date	05/02/18	Date	
Drawing Number	HA PIN	Originator	Woe	Volume	ATK	Revision	HGN	Project Ref. No.	0000000	Revision	P1
Location	WP1	Type	- DR - D -	Number	6014						

# CROSS SECTIONS

Scale 1:1000



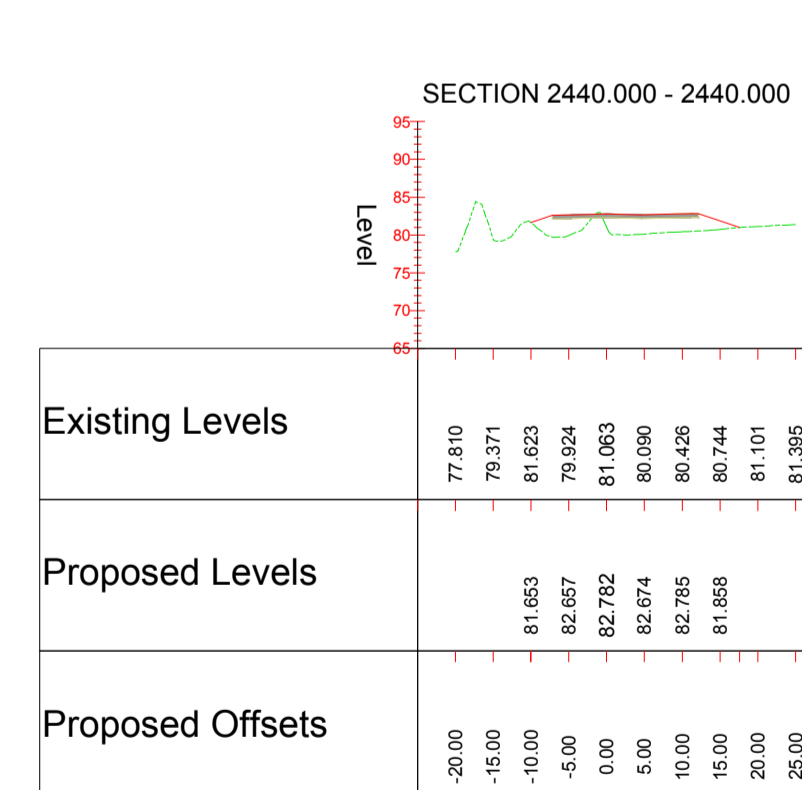
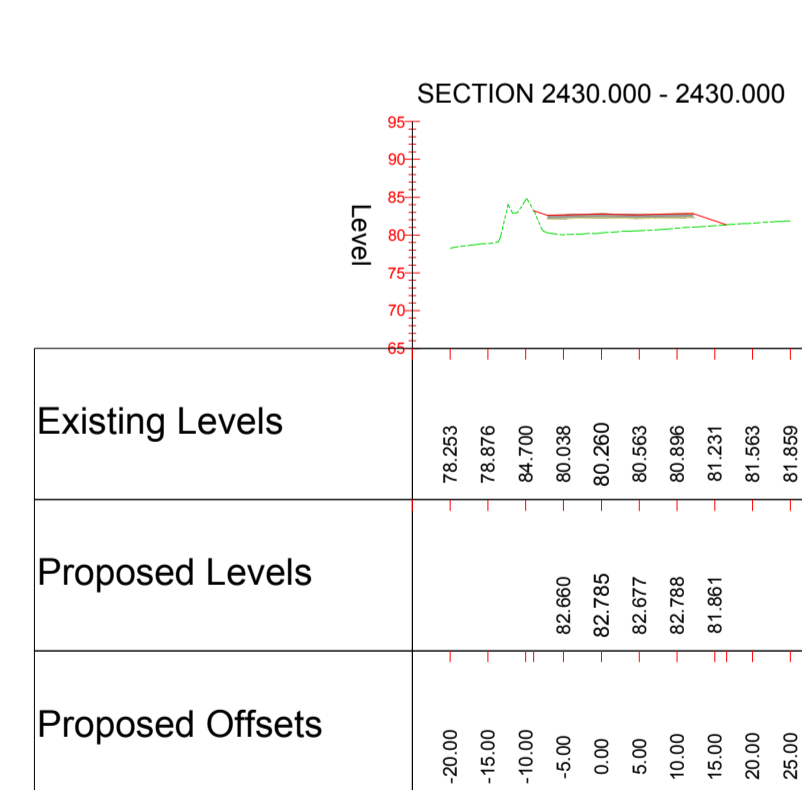
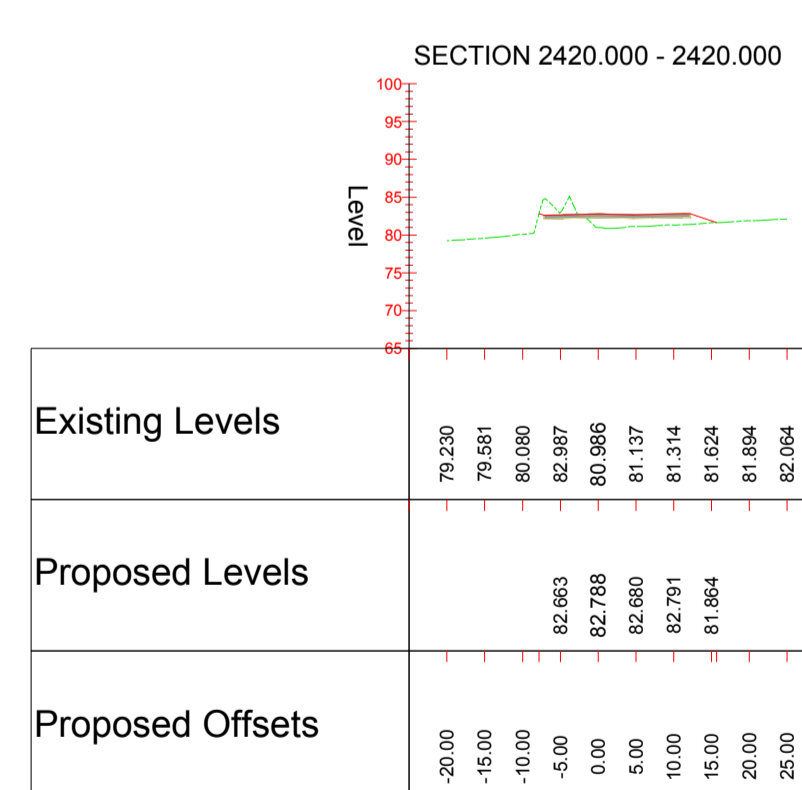
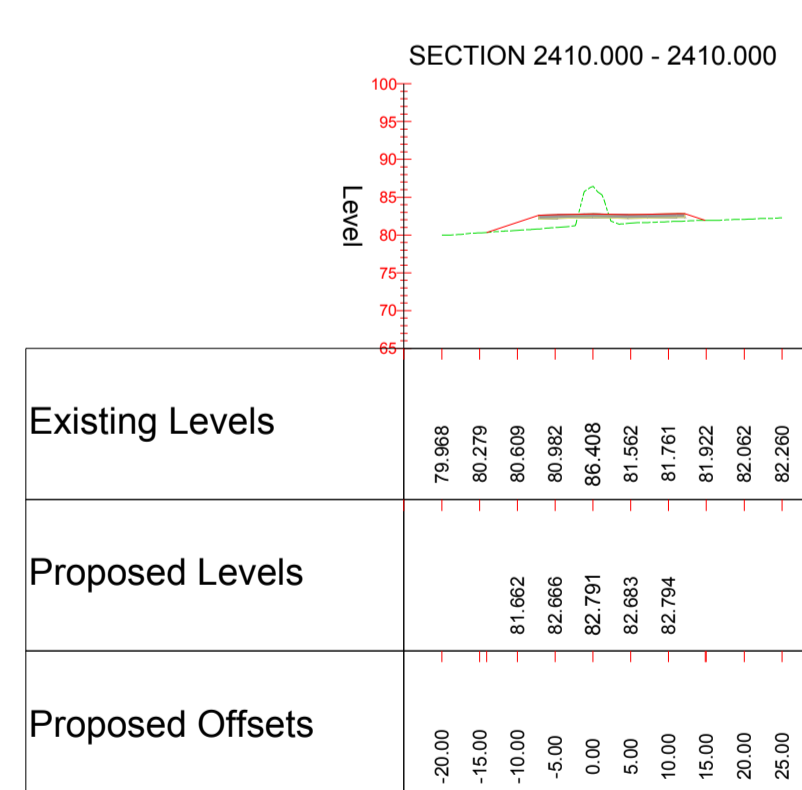
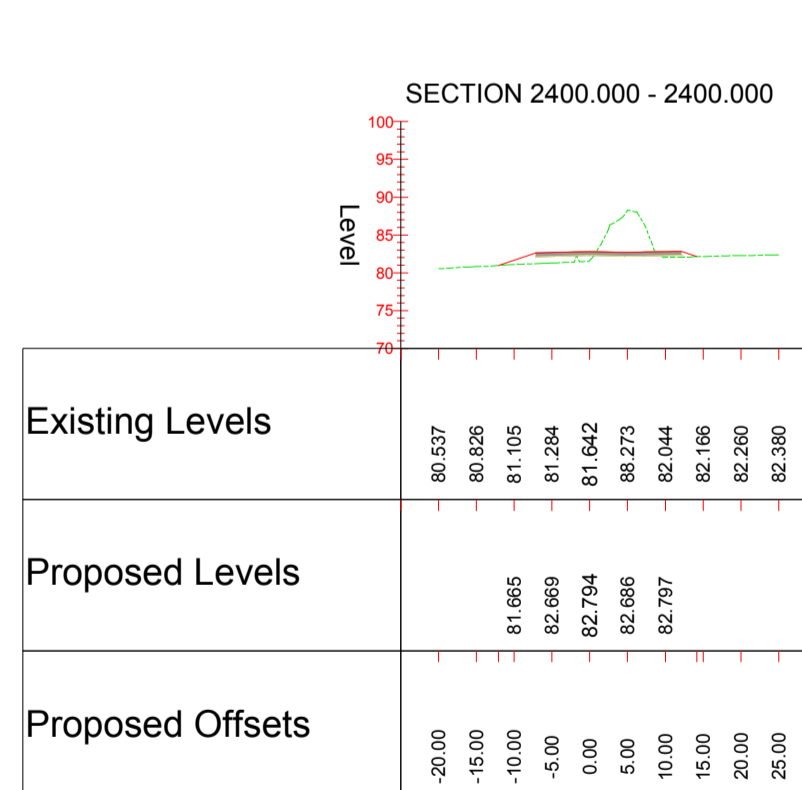
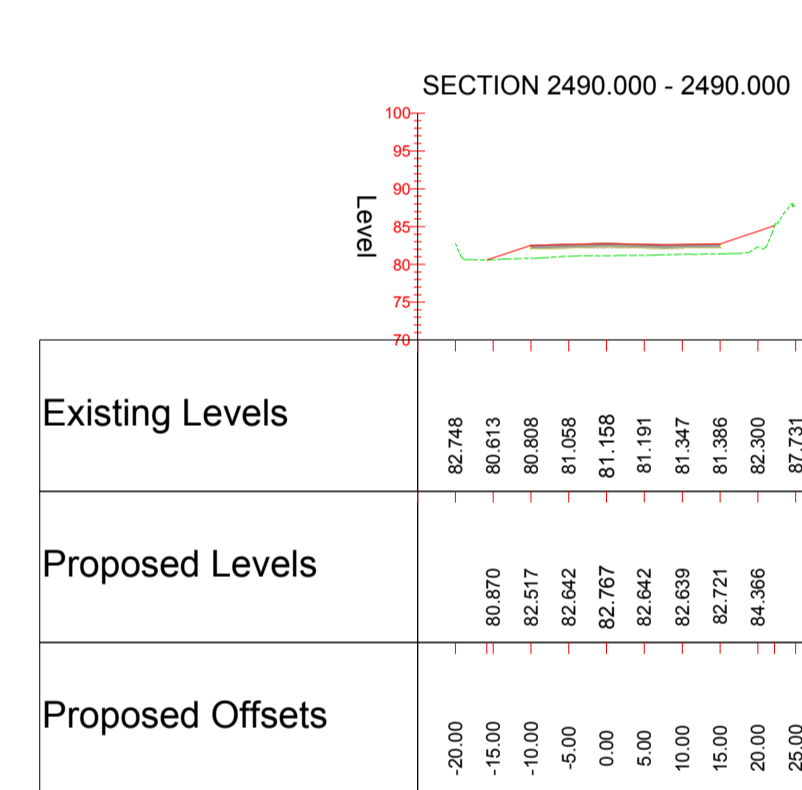
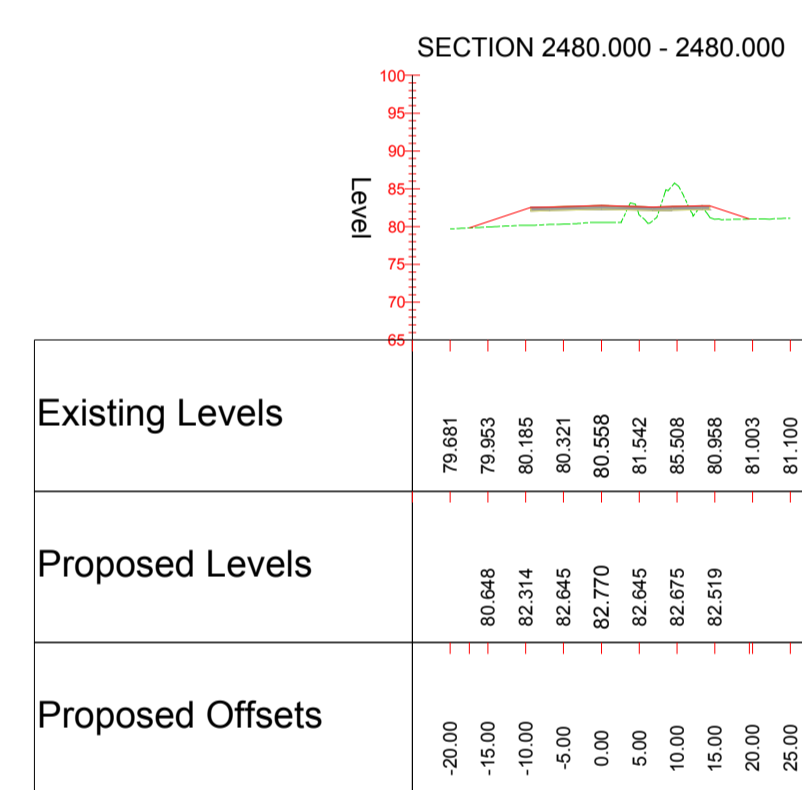
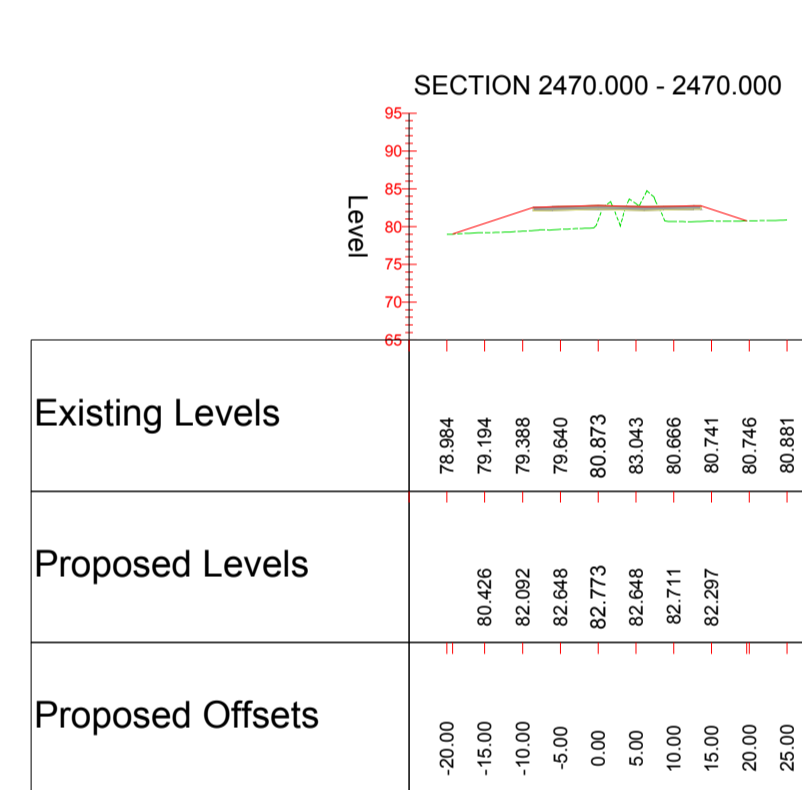
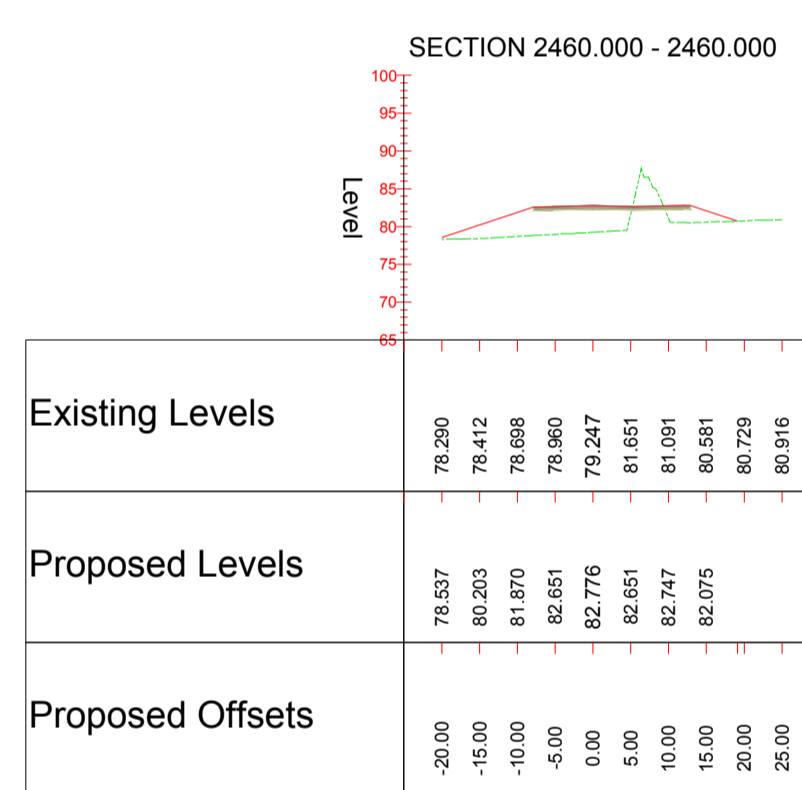
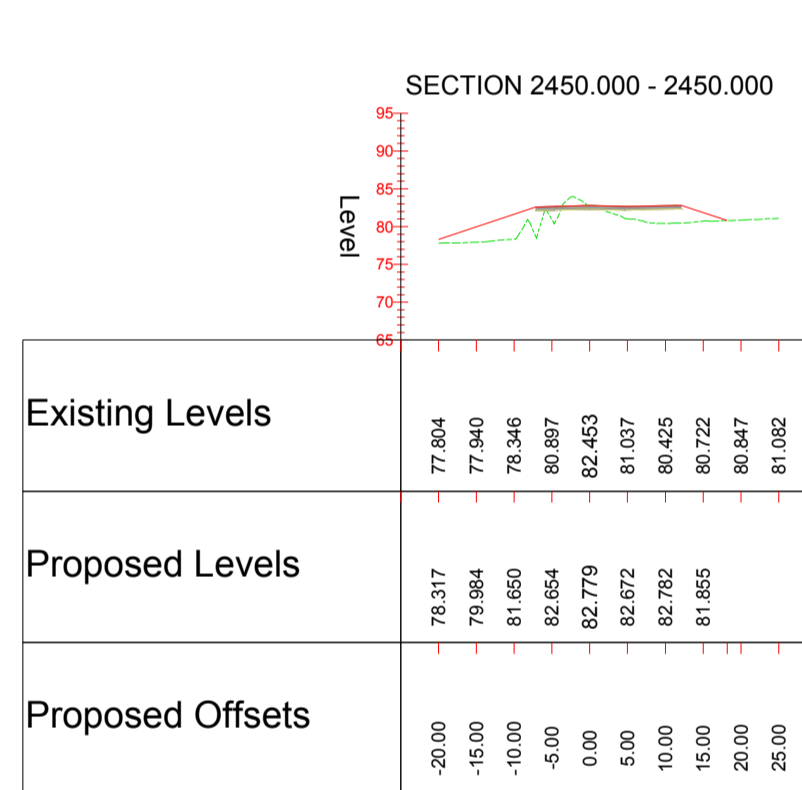
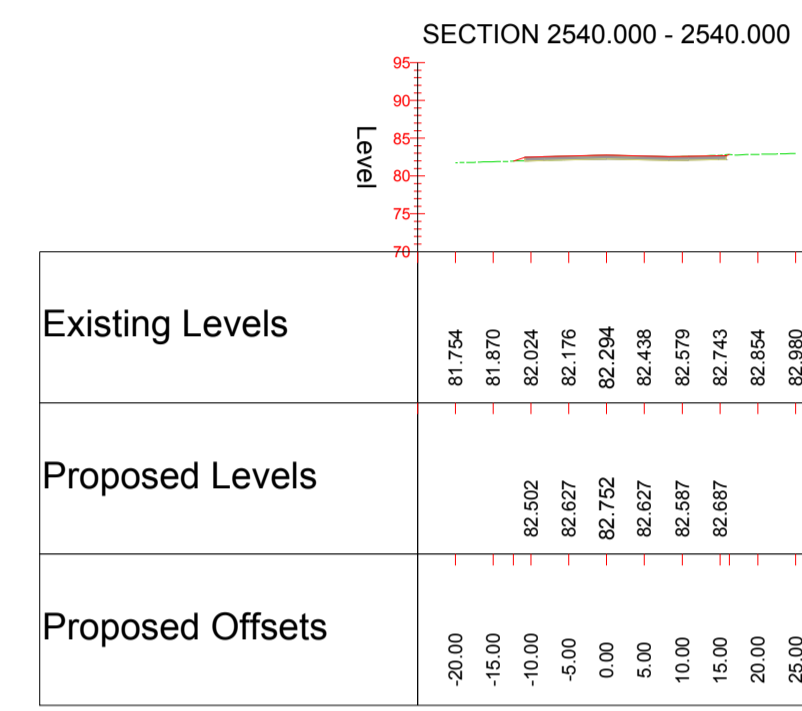
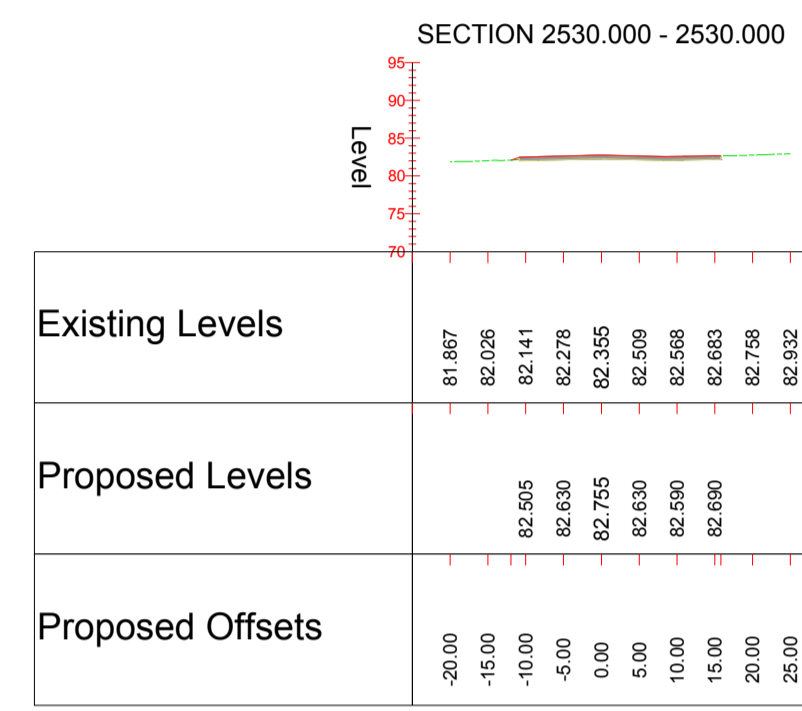
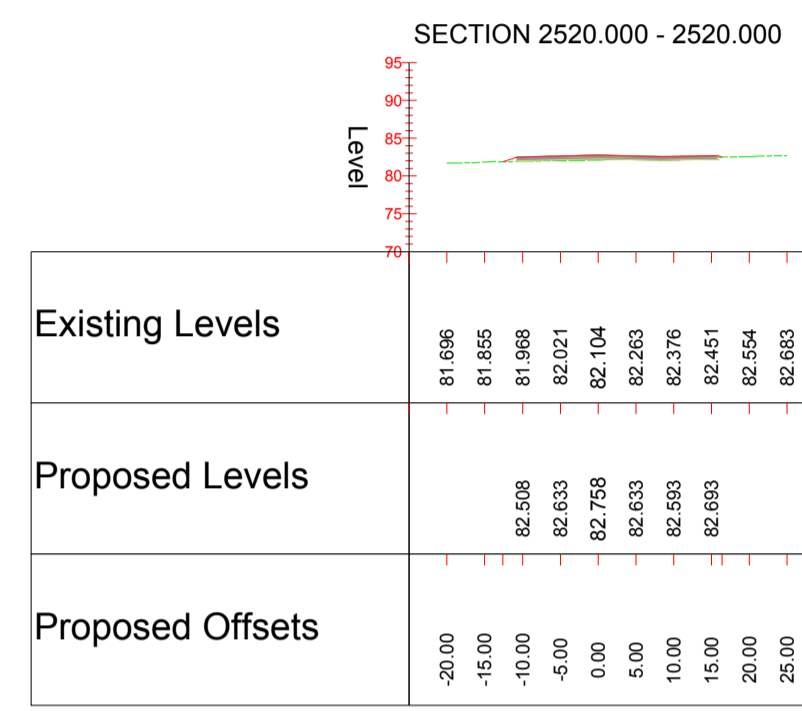
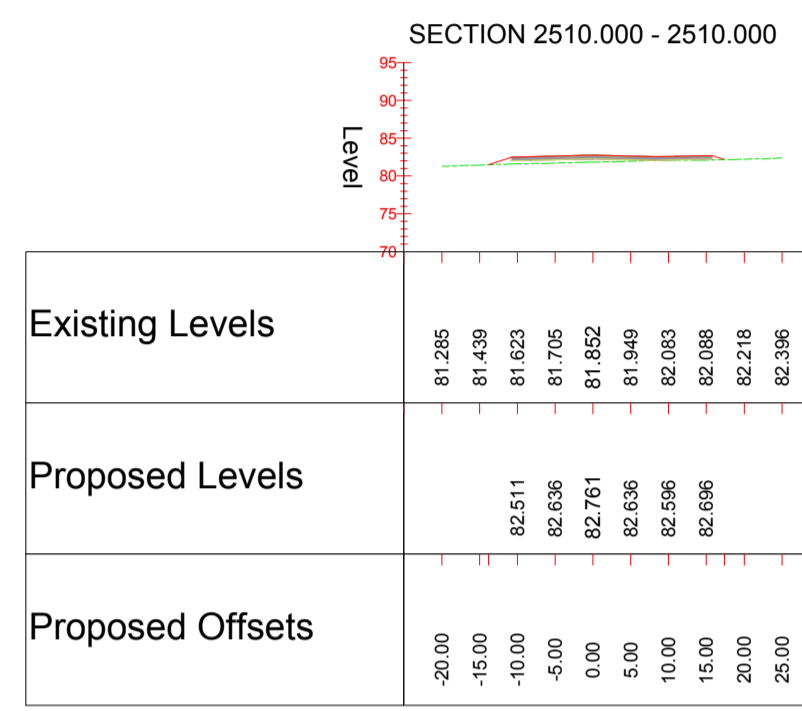
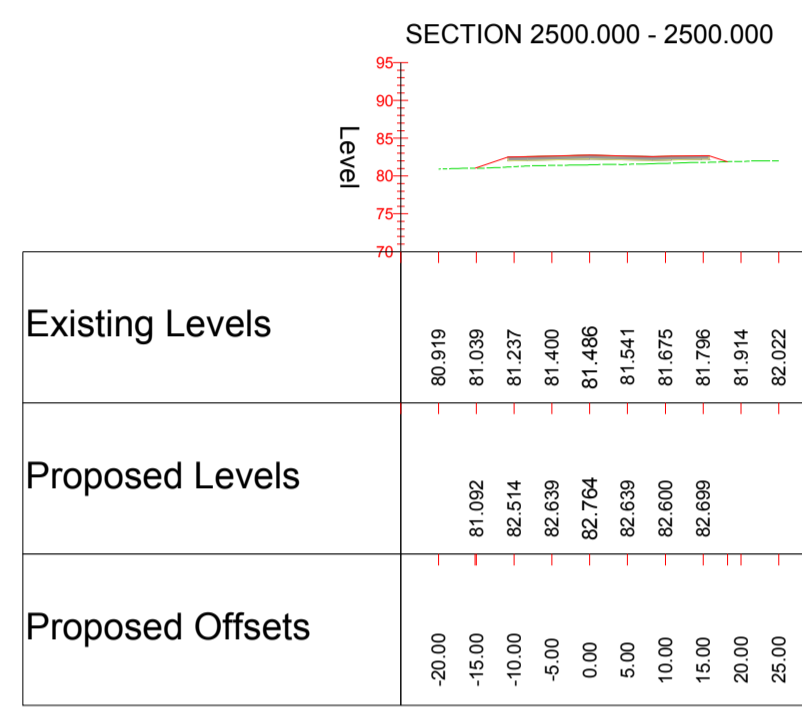
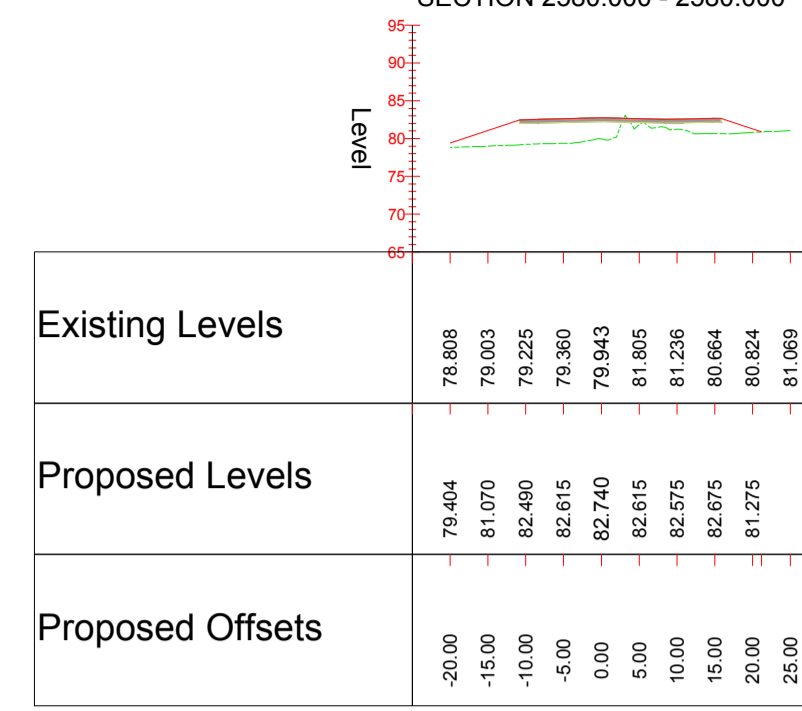
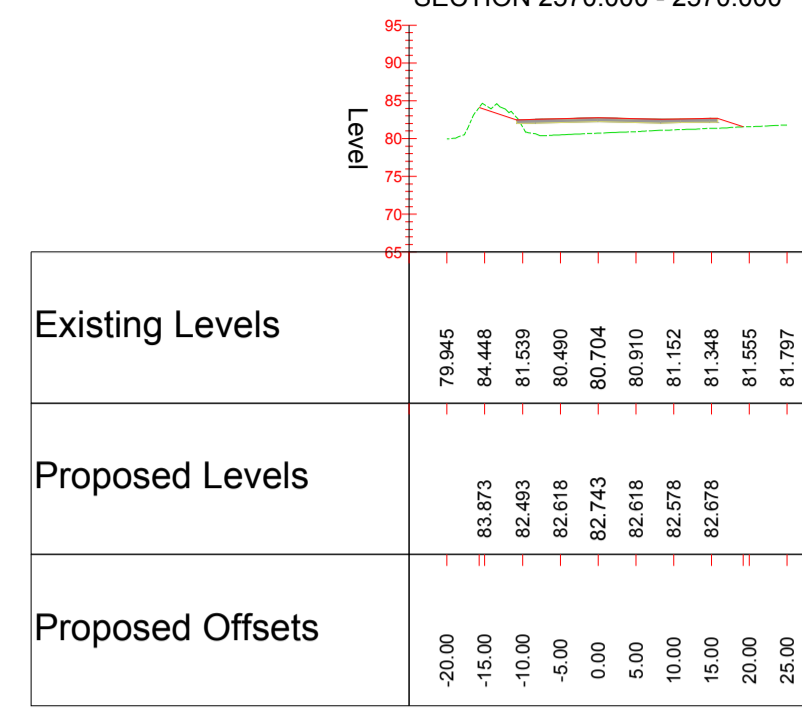
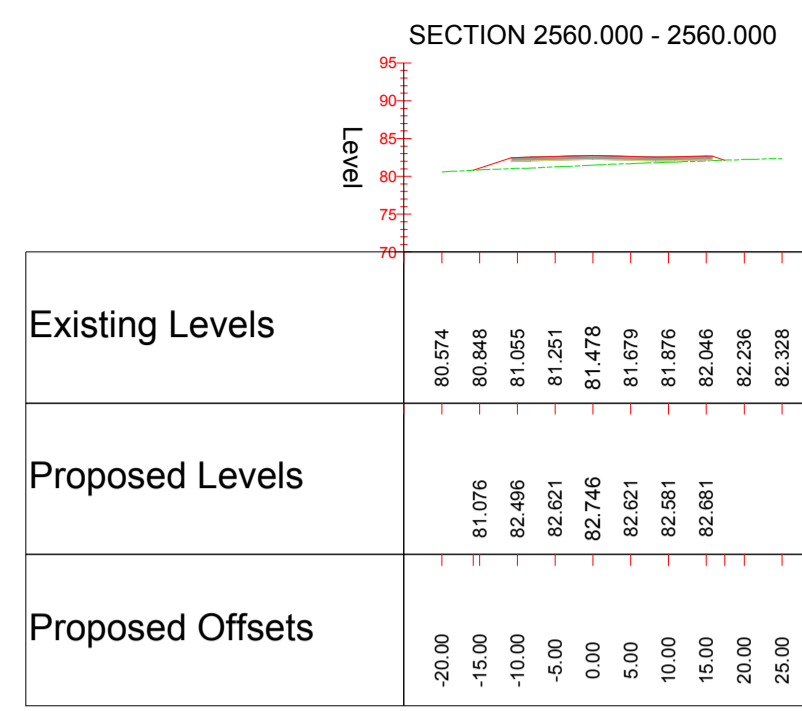
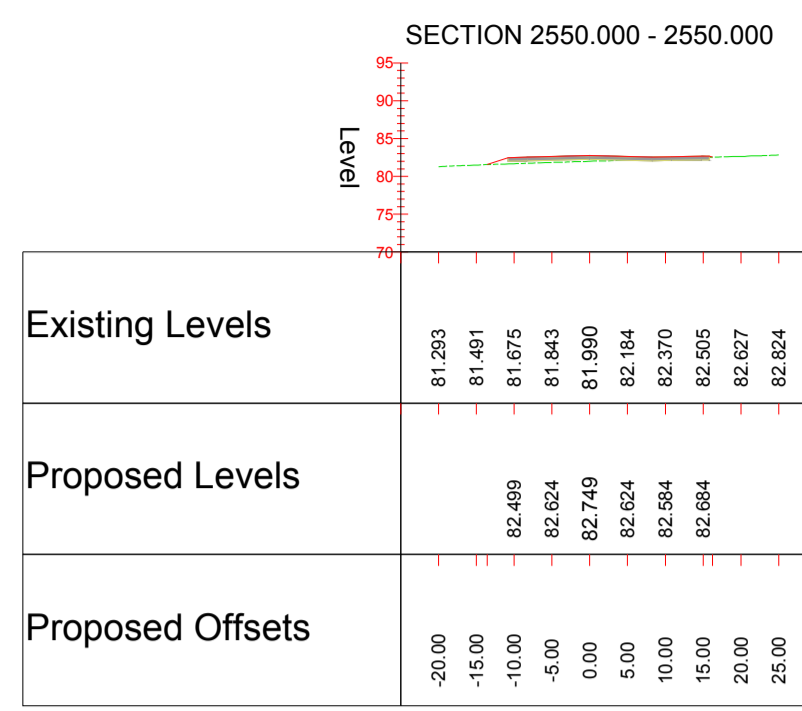
Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION			
NONE			
MAINTENANCE/CLEANING			
NONE			
DECOMMISSIONING/DEMOLITION			
NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF

Drawing Status		FOR INFORMATION		S2		Project Title	
ATKINS		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		WEST OF ENGLAND		WEST OF ENGLAND WP1	
Copyright © Atkins Limited (2014)		Client		Drawing Title		A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 12 19	
Scale 1:1000		Designed EC		Drawn		Checked AH	
Original Size A1		Date 05/02/18		Date 05/02/18		Date 05/02/18	
Drawing Number HA PIN		Woe		Volume		Project Ref. No. 0000000	
WP1		- DR - D - 6015		Revision		P1	
Location		Type		Role		Number	

CROSS SECTIONS  
Scale 1:1000



Key:	
Notes:	

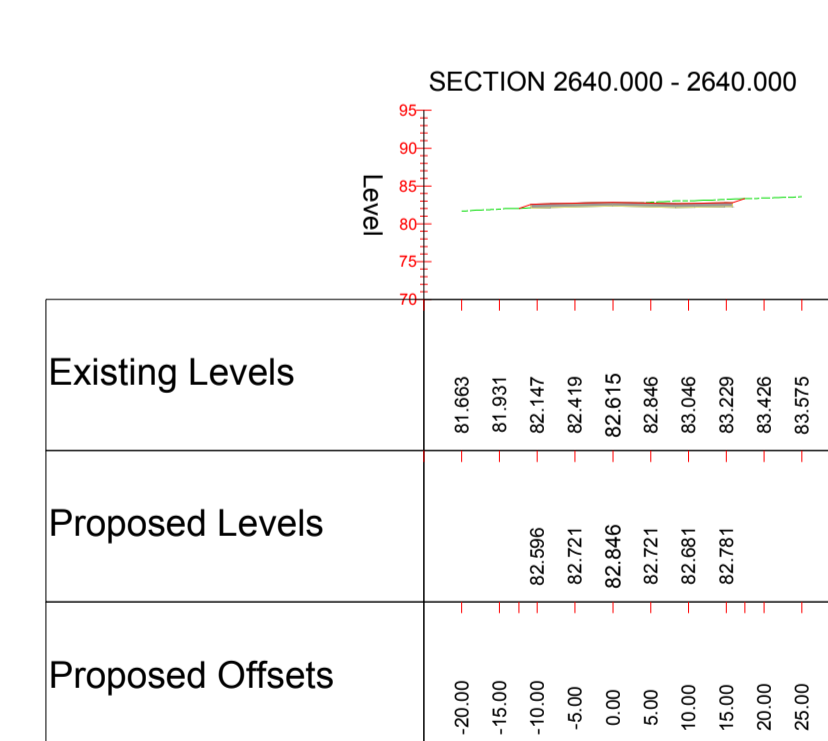
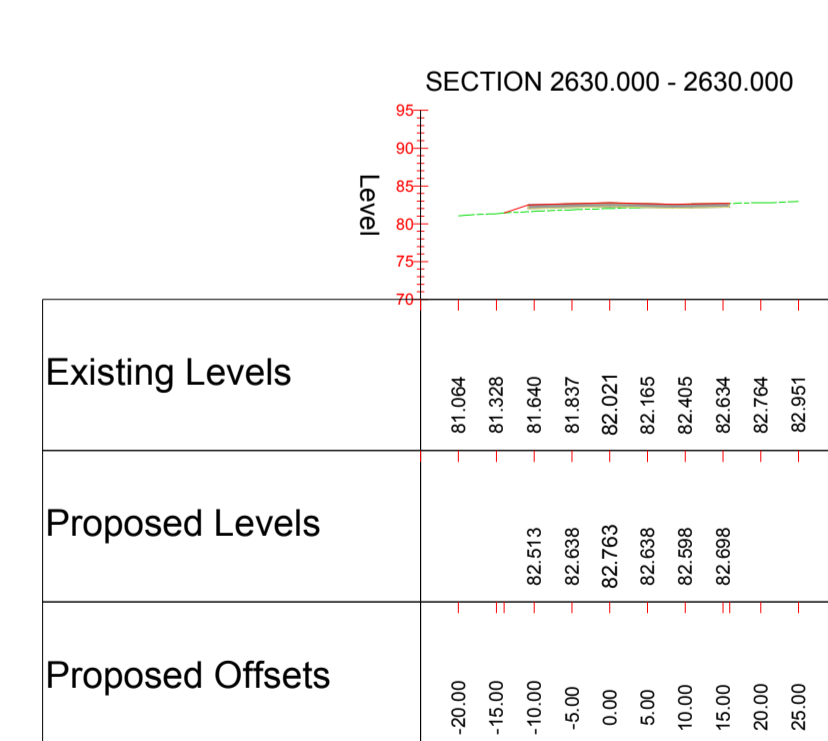
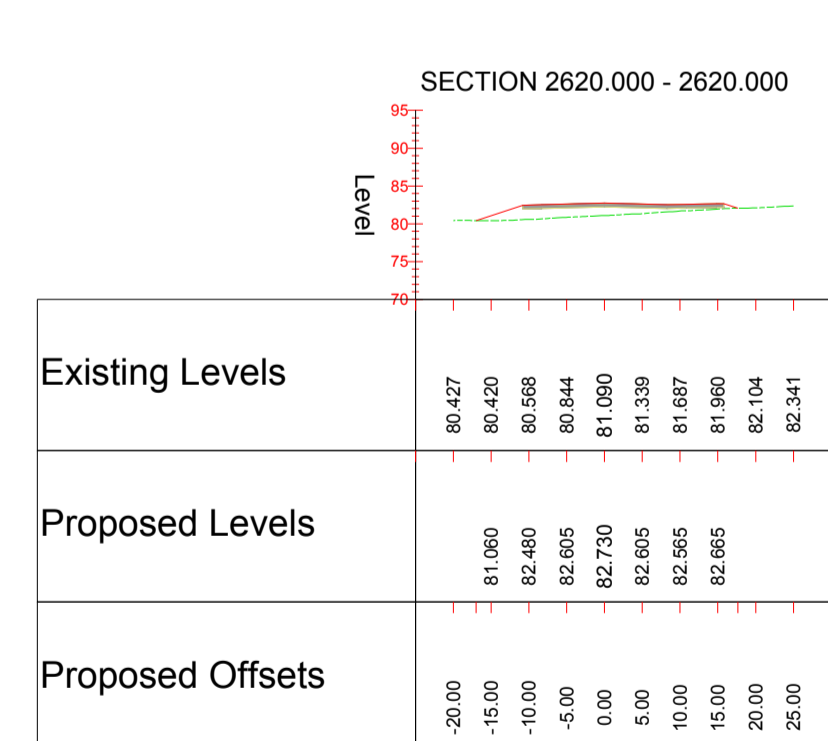
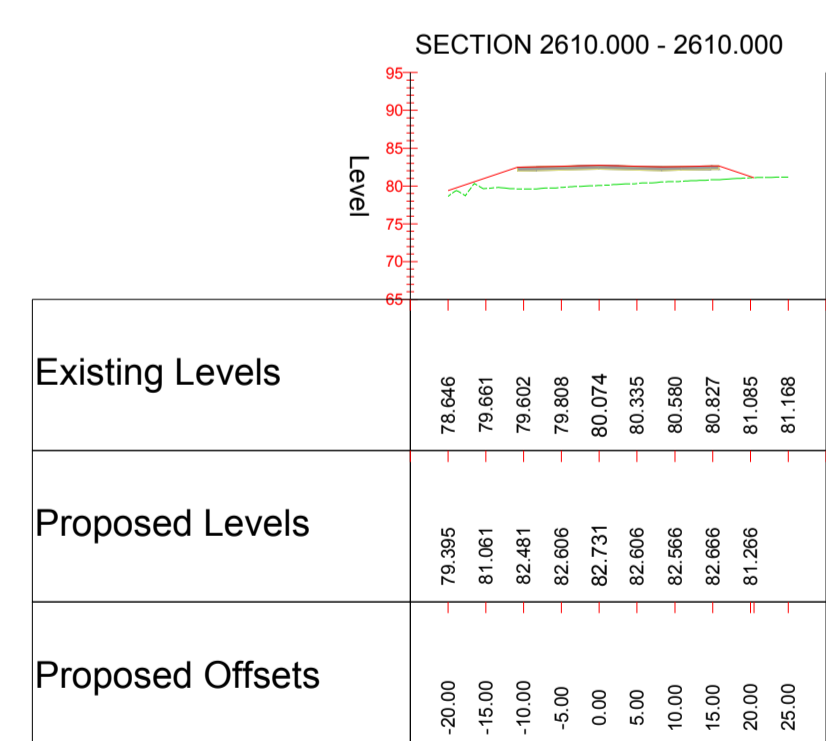
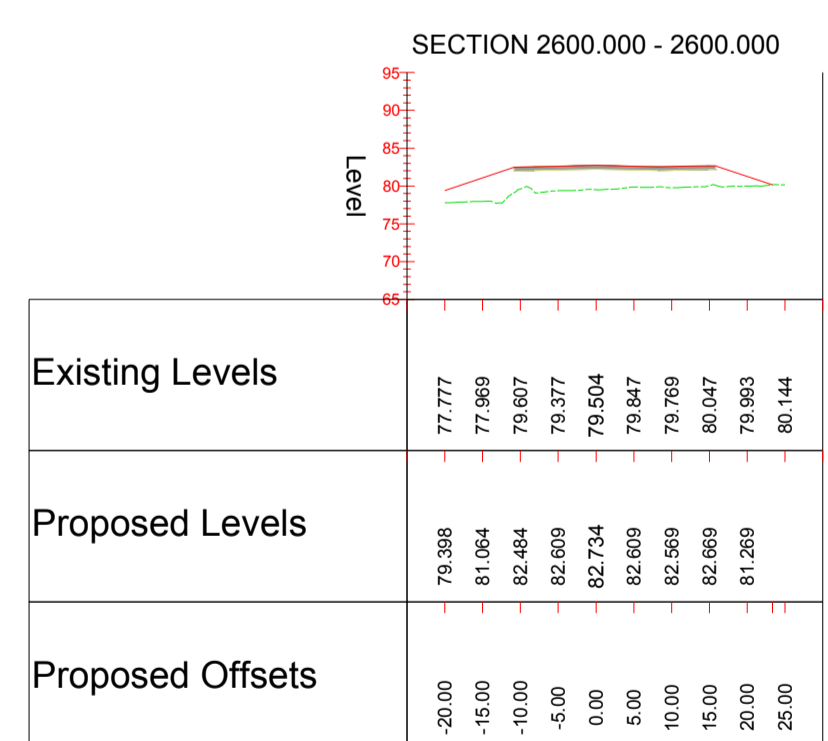
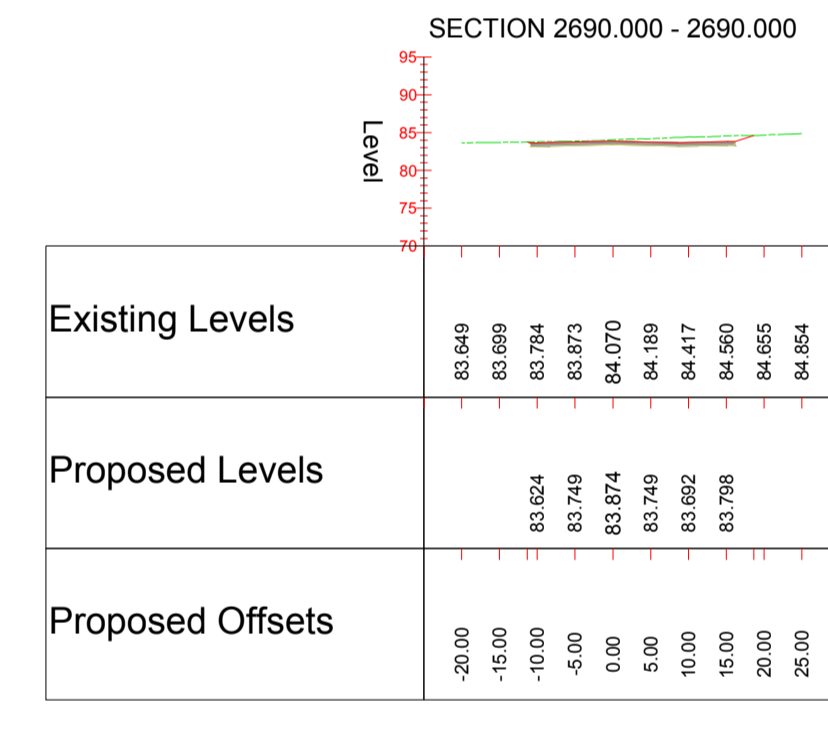
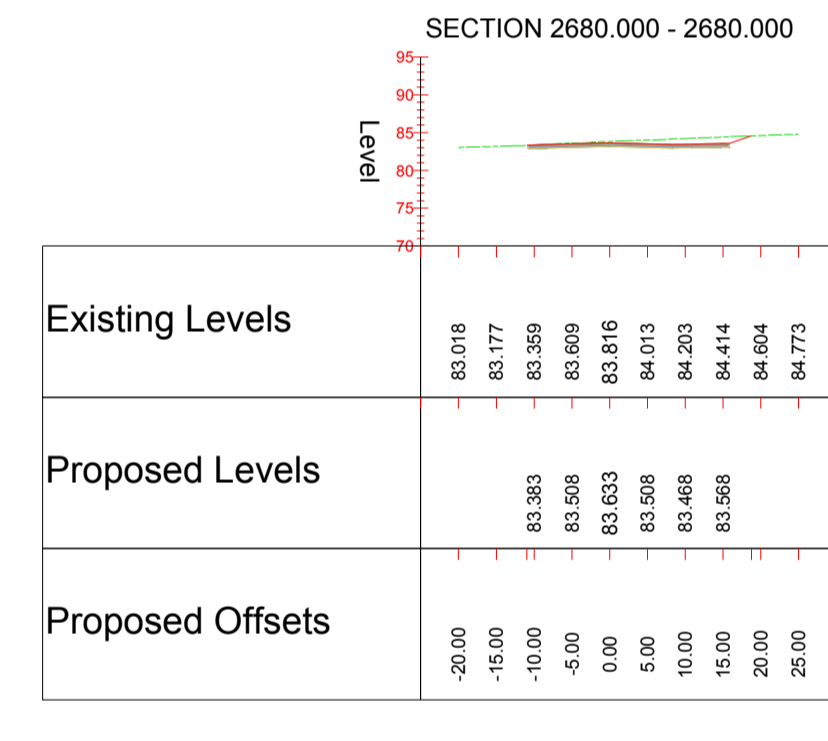
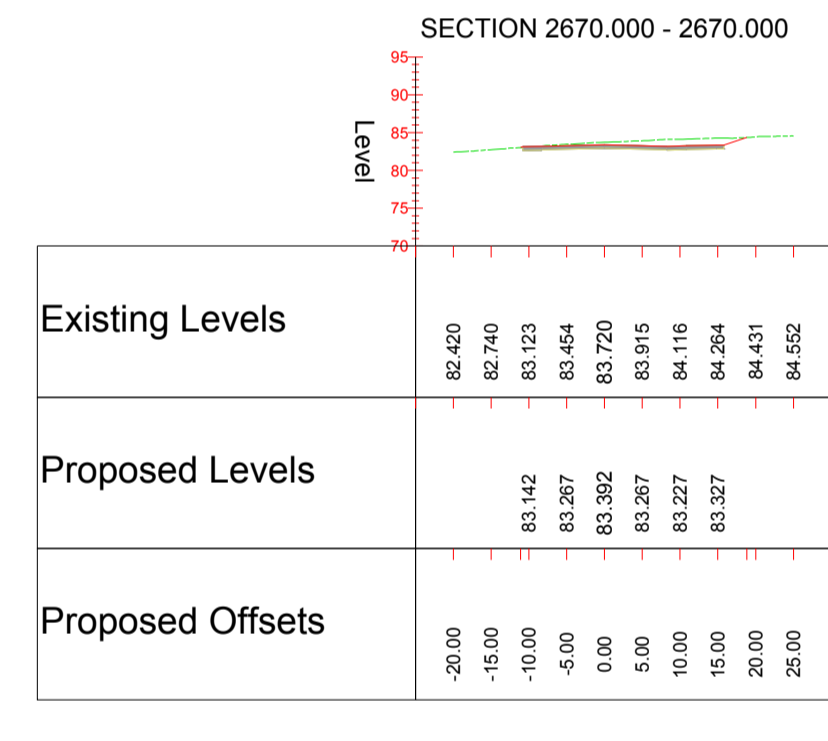
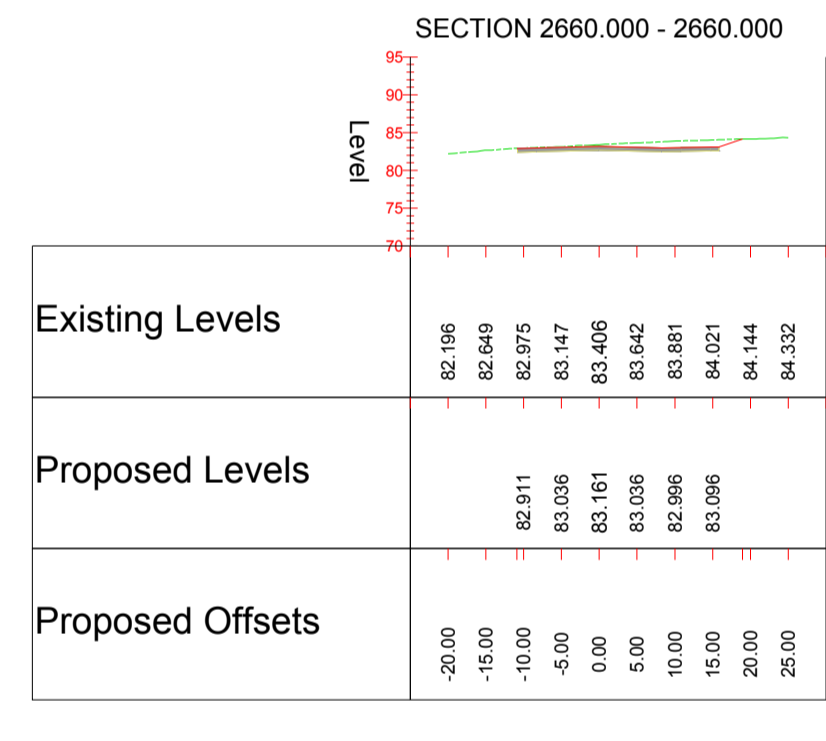
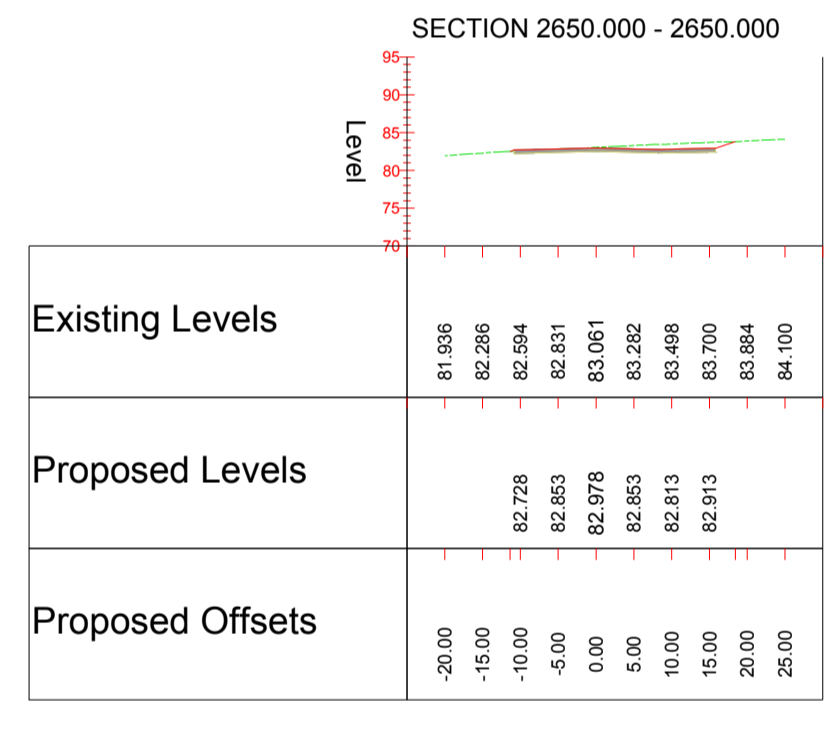
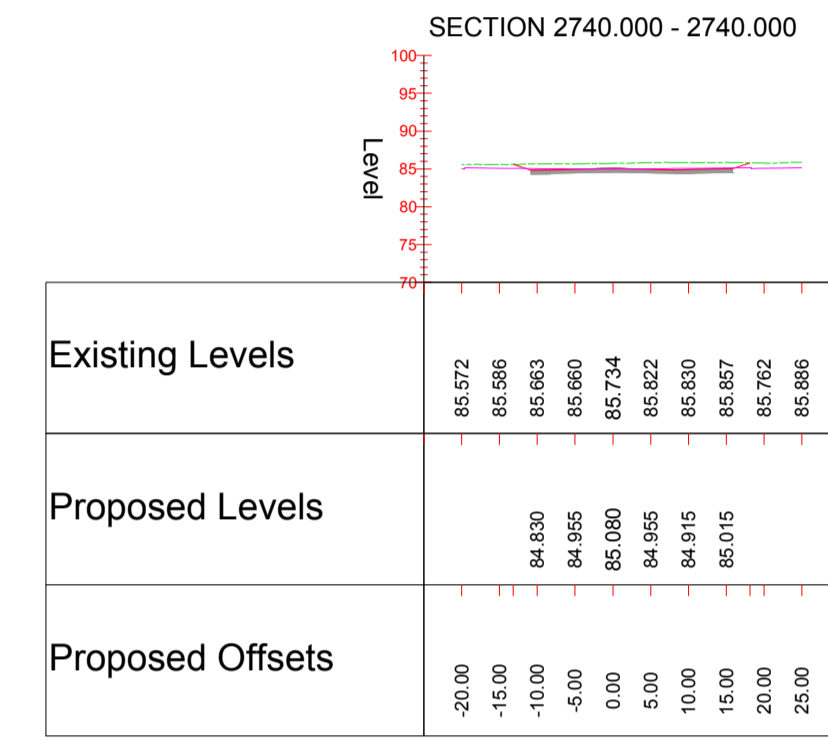
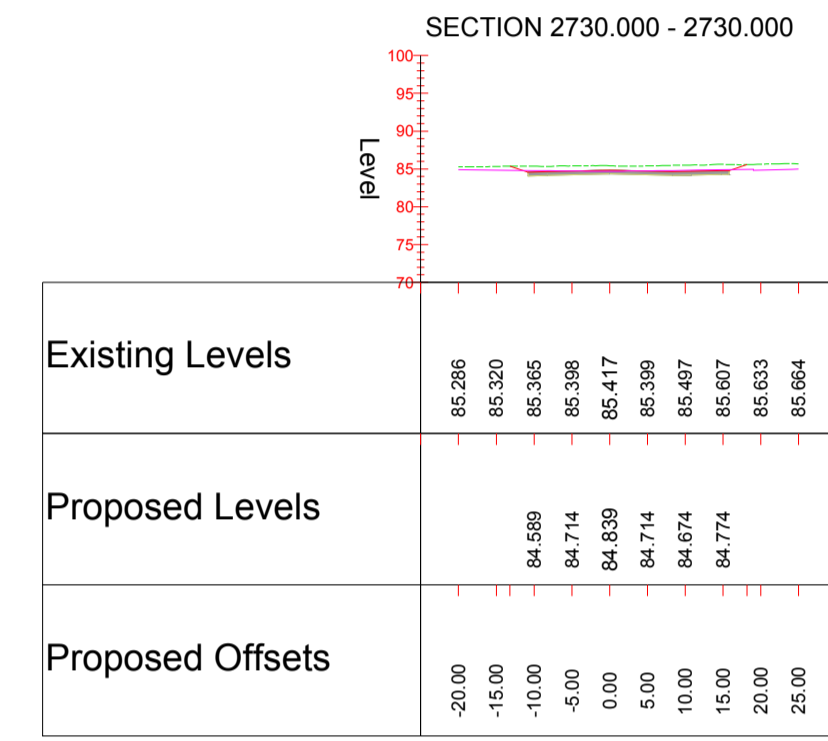
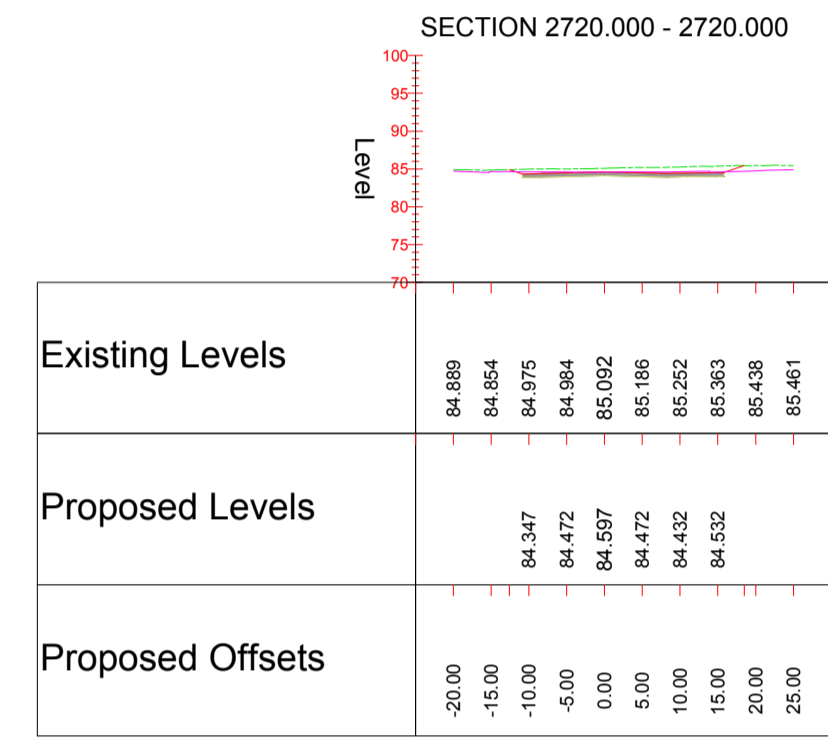
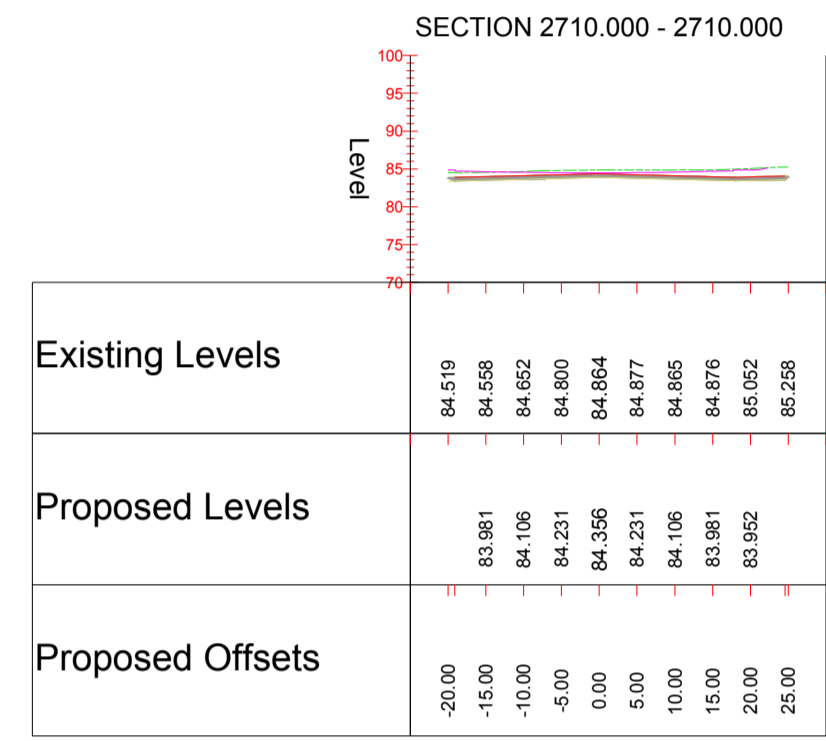
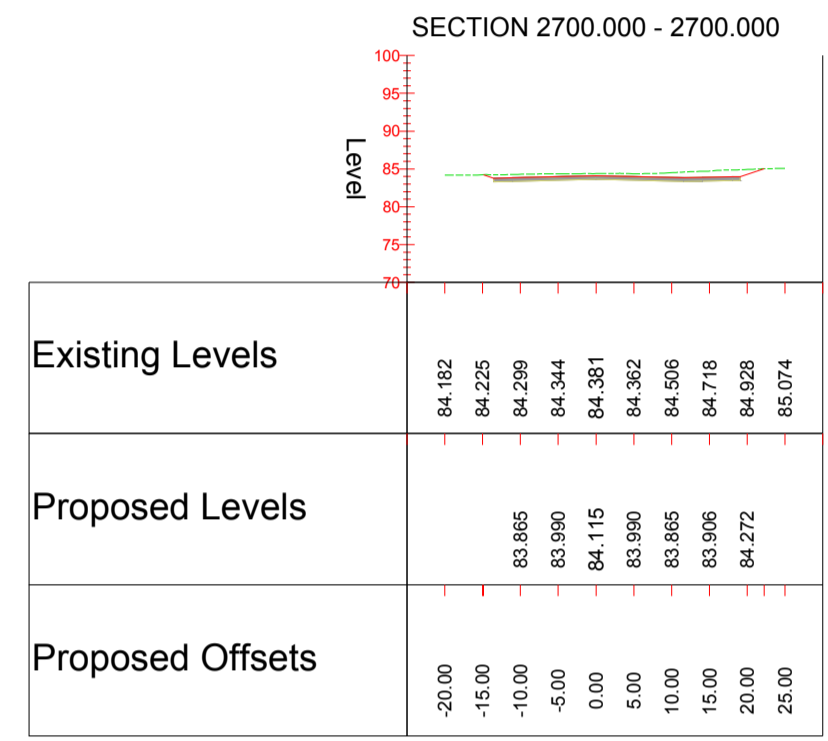
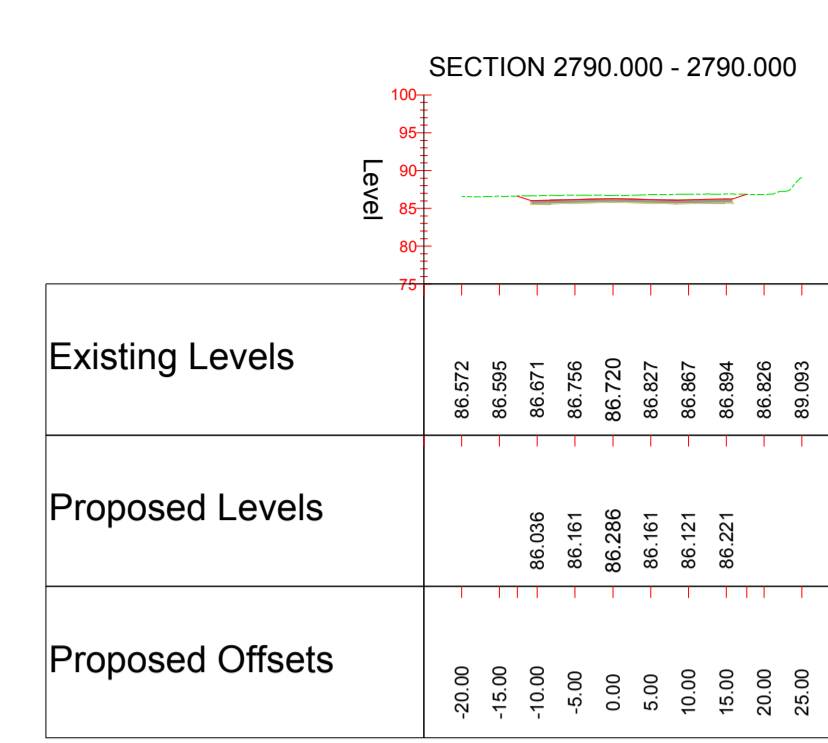
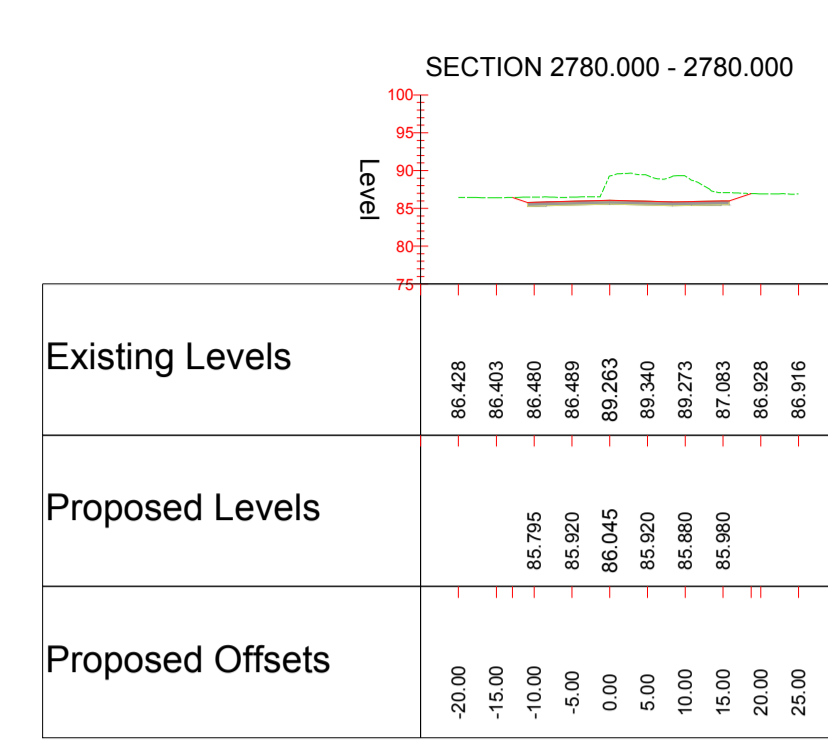
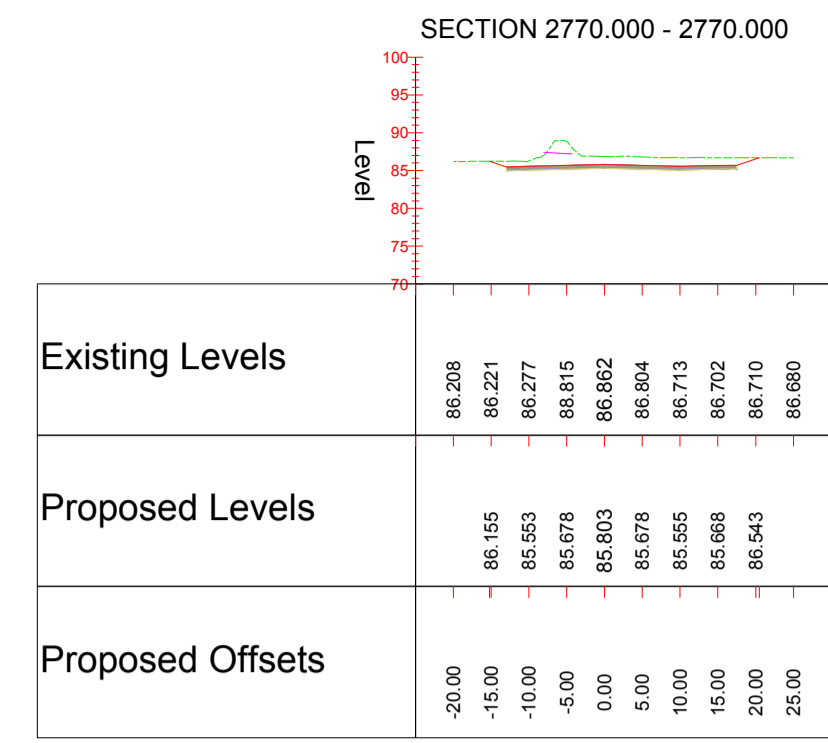
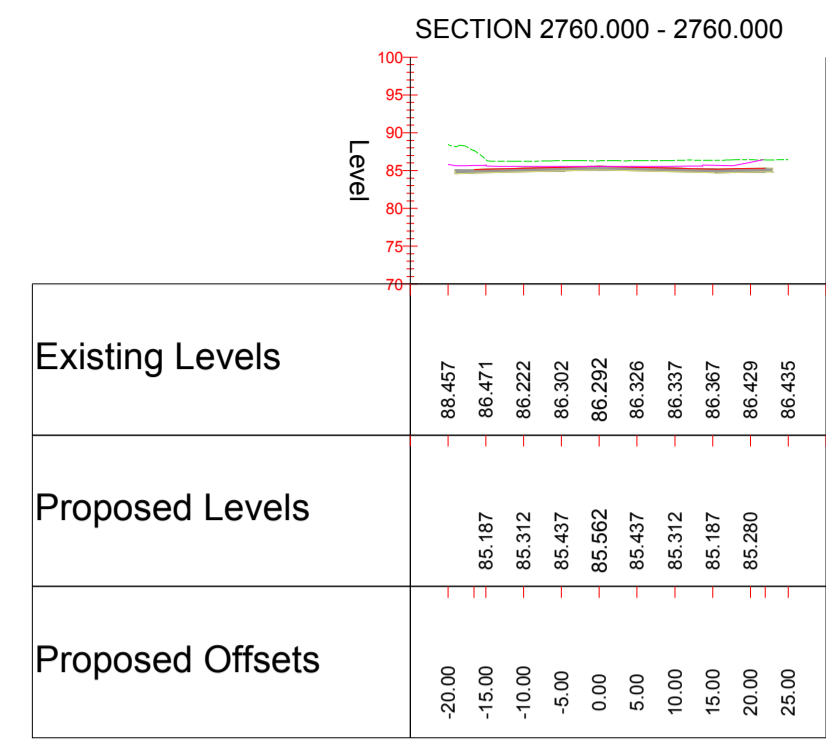
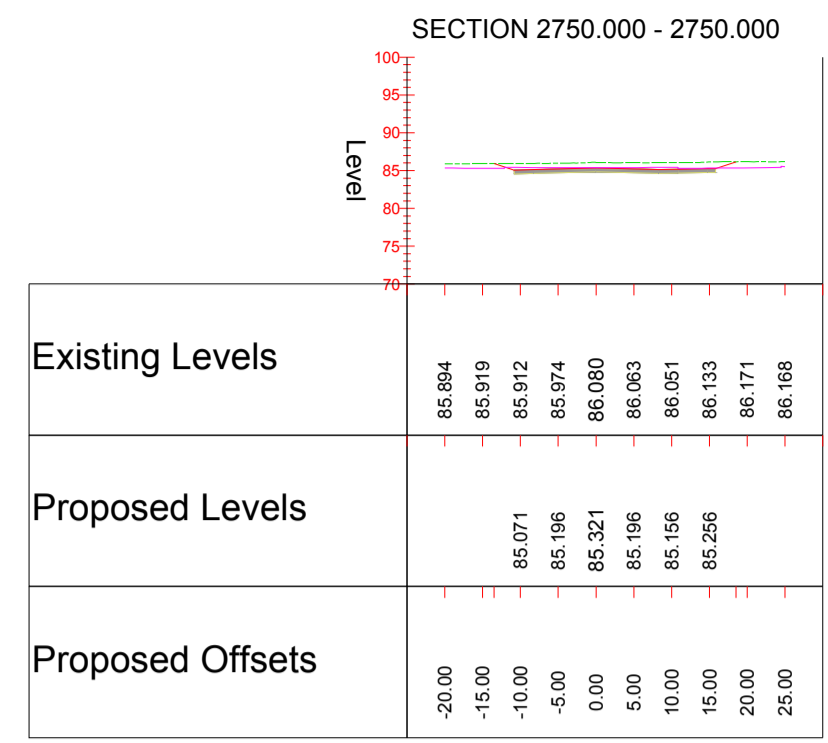
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION	NONE		
MAINTENANCE/CLEANING	NONE		
DECOMMISSIONING/DEMOLITION	NONE		
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			
Rev.	Date	Description	By
P1	05.02.18	DRAWING CREATED	AF

Project Ref. No.	0000000
Revision	P1

**FOR INFORMATION**  
  
 The Hub  
 500 Park Avenue  
 Aztec West  
 Almondsbury  
 Bristol  
 BS32 4RZ  
 Tel: +44 (0)1454 662000  
 Fax: +44 (0)1372 663333  
 www.atkinsglobal.com  
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Drawing Status	S2	Project Title	WEST OF ENGLAND WP1			
Drawing Title	A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 12 19					
Scale	1:1000	Designed	EC	Drawn	Checked	Authorised
Original Size	A1	Date	05/02/18	Date	05/02/18	Date
Drawing Number	HA PIN	Originator	Volume	Project Ref. No.	Revision	
WP1	Woe	ATK	HGN	0000000	P1	
Location	WP1	Type	DR - D	Number	6016	

CROSS SECTIONS  
Scale 1:1000



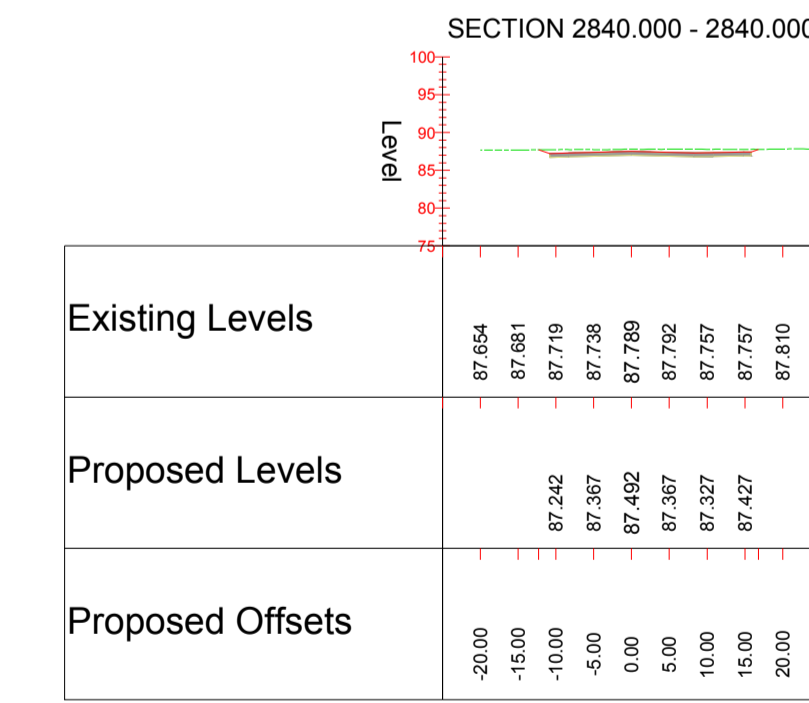
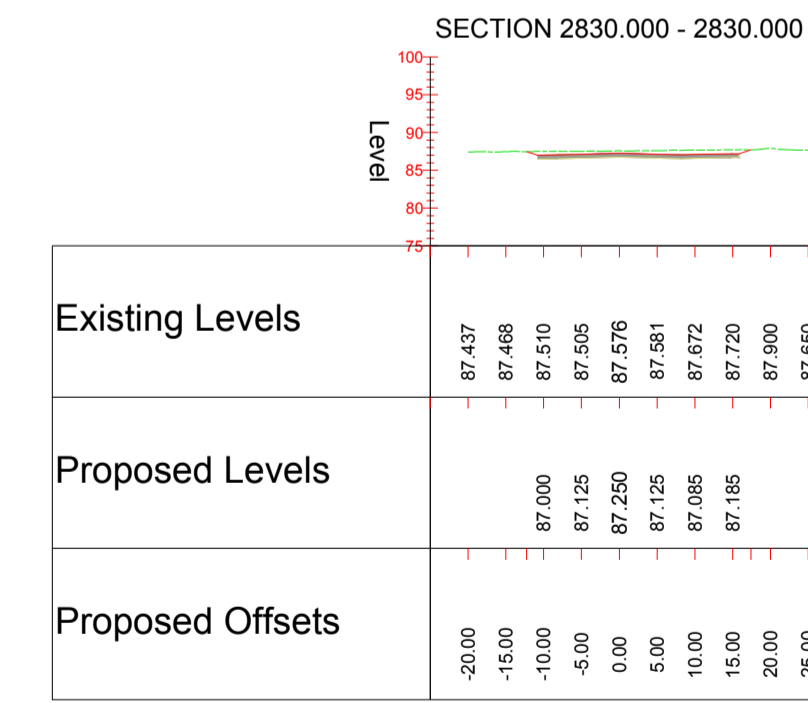
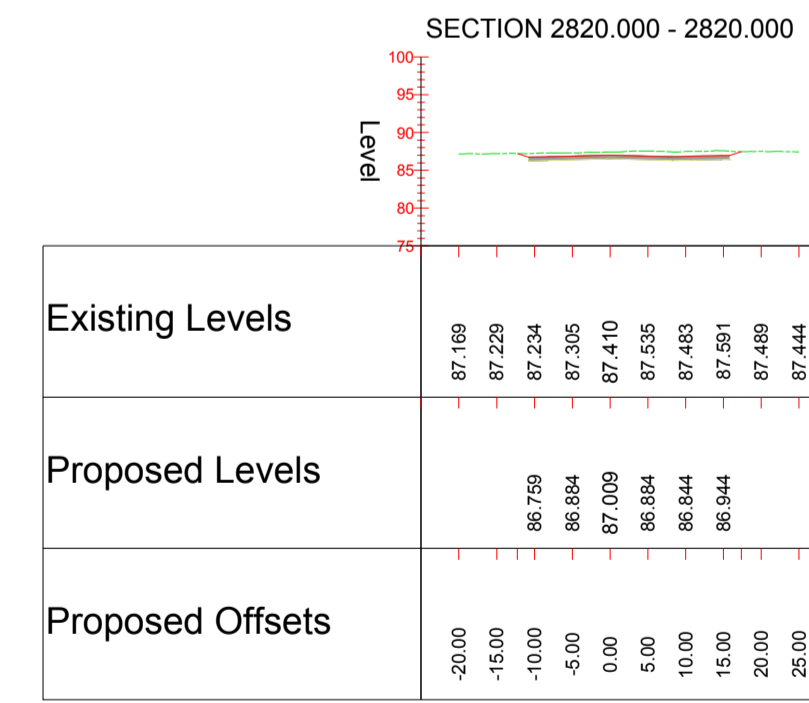
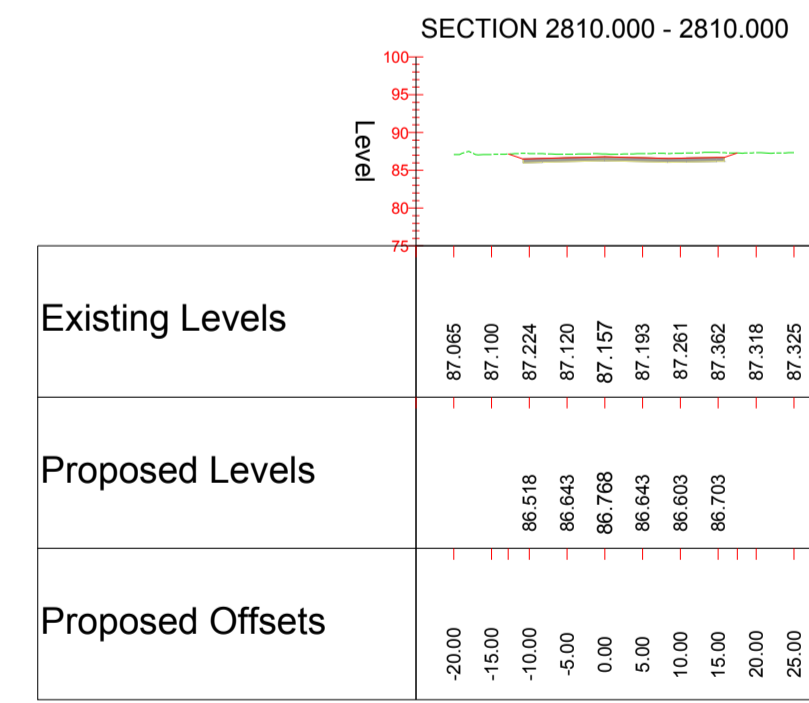
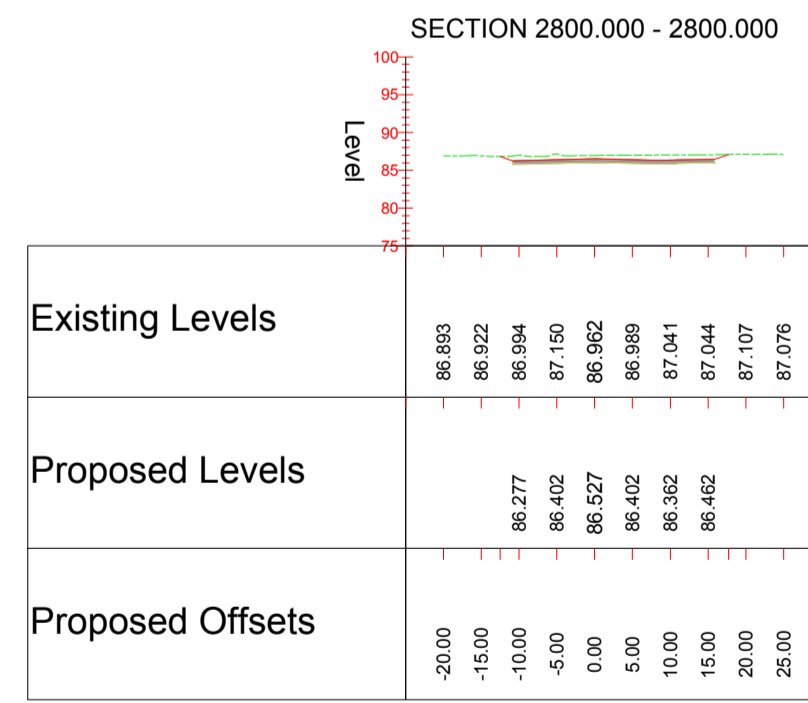
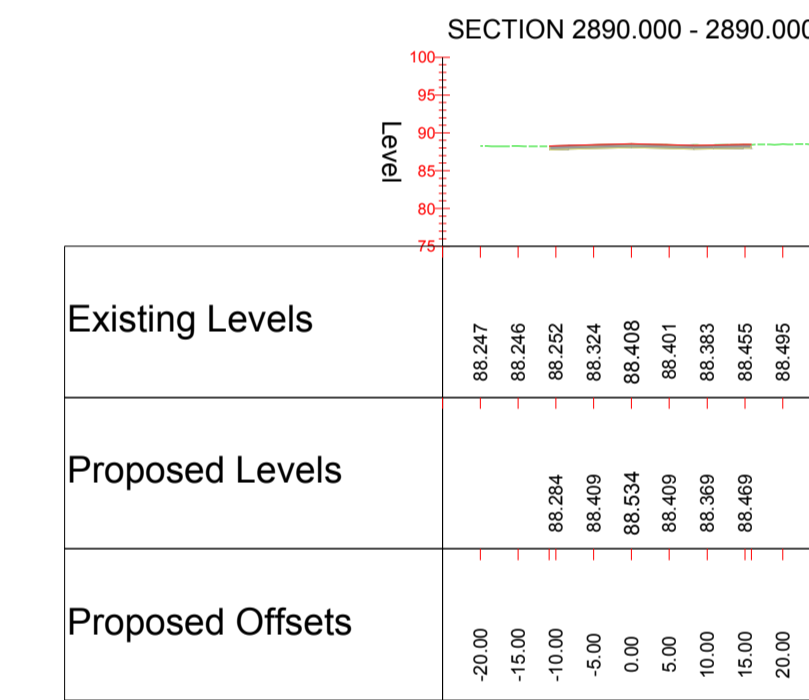
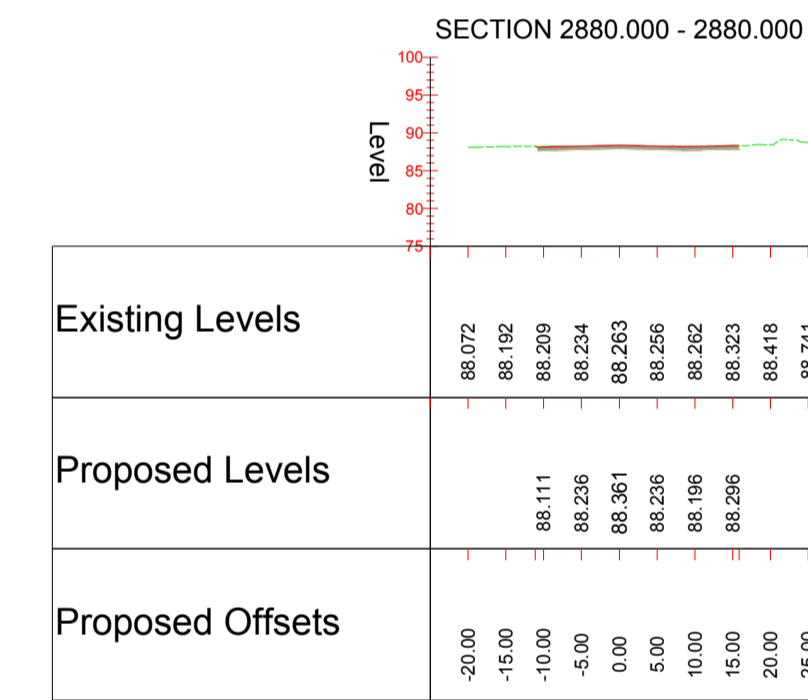
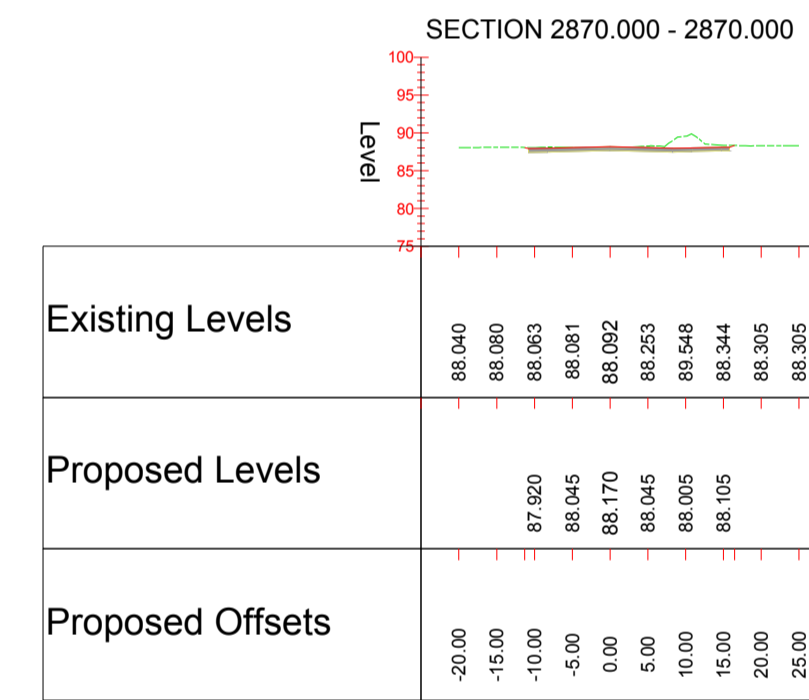
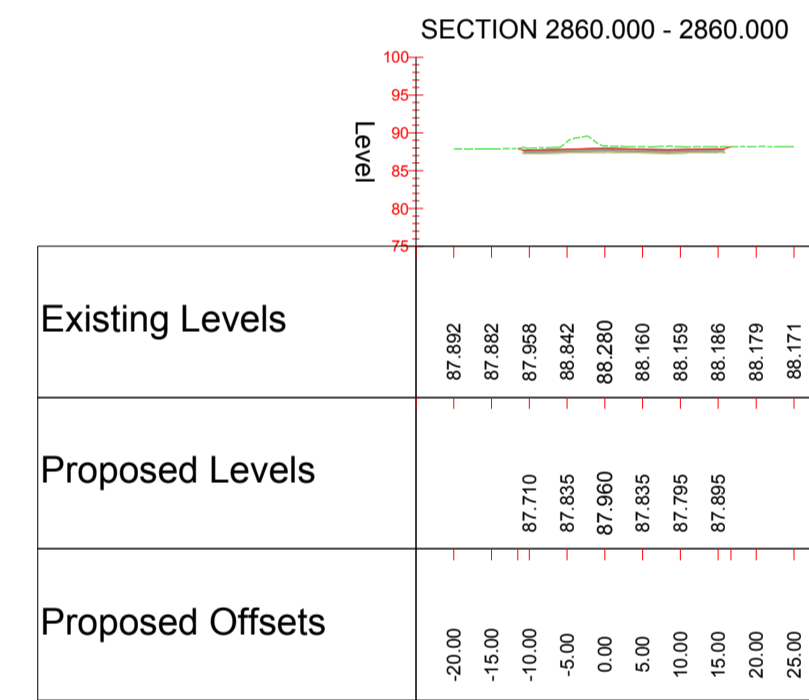
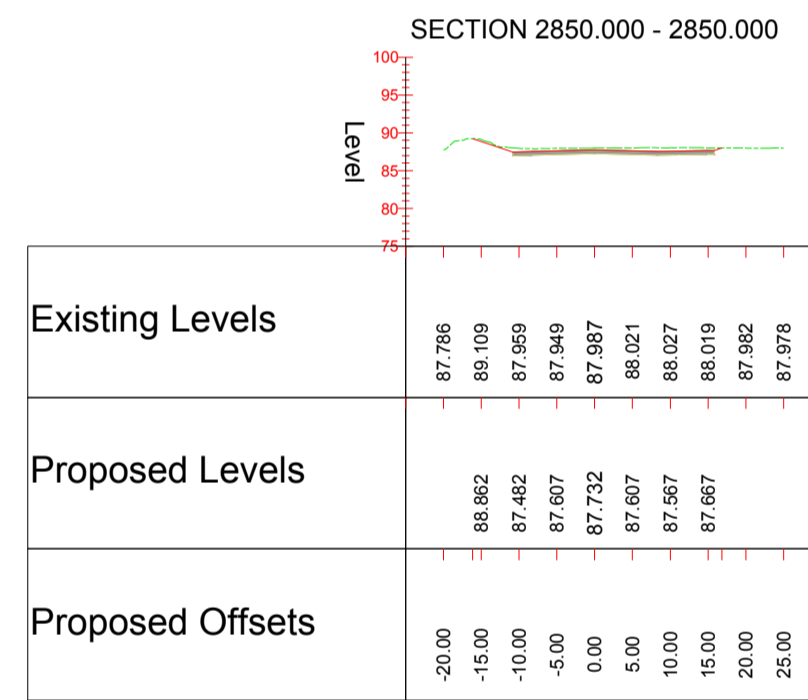
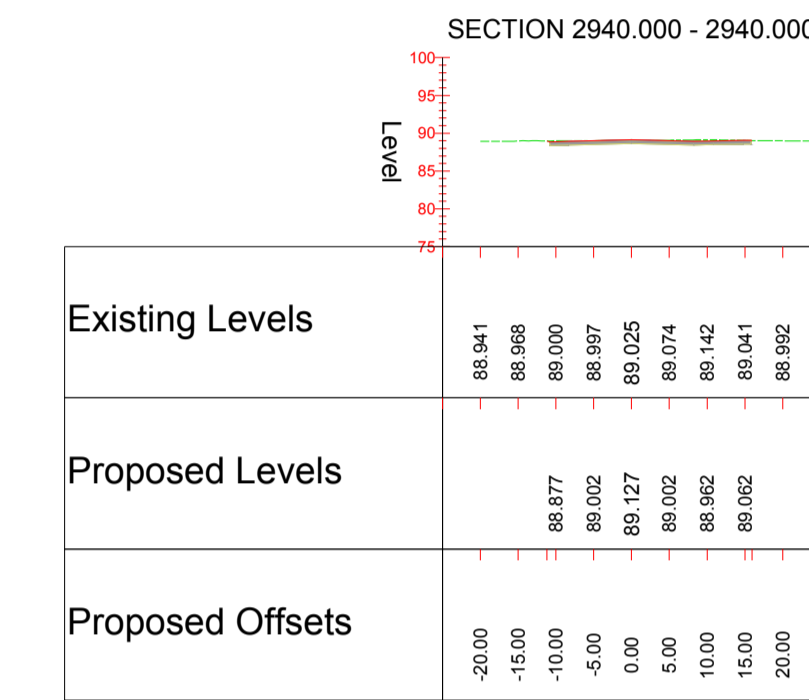
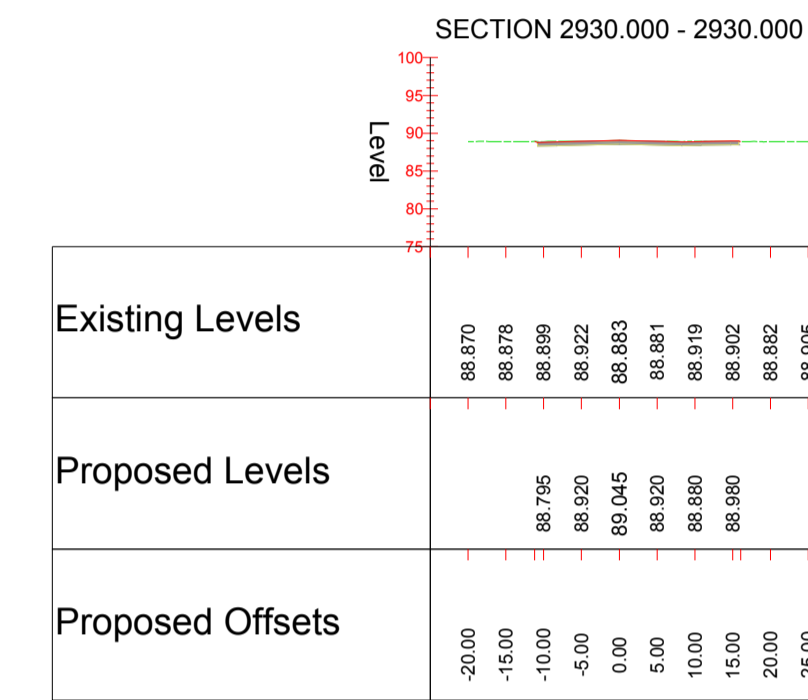
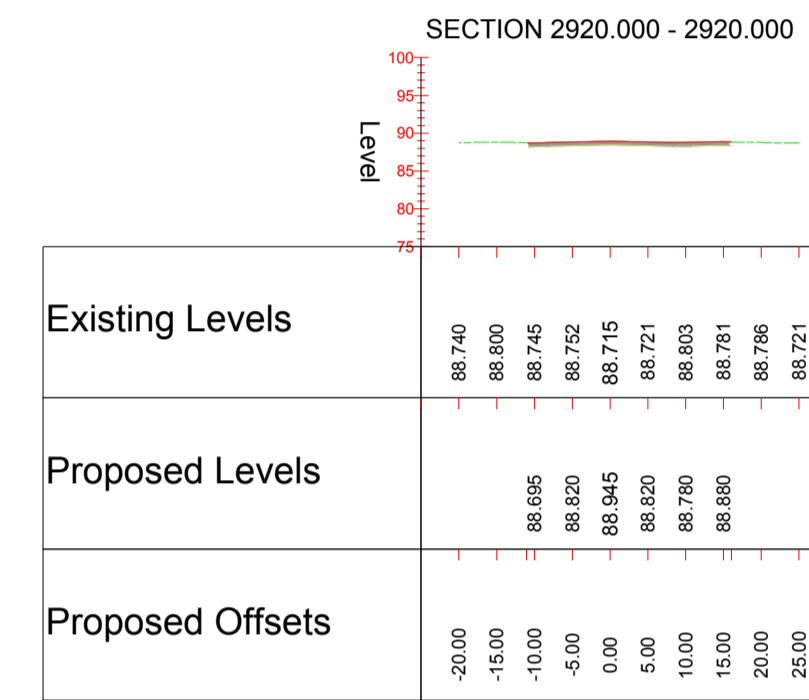
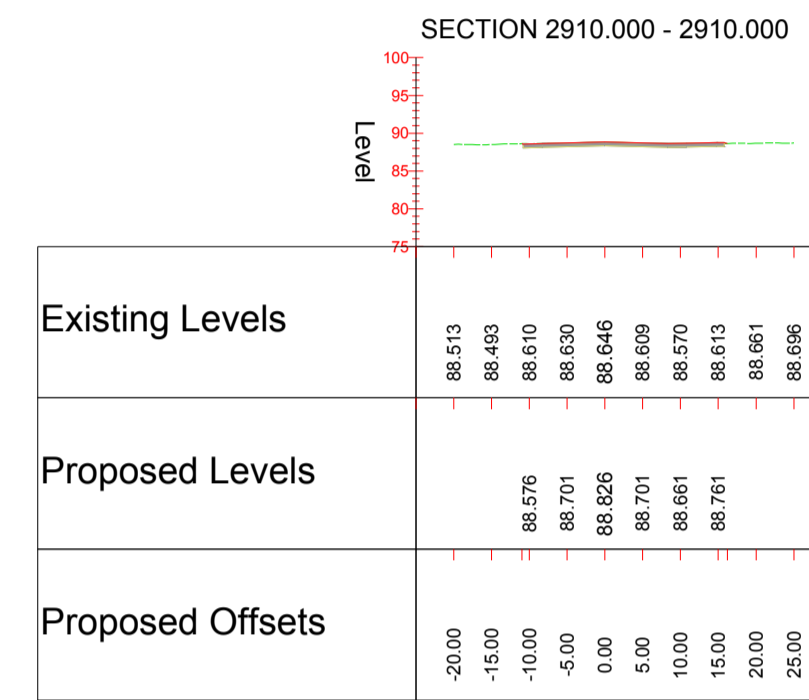
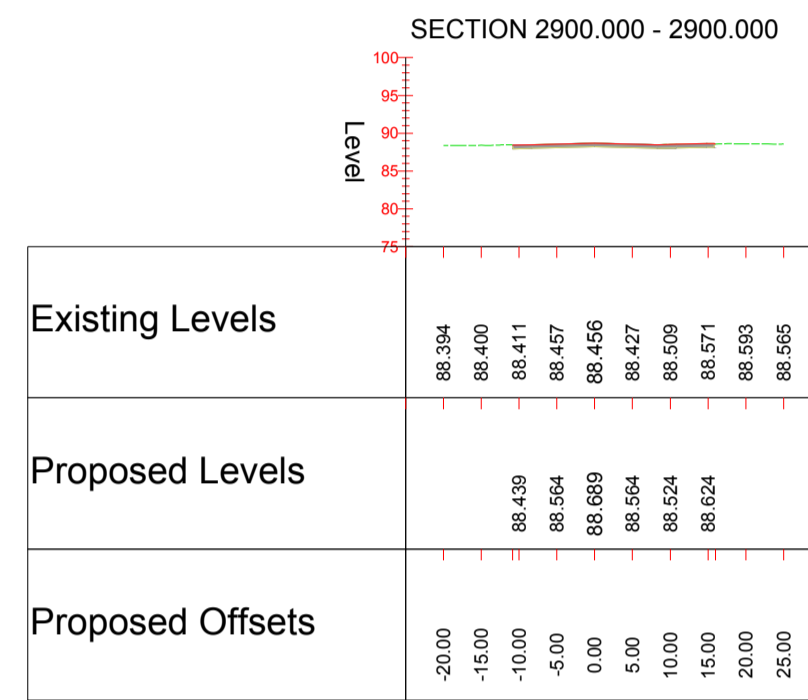
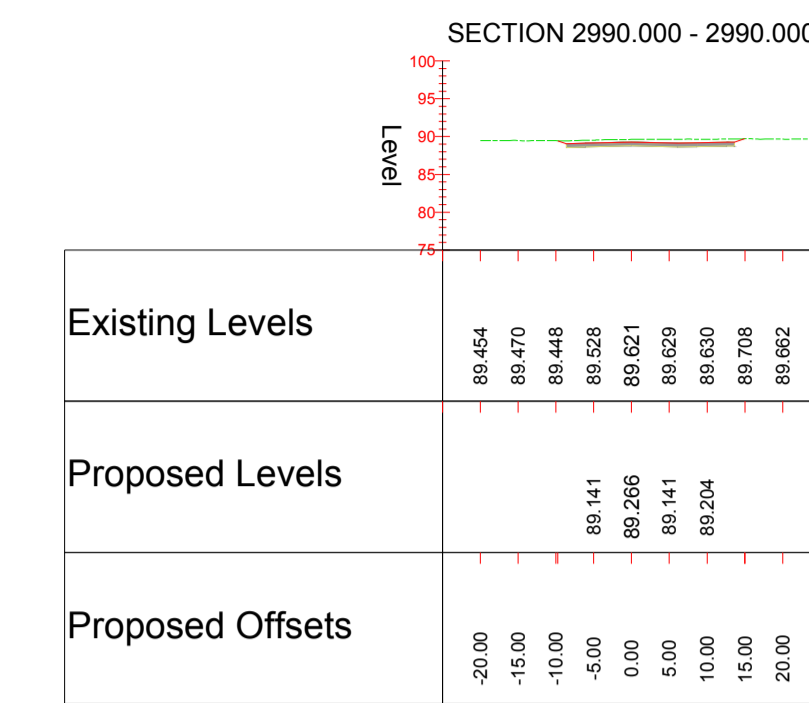
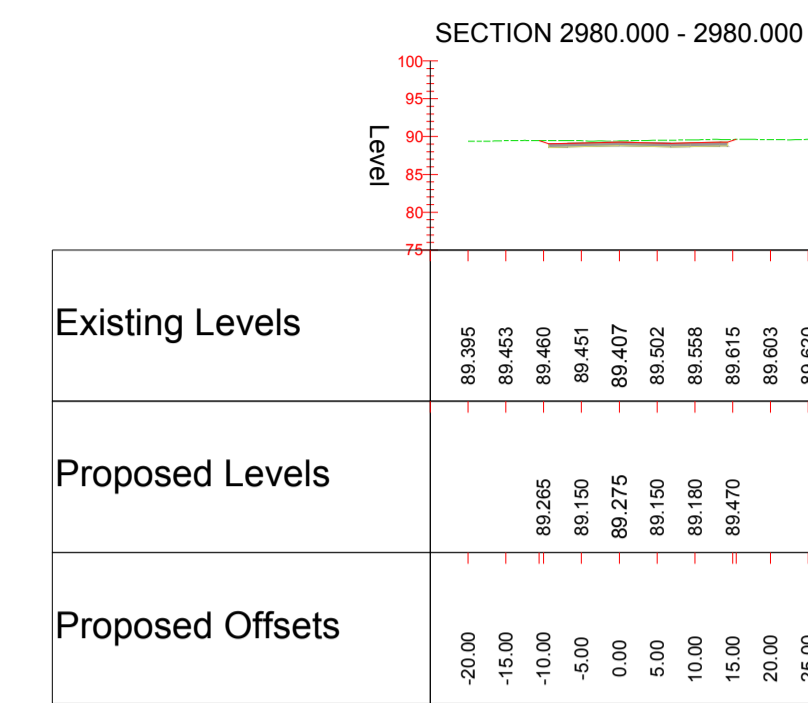
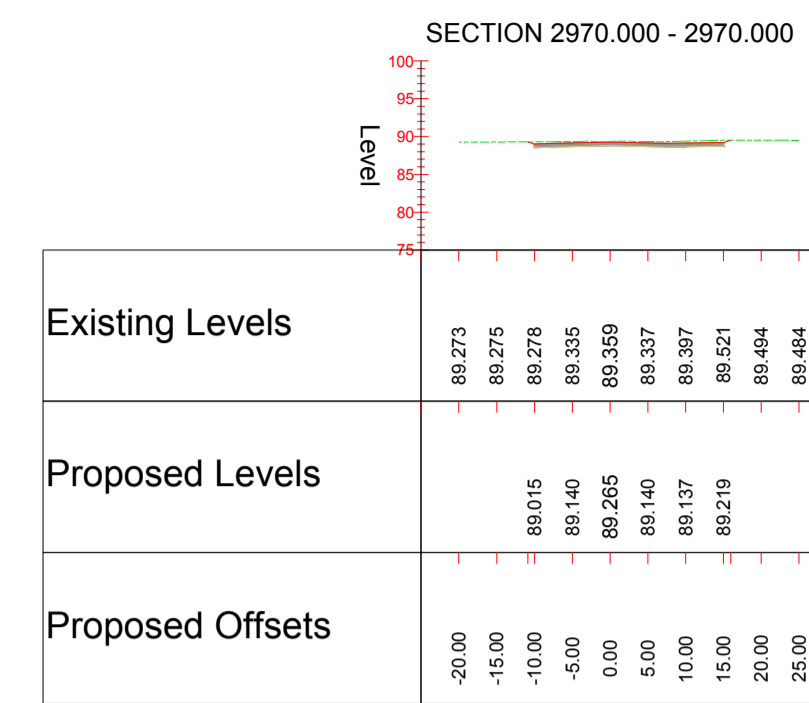
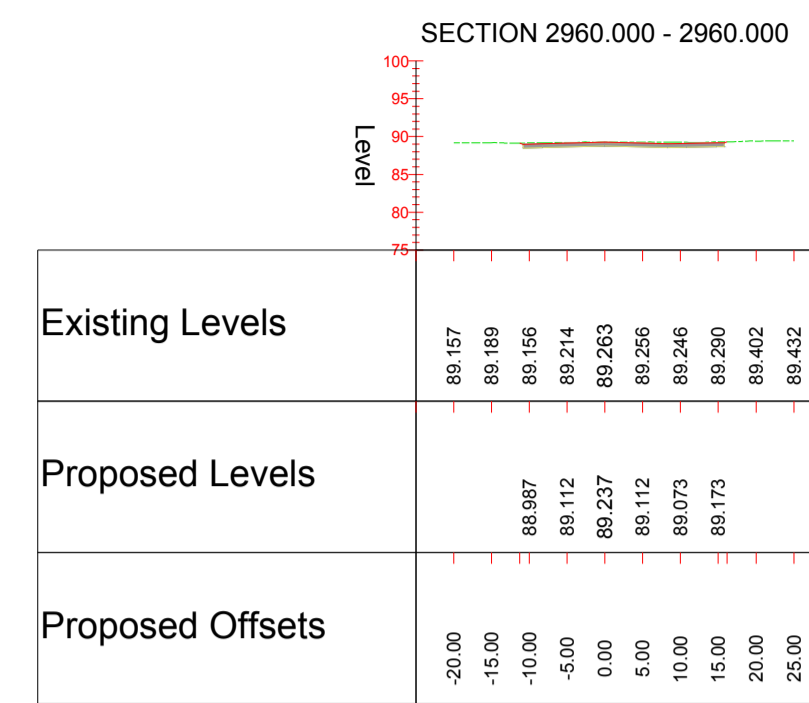
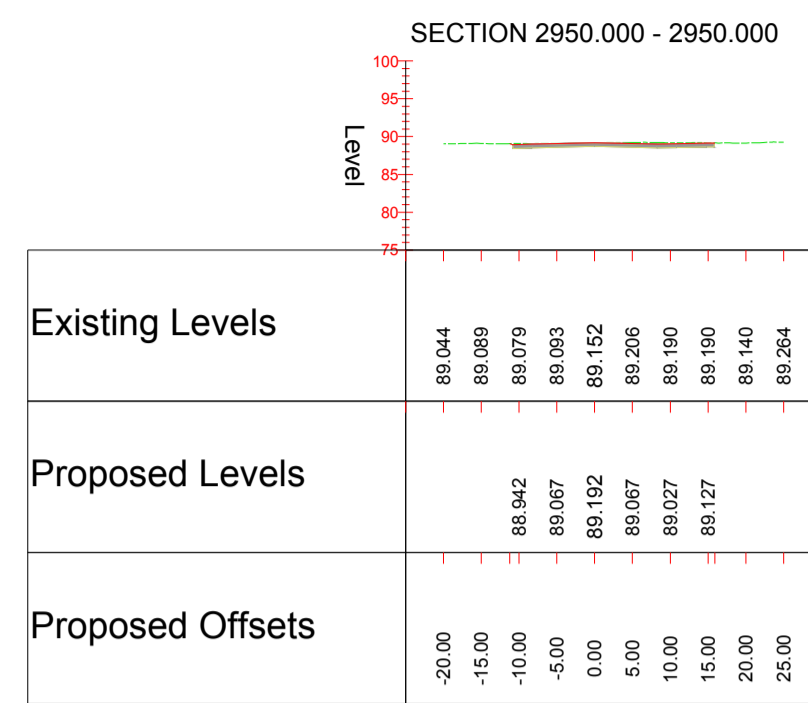
Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION					
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:					
CONSTRUCTION					
NONE					
MAINTENANCE/CLEANING					
NONE					
DECOMMISSIONING/DEMOLITION					
NONE					
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement					
Rev.	Date	Description	By	Chk'd	App'd
P1	05.02.18	DRAWING CREATED		AF	

Drawing Status	FOR INFORMATION	Suitability	S2	Project Title	WEST OF ENGLAND WP1				
		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Drawing Title <b>A4 - A37 LINK OPTION 1 PROPOSED CONCEPT CROSS SECTIONS SHEET 1 of 19</b>					
Copyright	© Atkins Limited (2014)	Scale	1:1000	Designed	EC	Drawn	AH	Checked	Authorised
Client	WEST OF ENGLAND	Original Size	A1	Date	05/02/18	Date	05/02/18	Date	05/02/18
Drawing Number	HA PIN	Originator	Woe	Volume	ATK	Project Ref. No.	0000000	Revision	
		Type	- DR - D -	Number	6017				P1

CROSS SECTIONS  
Scale 1:1000



Key:

Notes:

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
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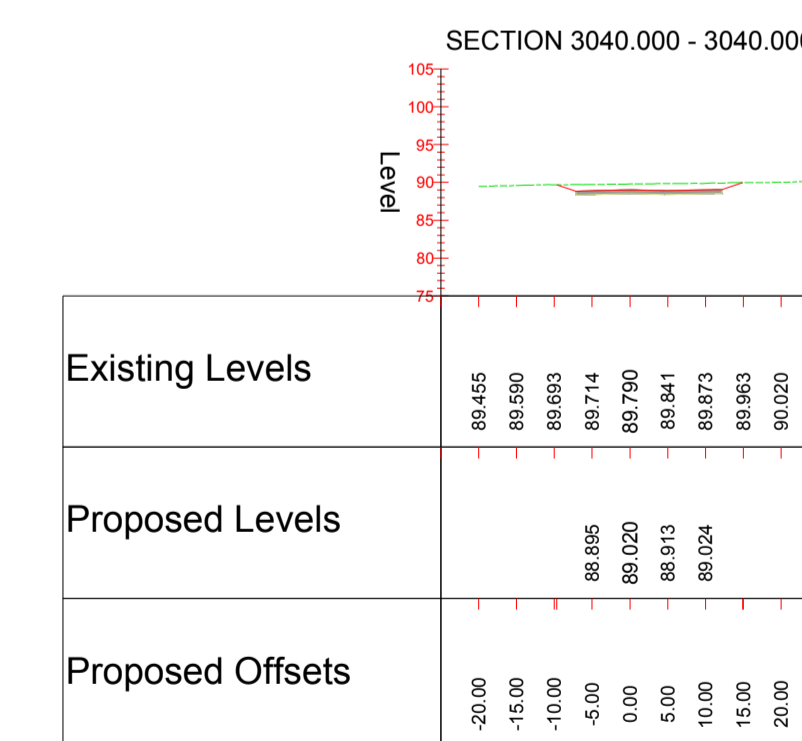
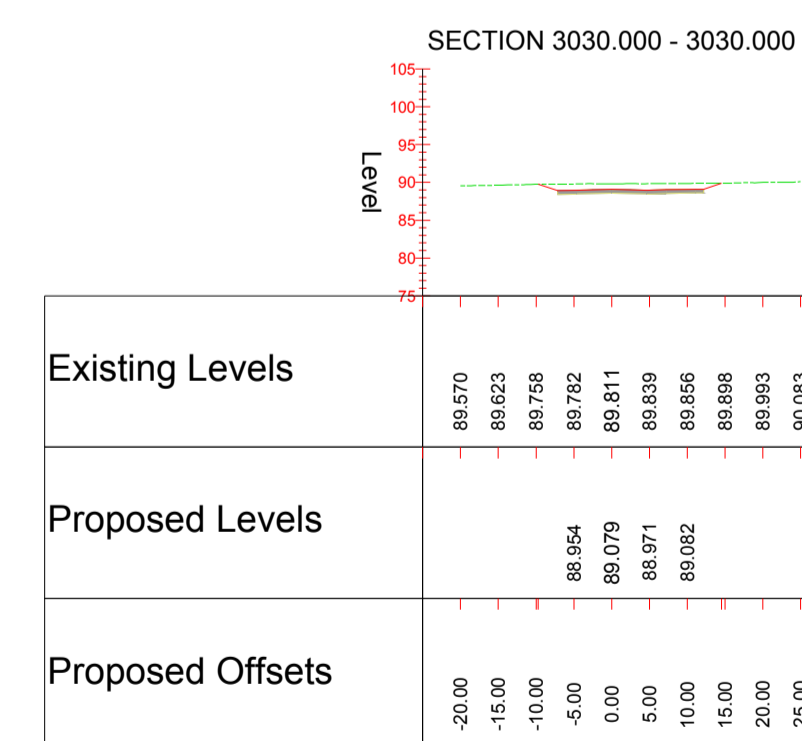
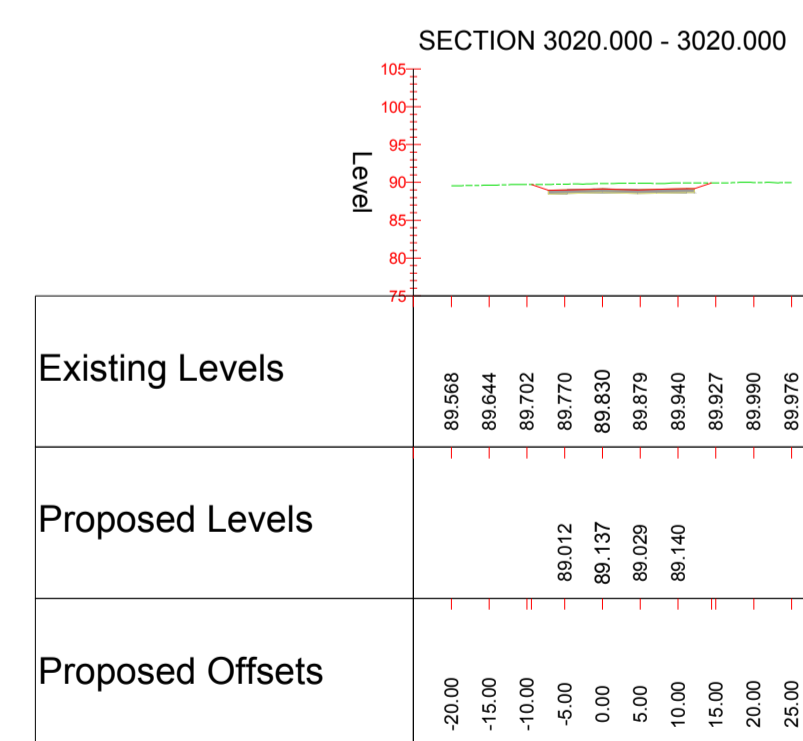
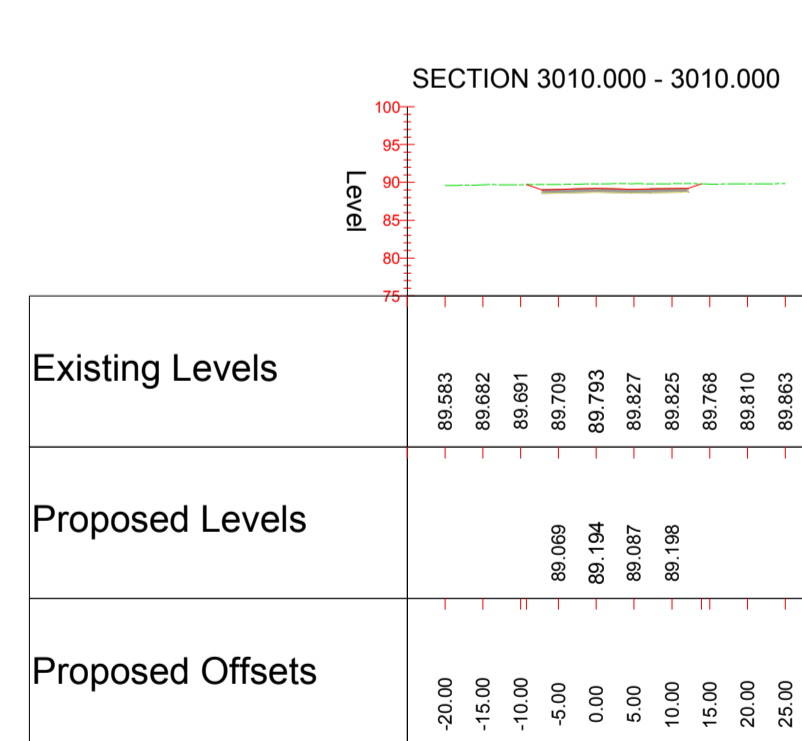
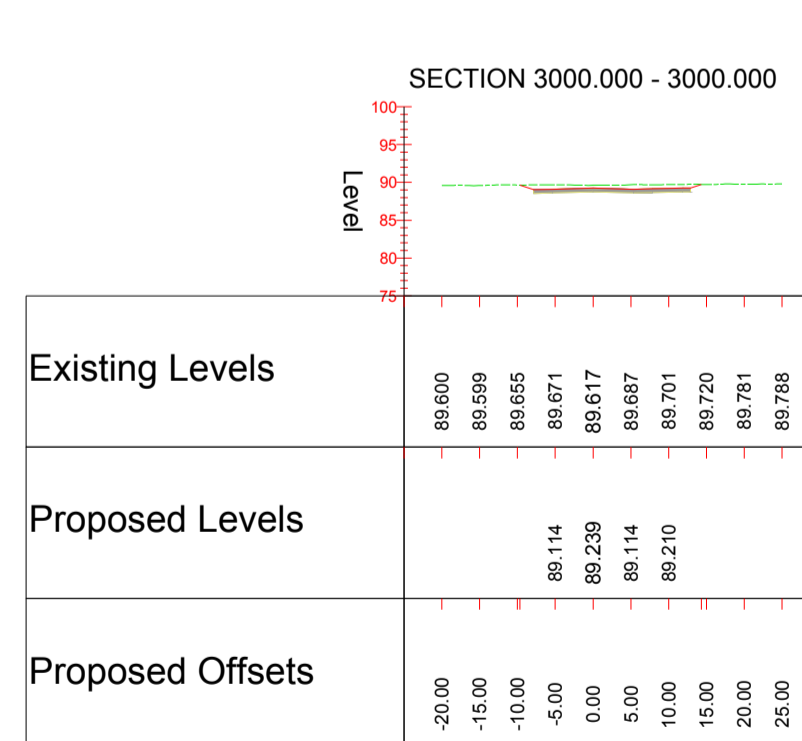
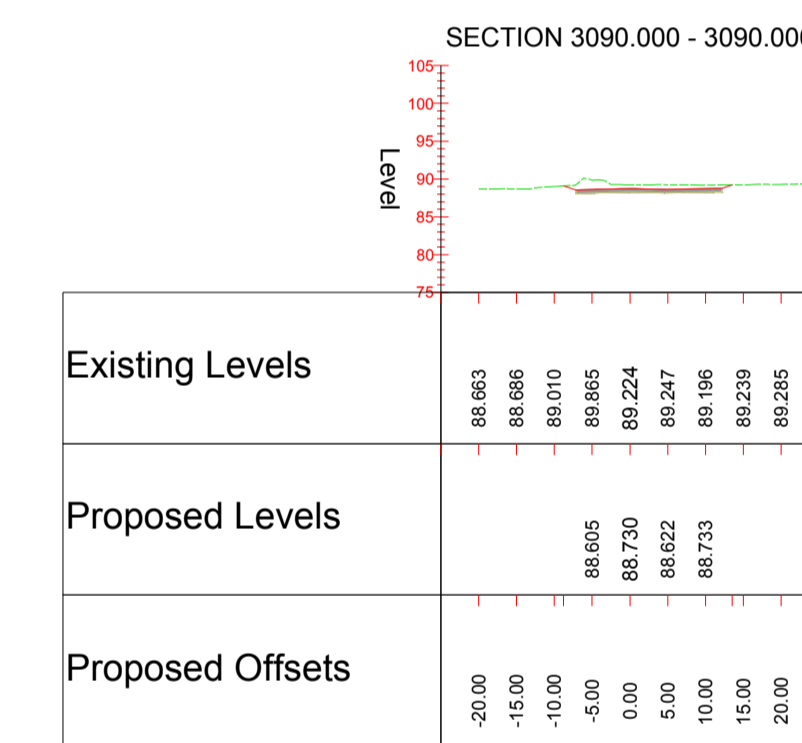
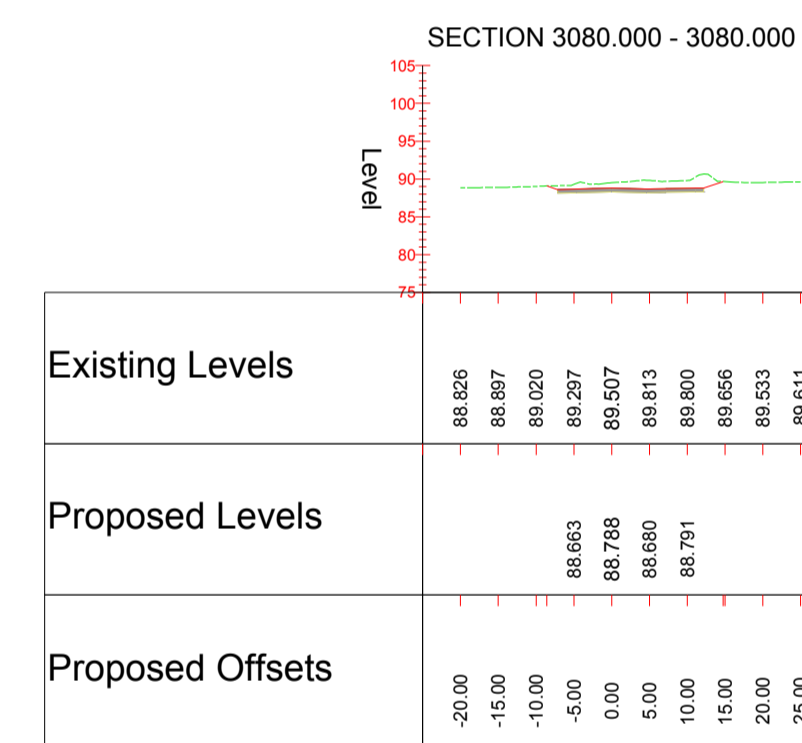
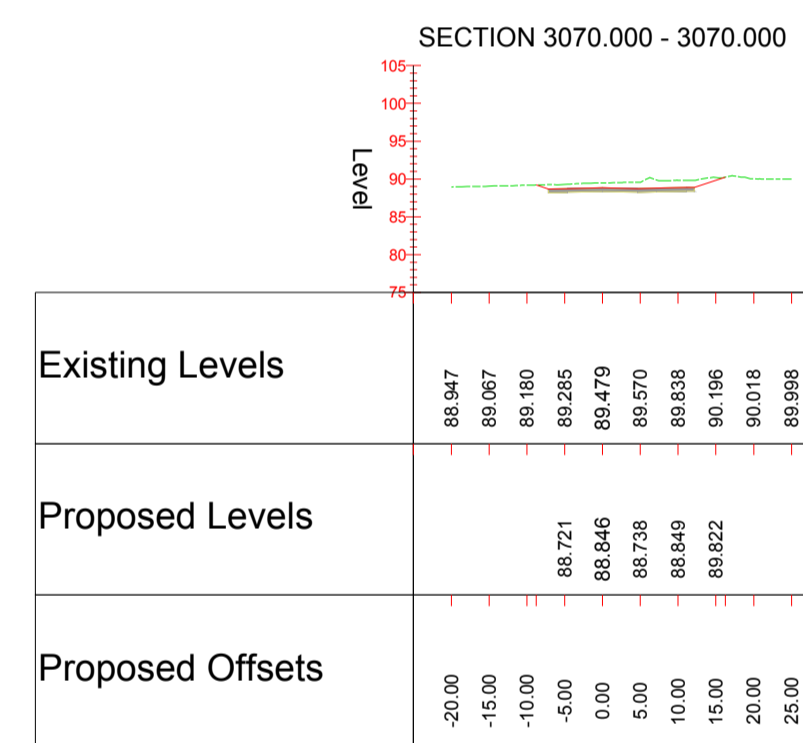
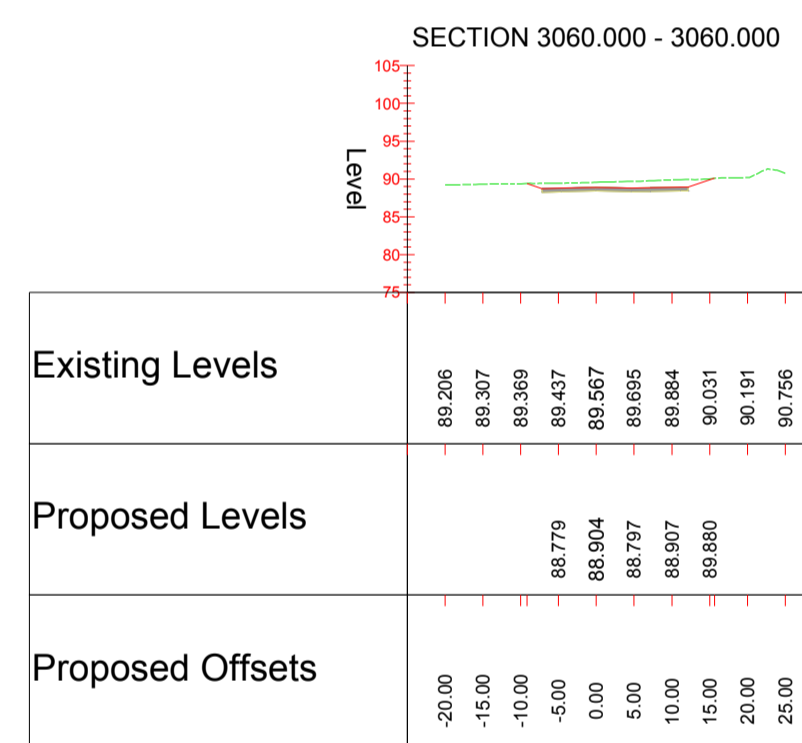
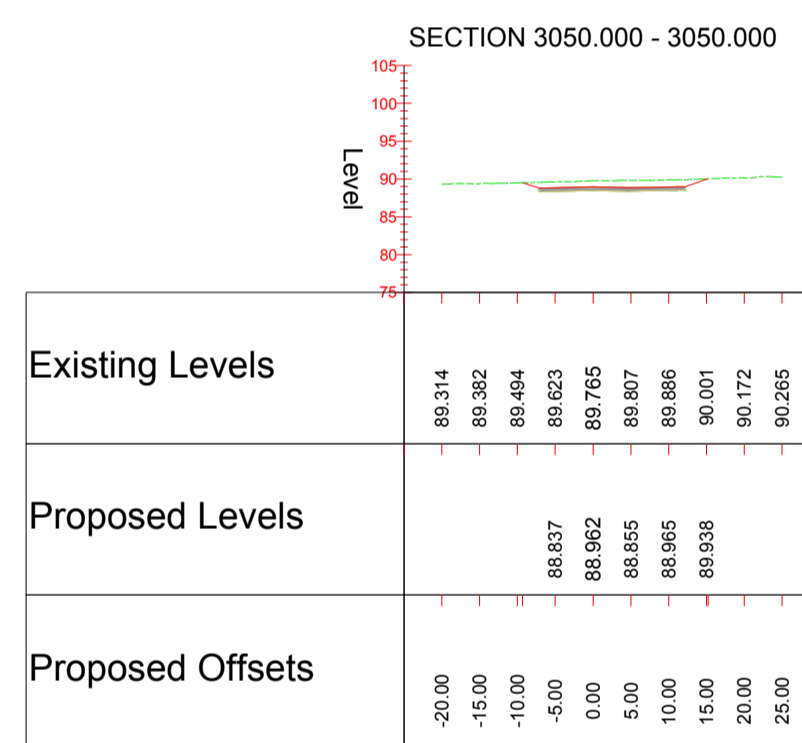
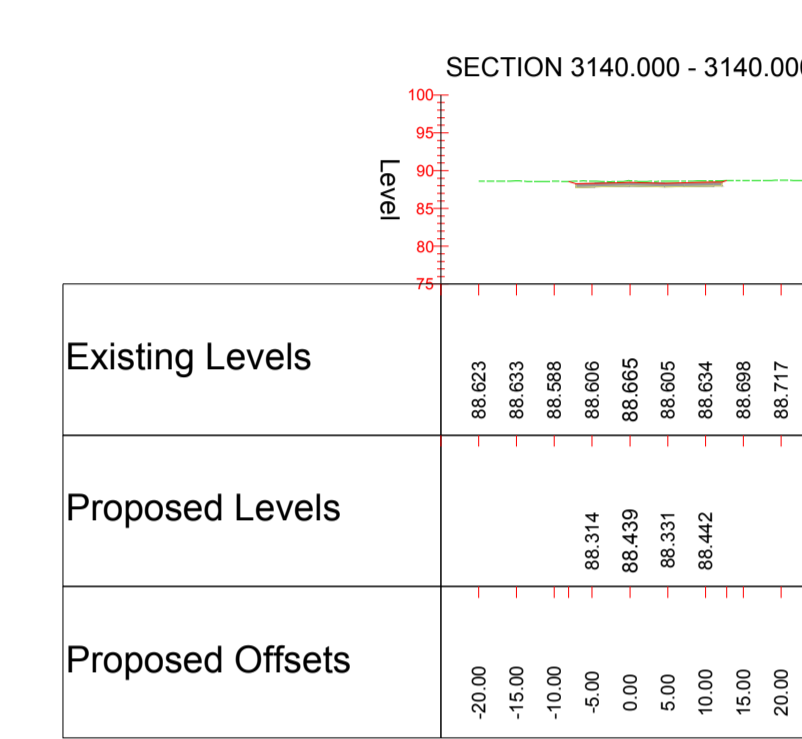
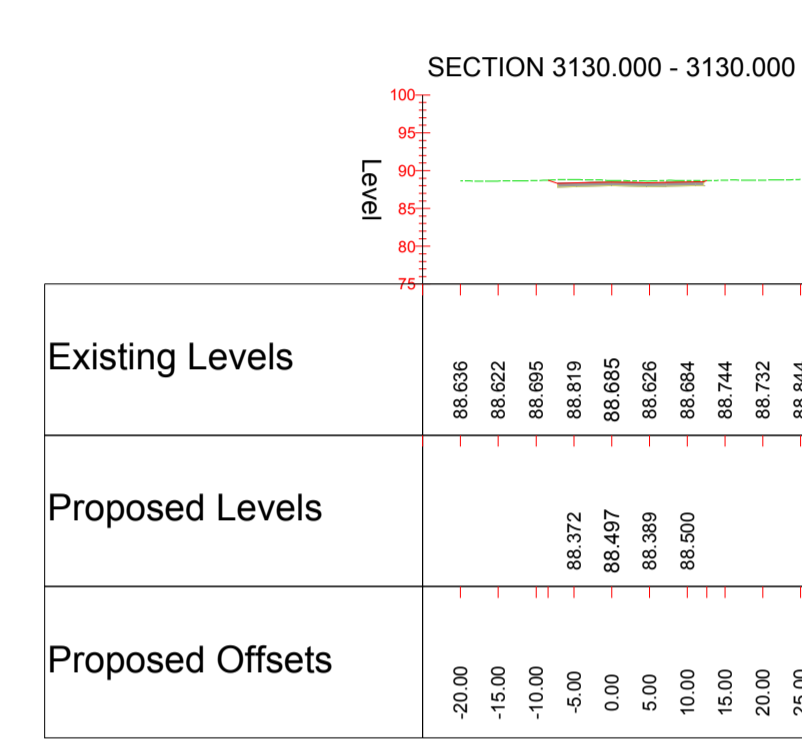
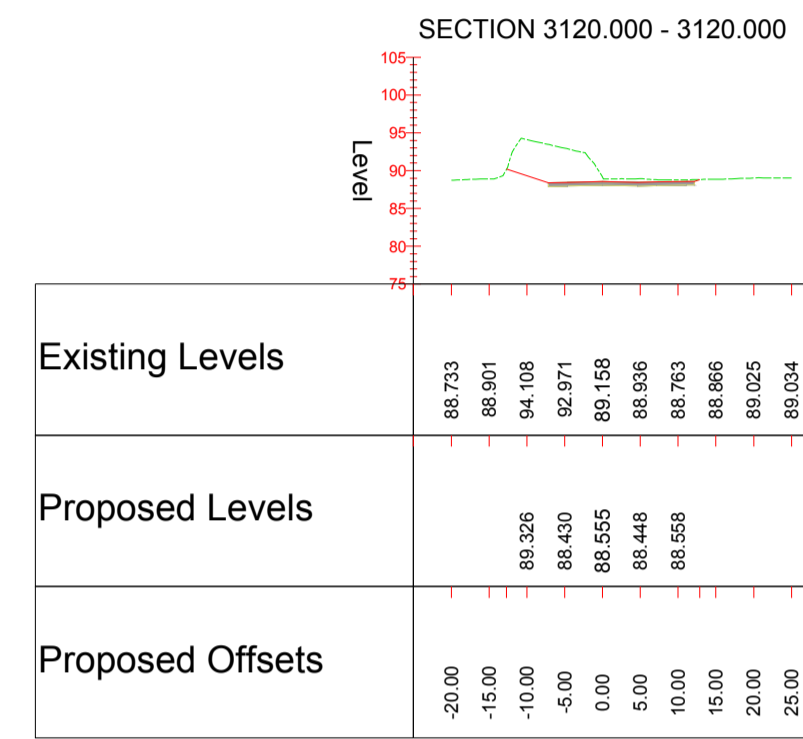
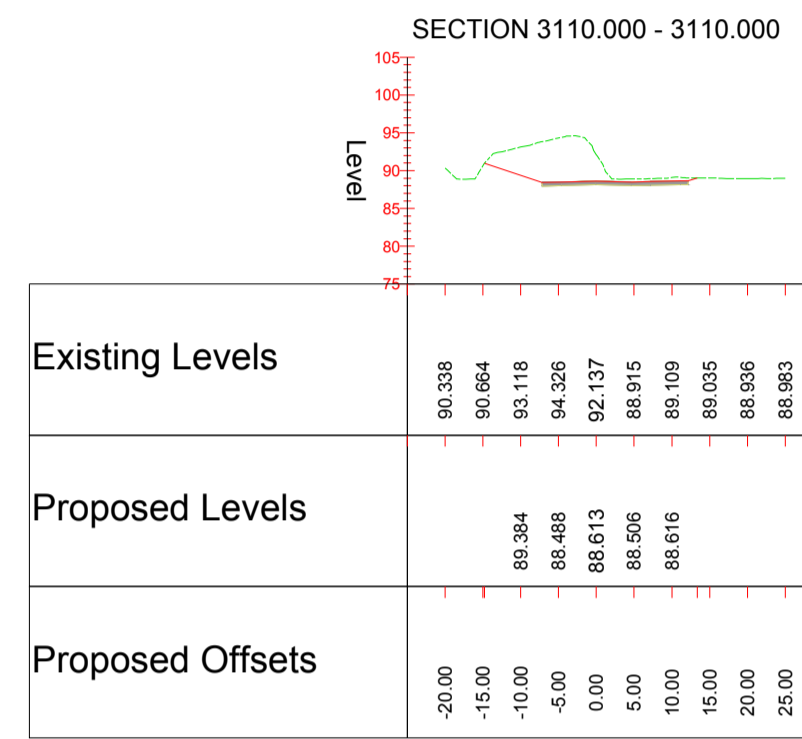
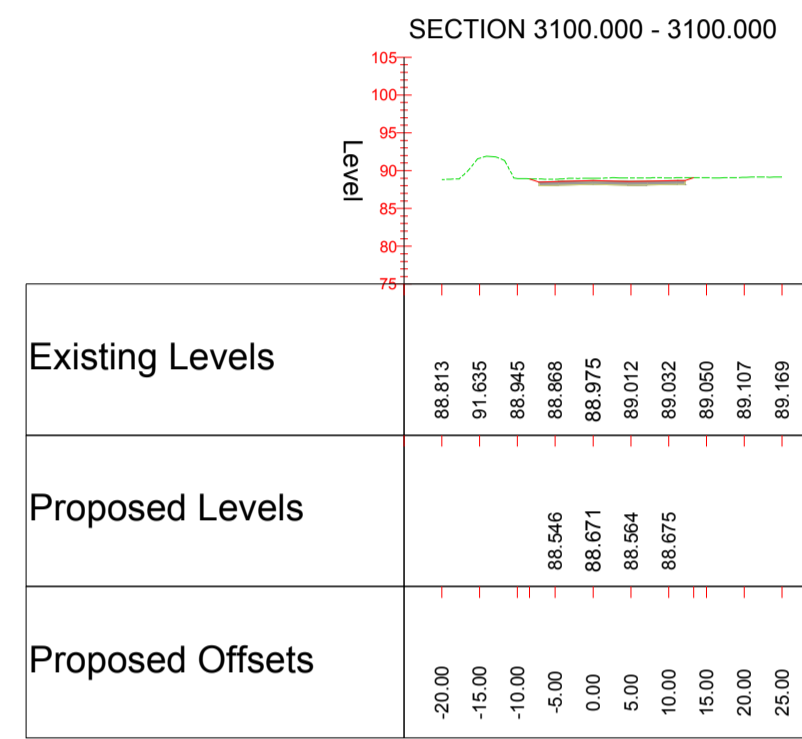
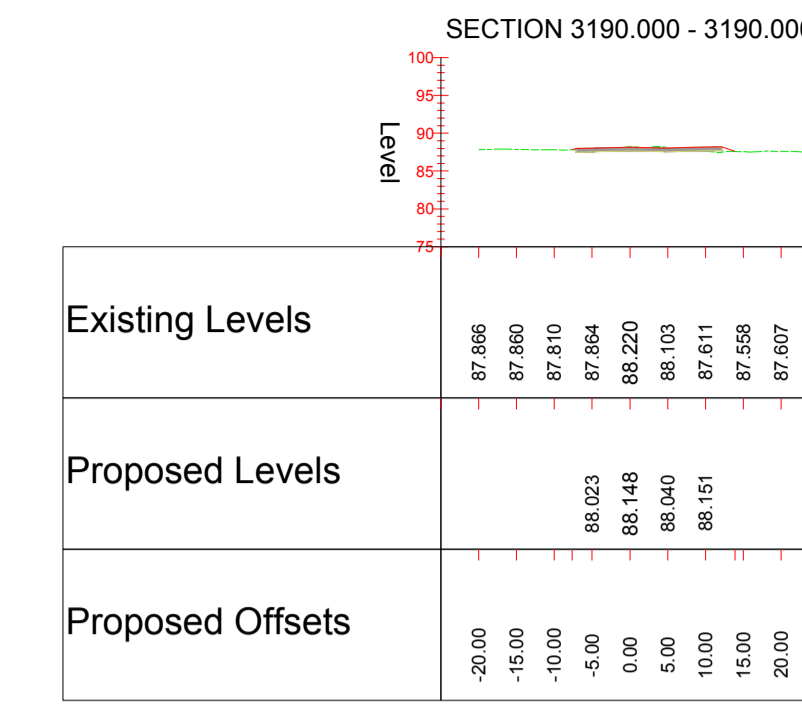
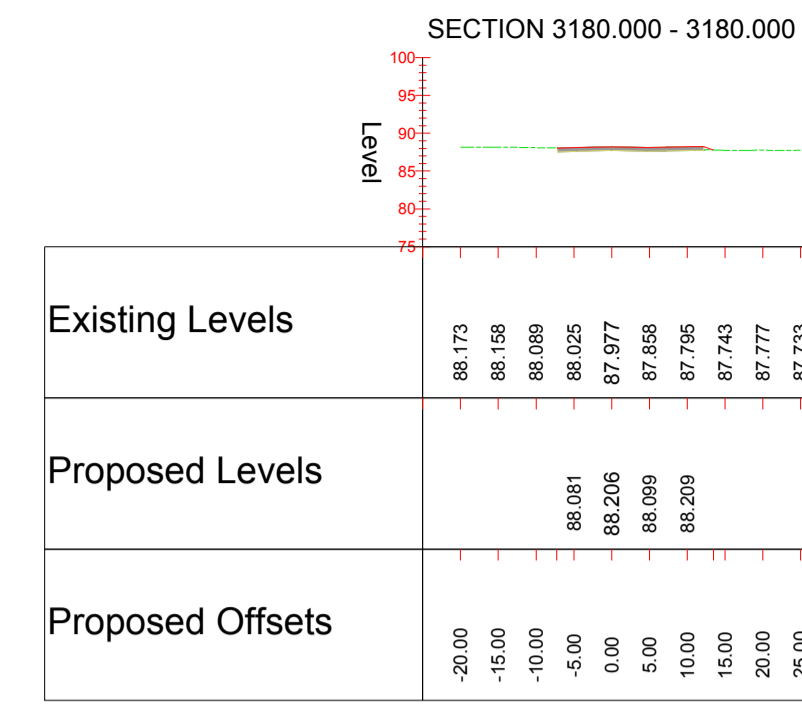
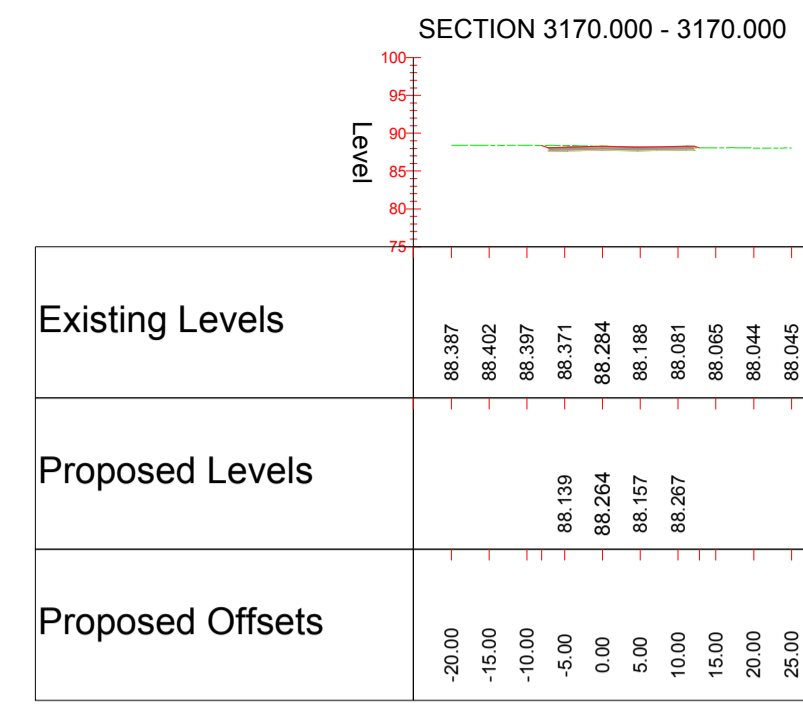
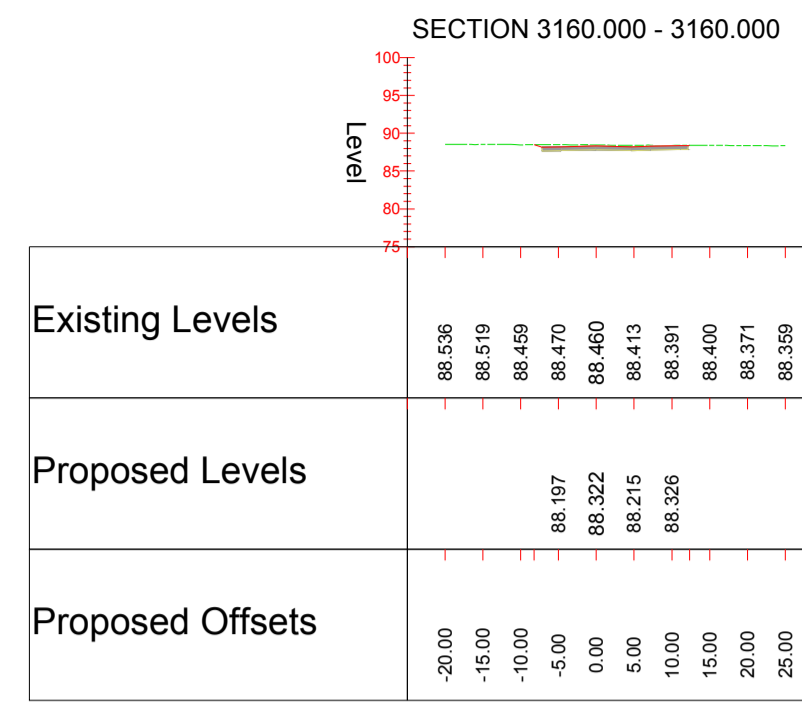
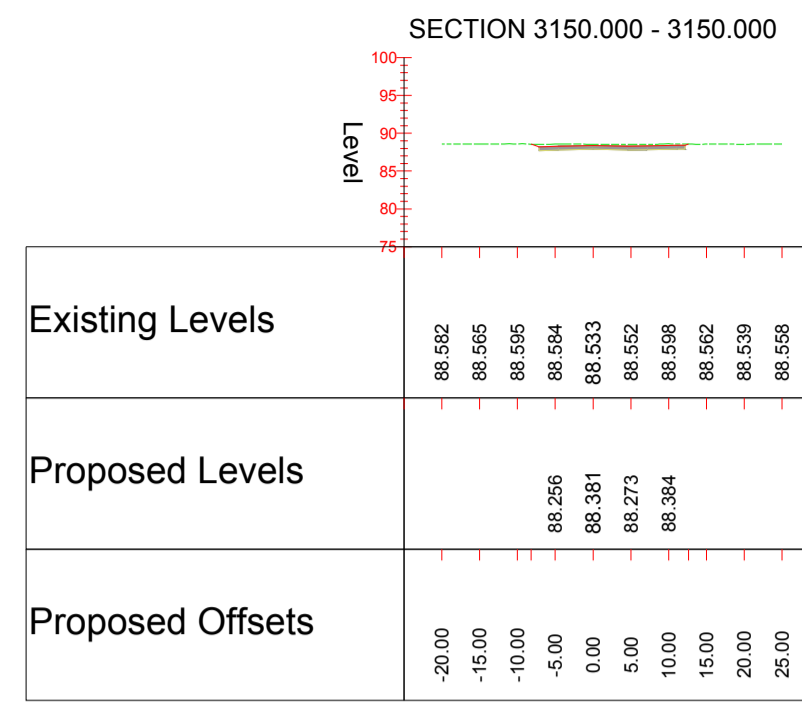
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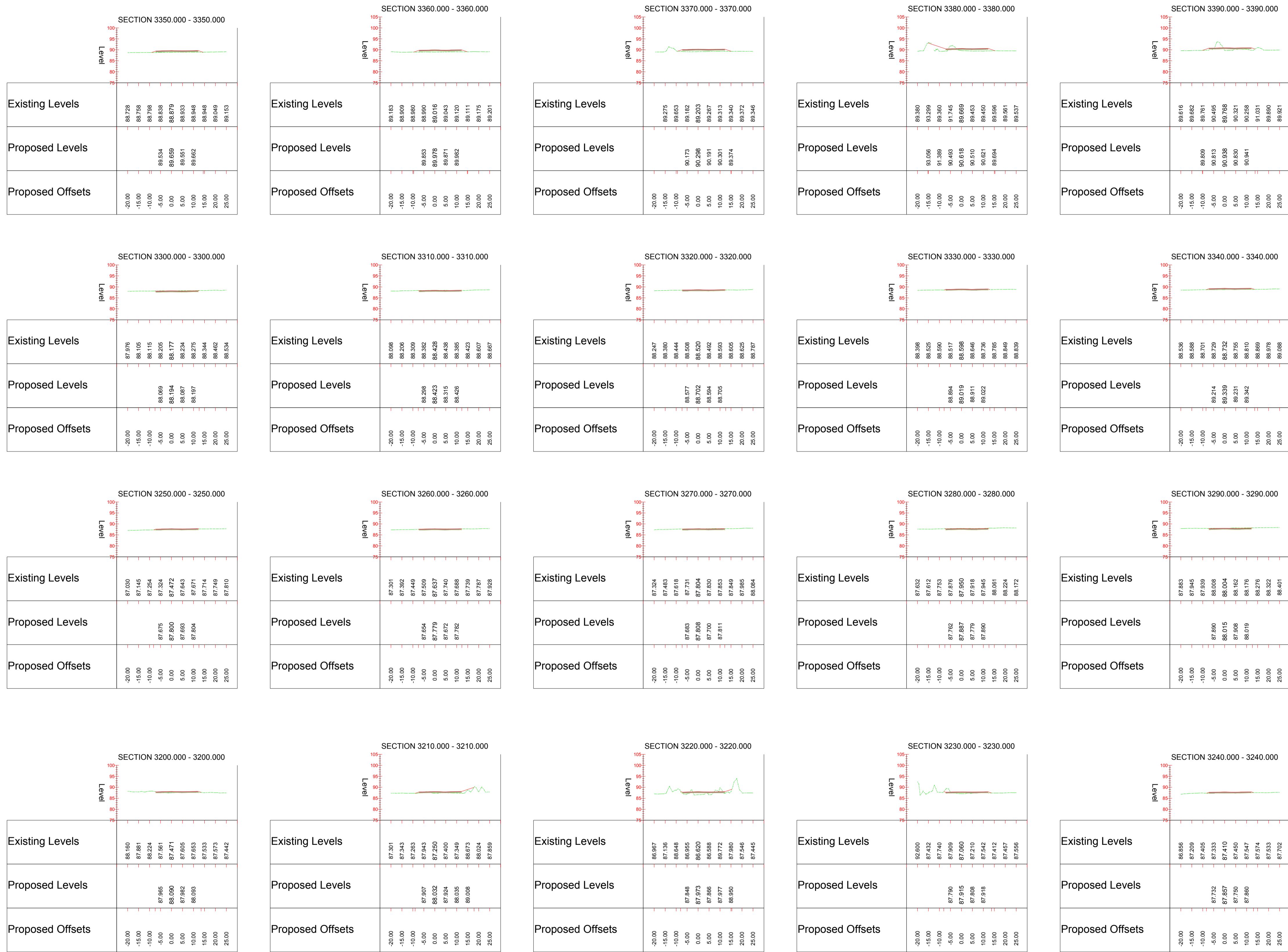
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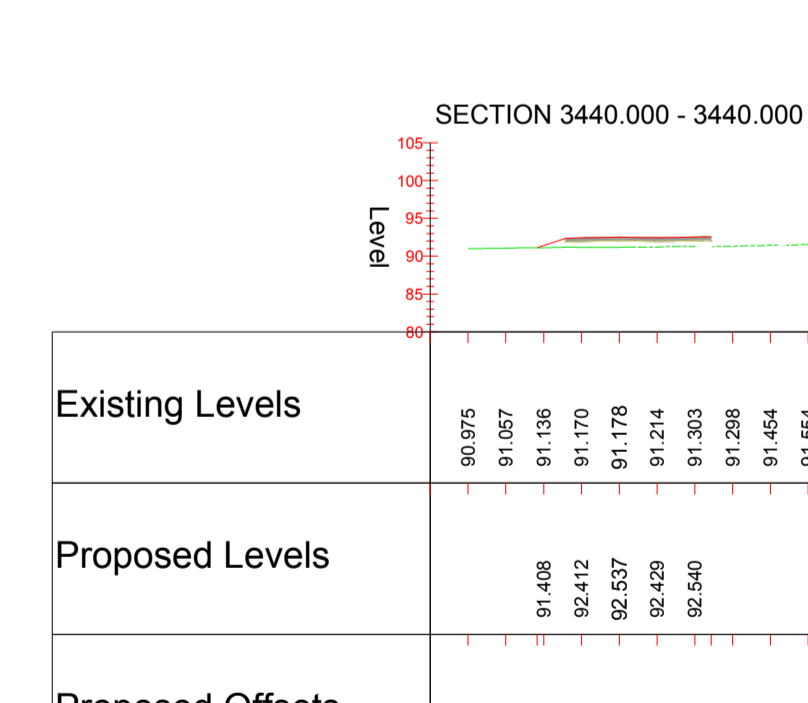
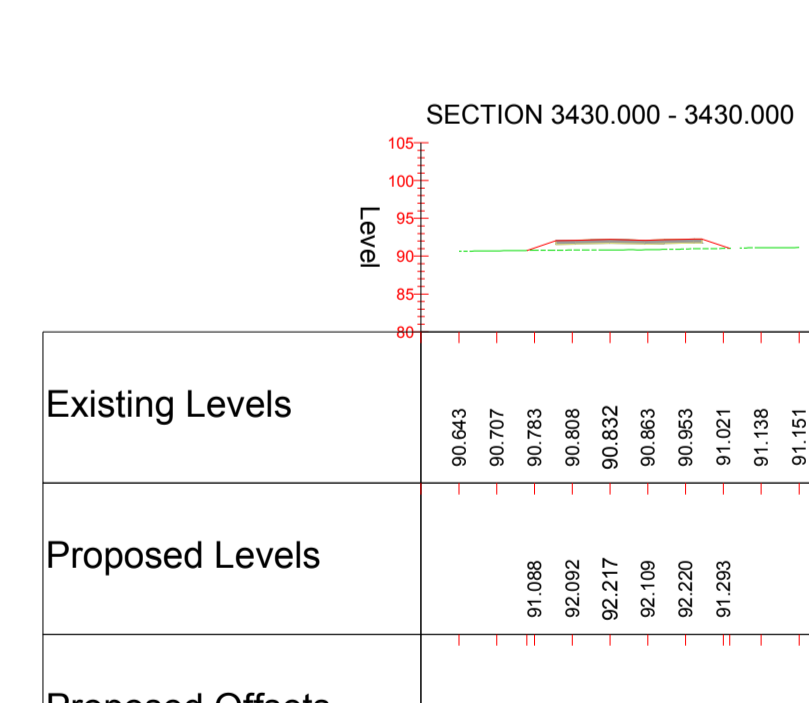
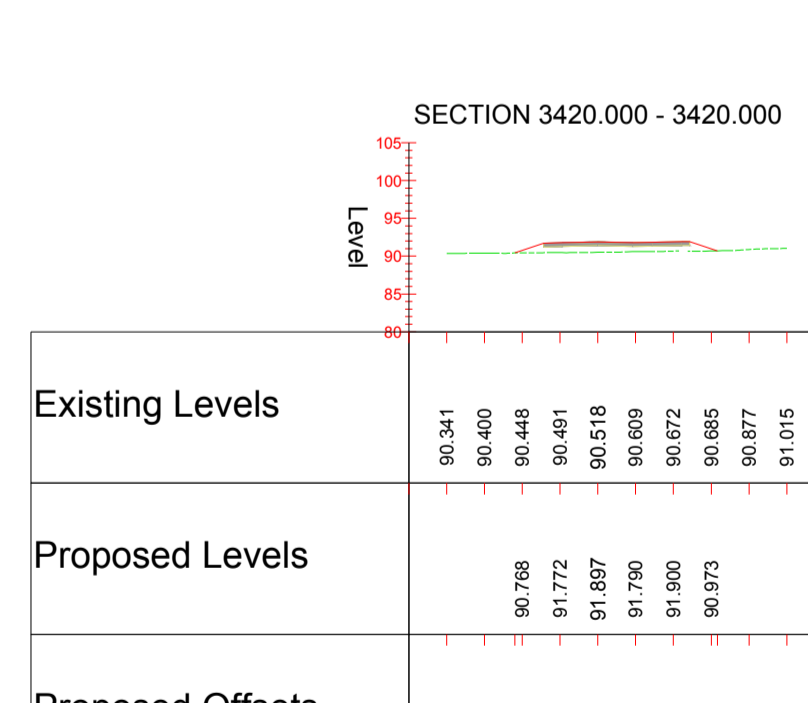
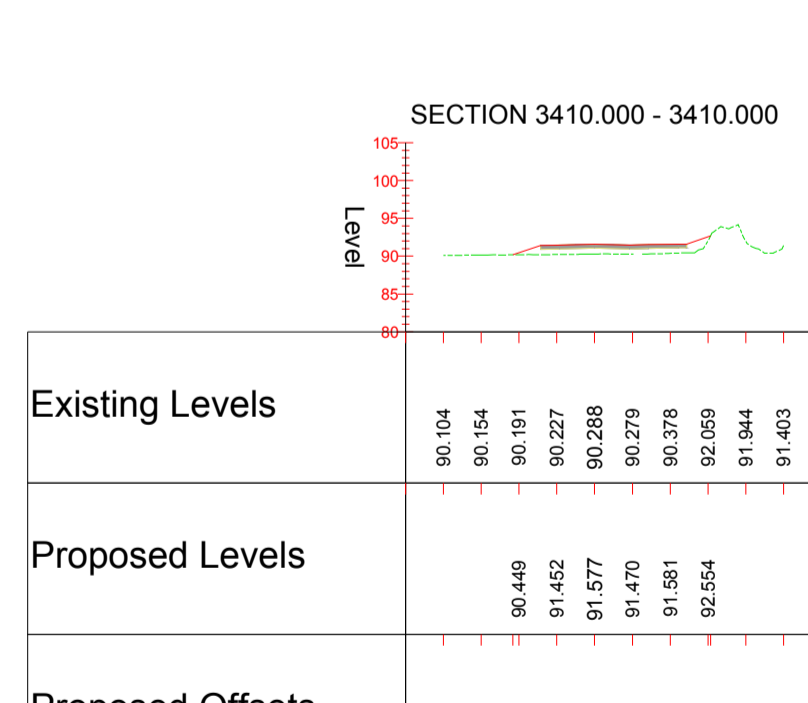
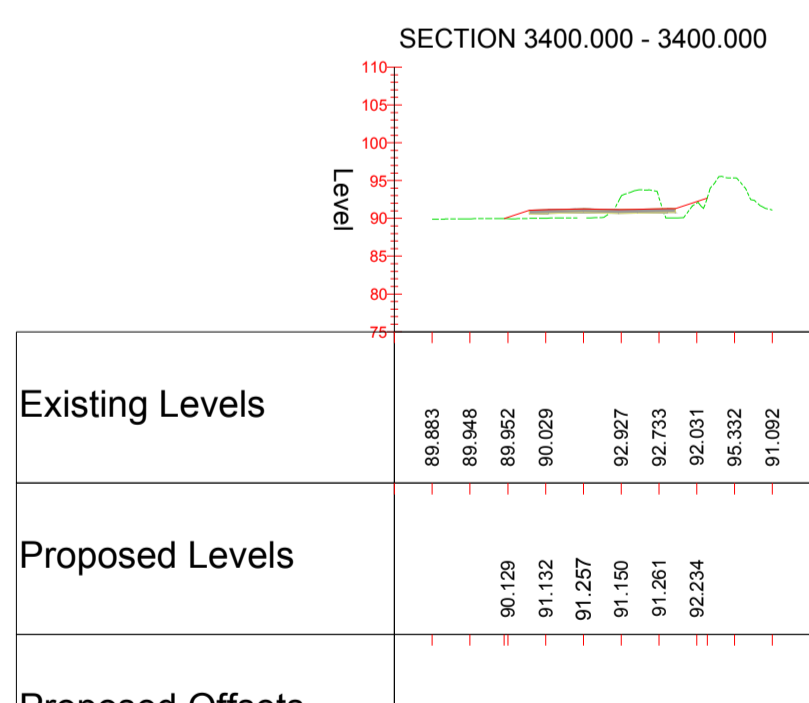
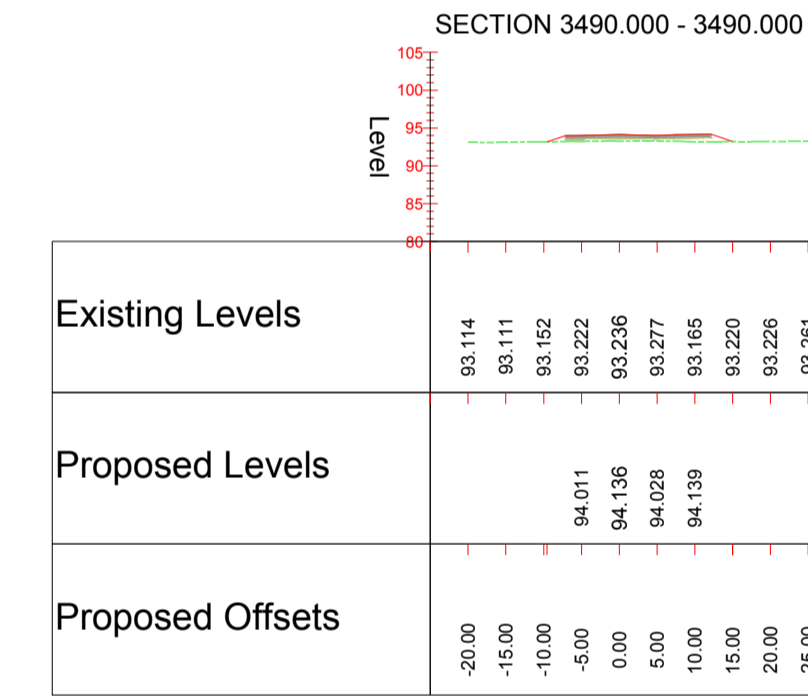
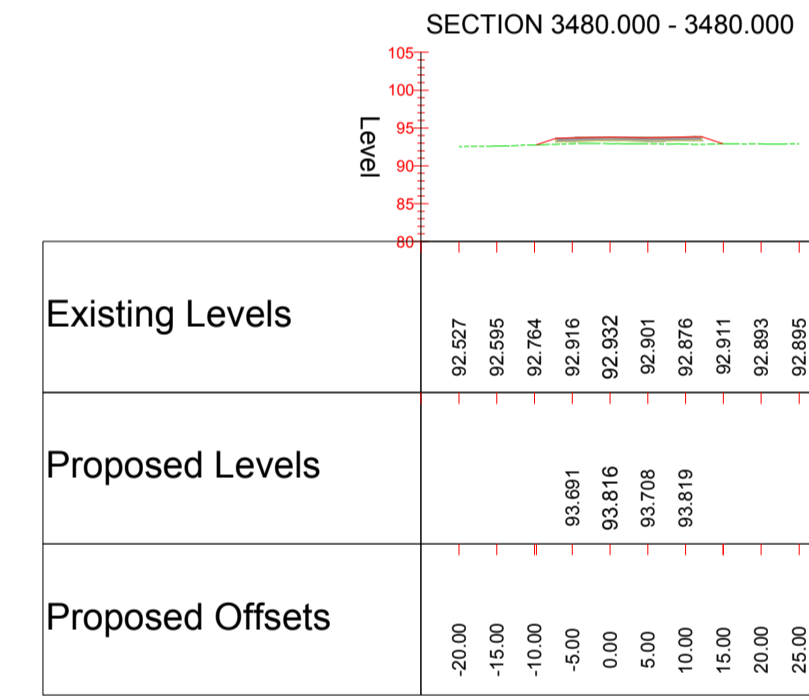
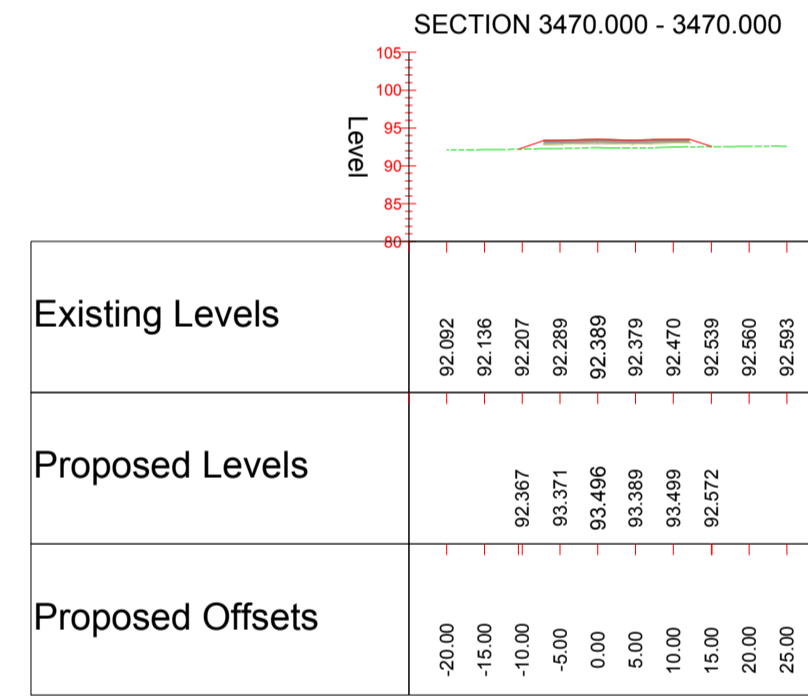
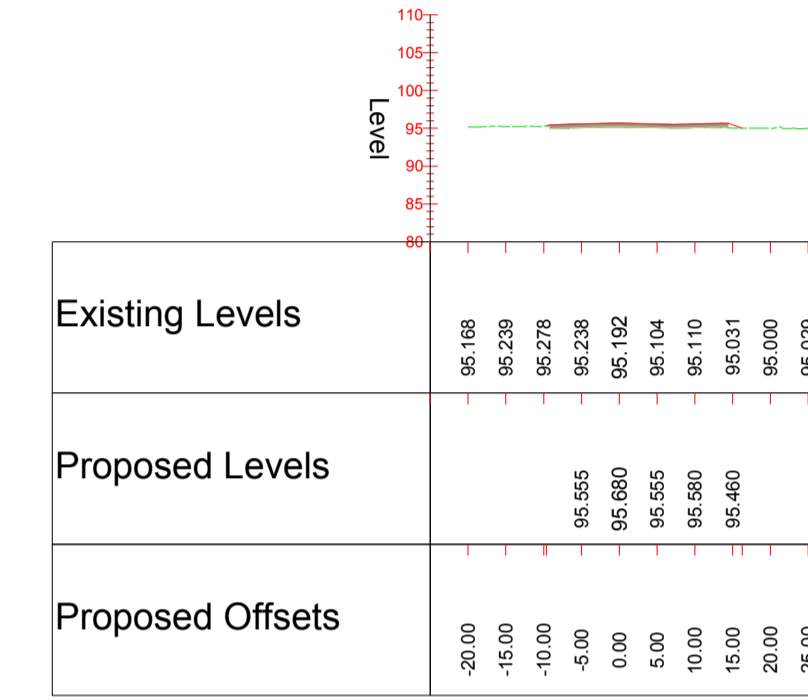
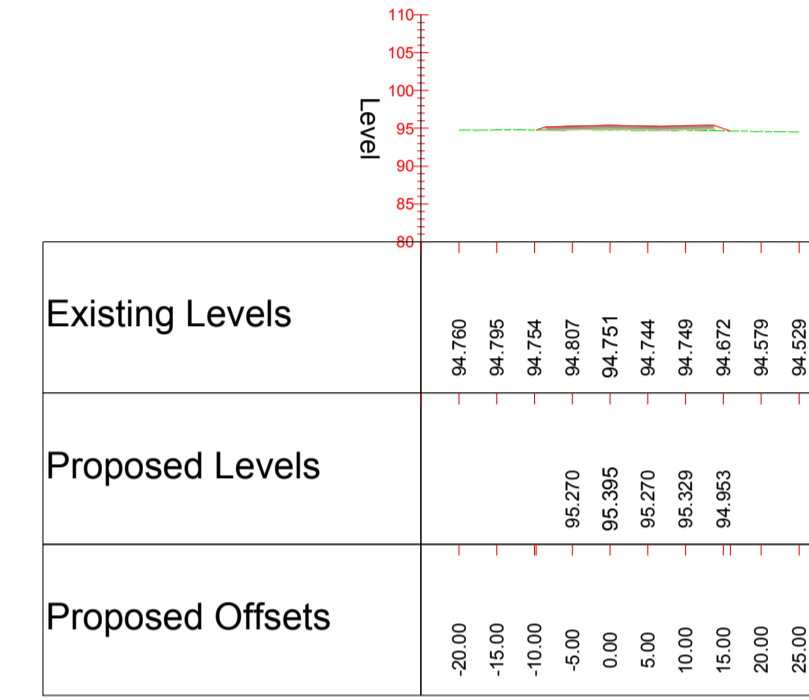
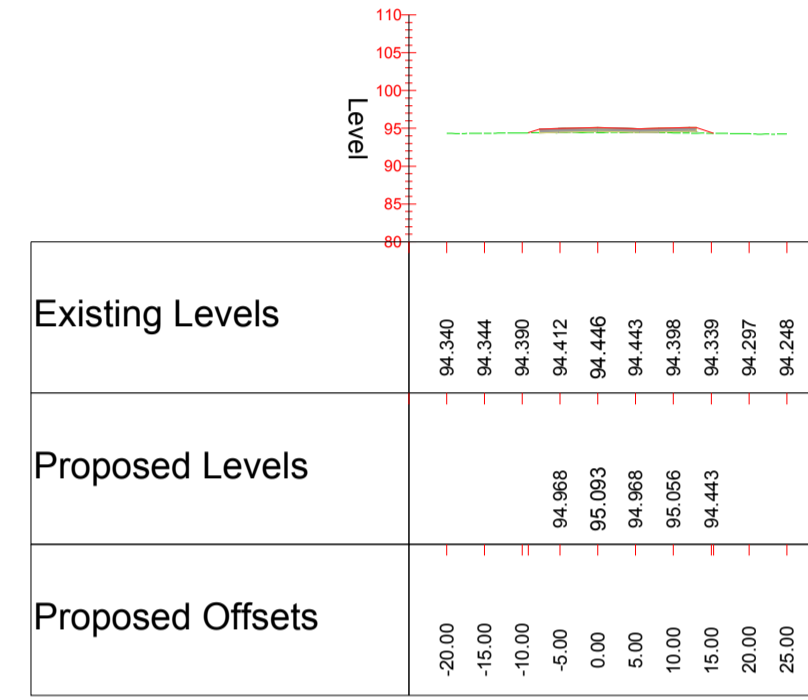
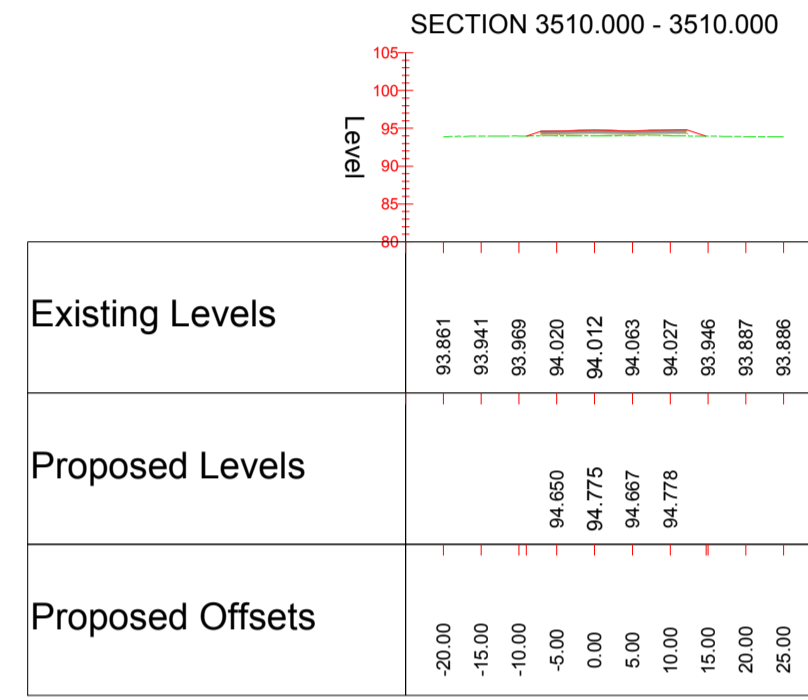
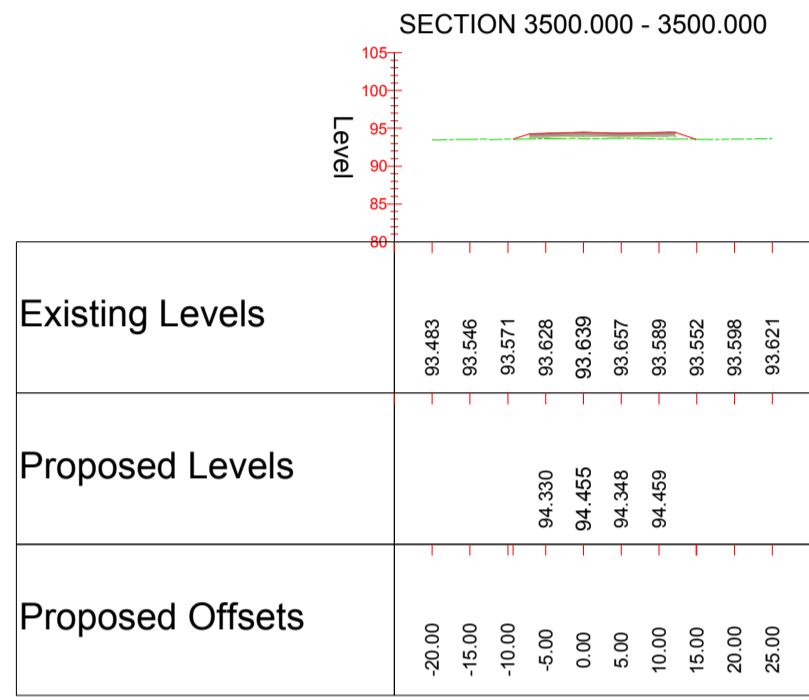
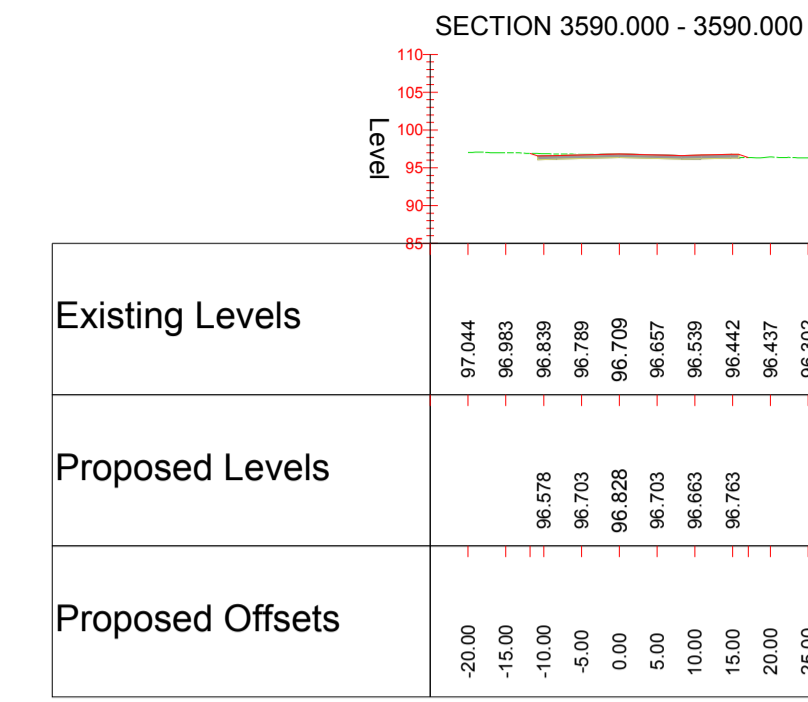
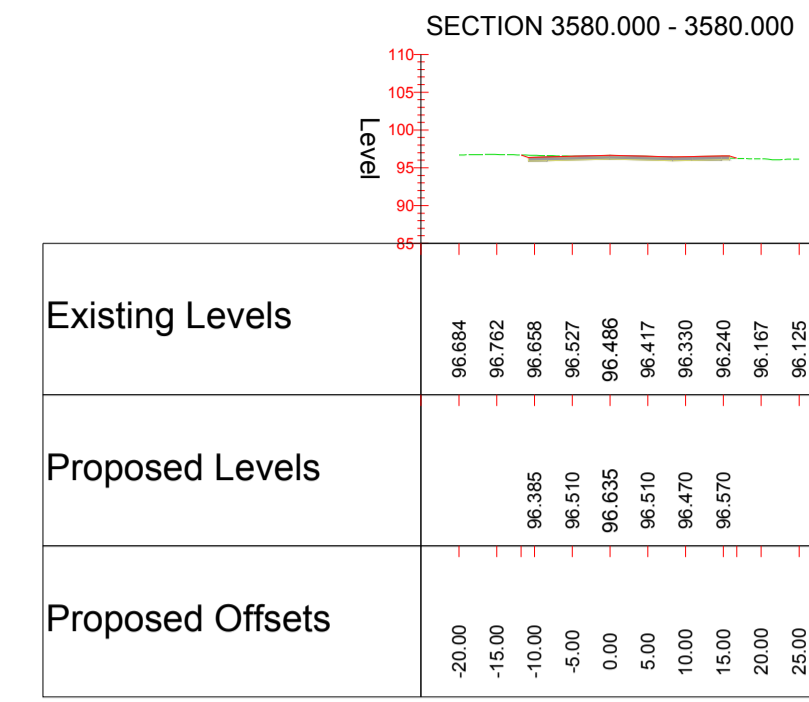
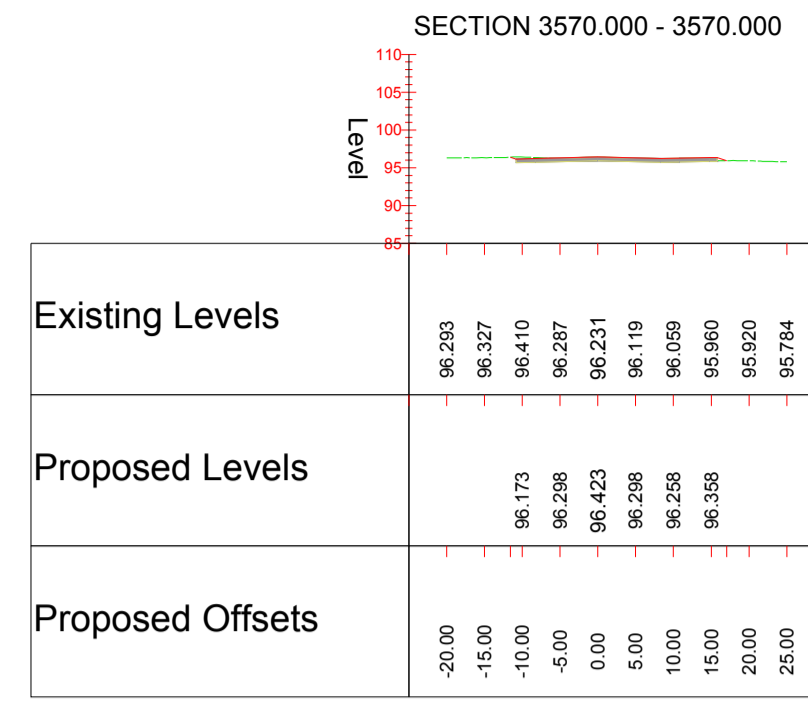
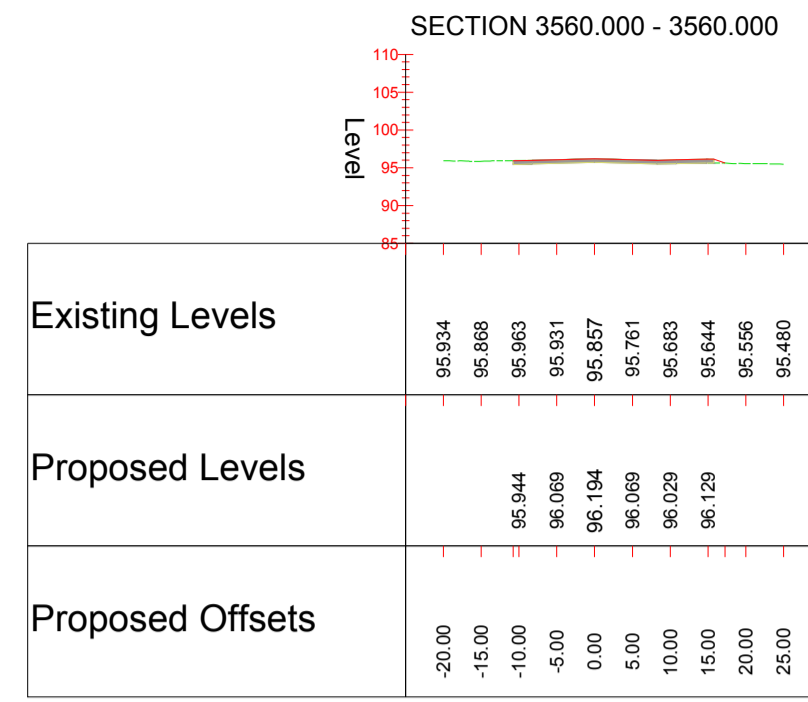
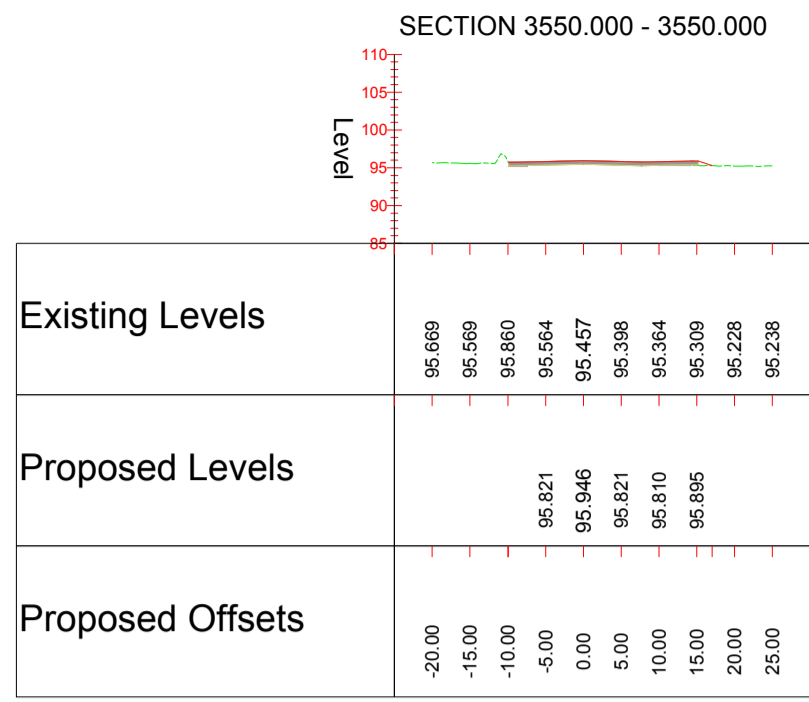
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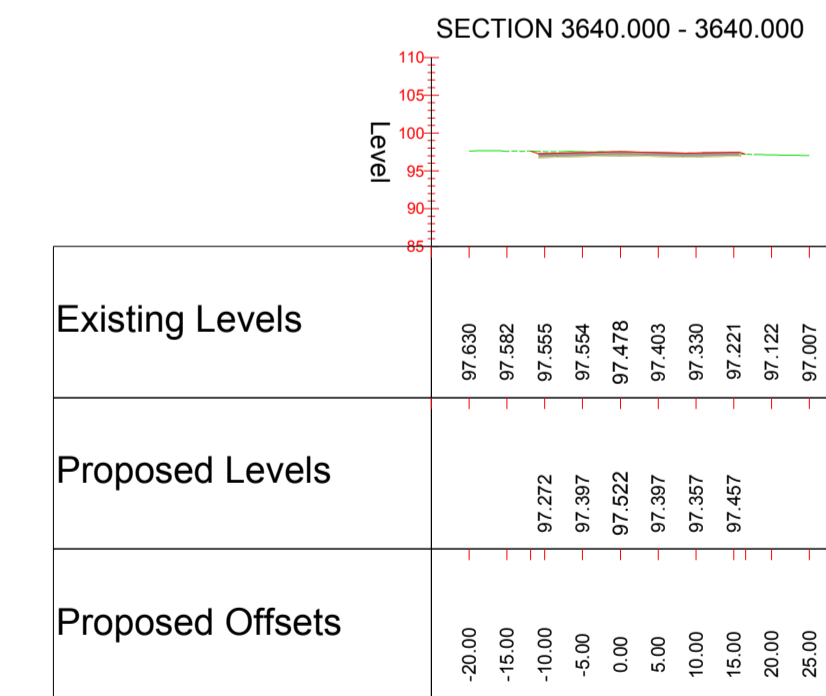
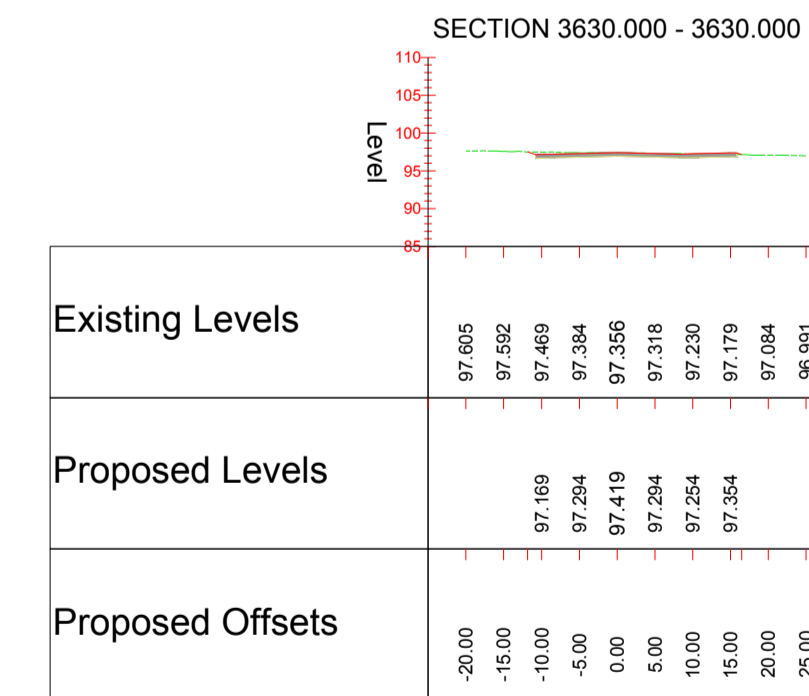
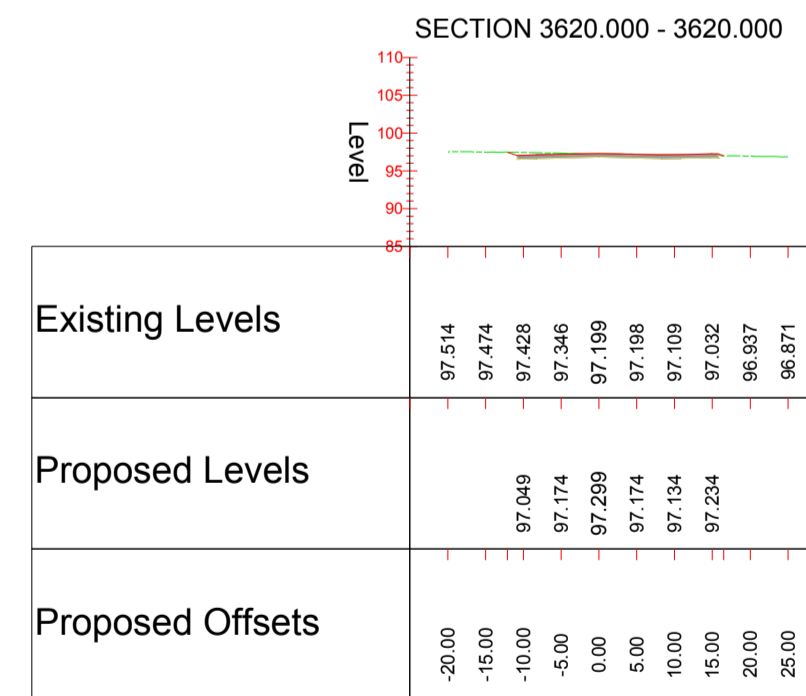
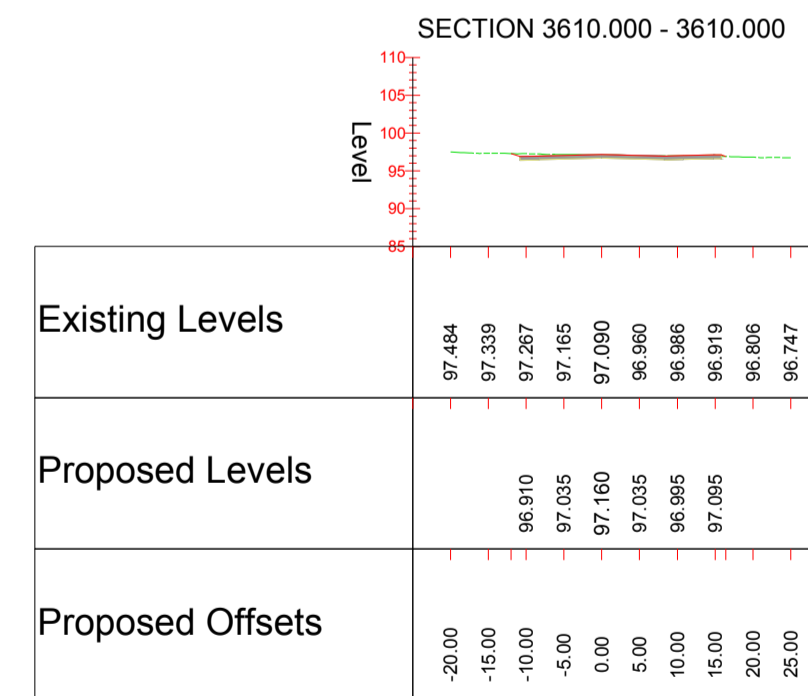
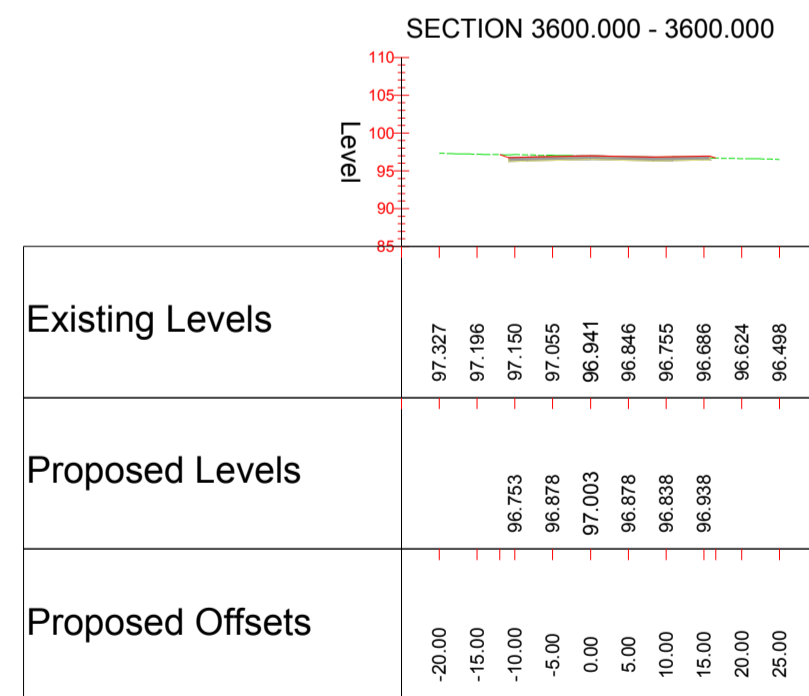
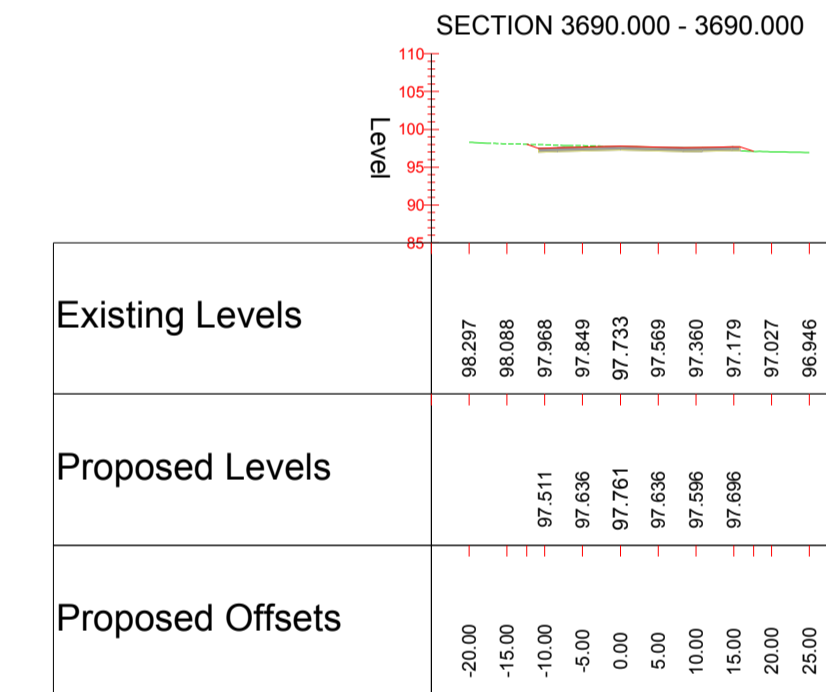
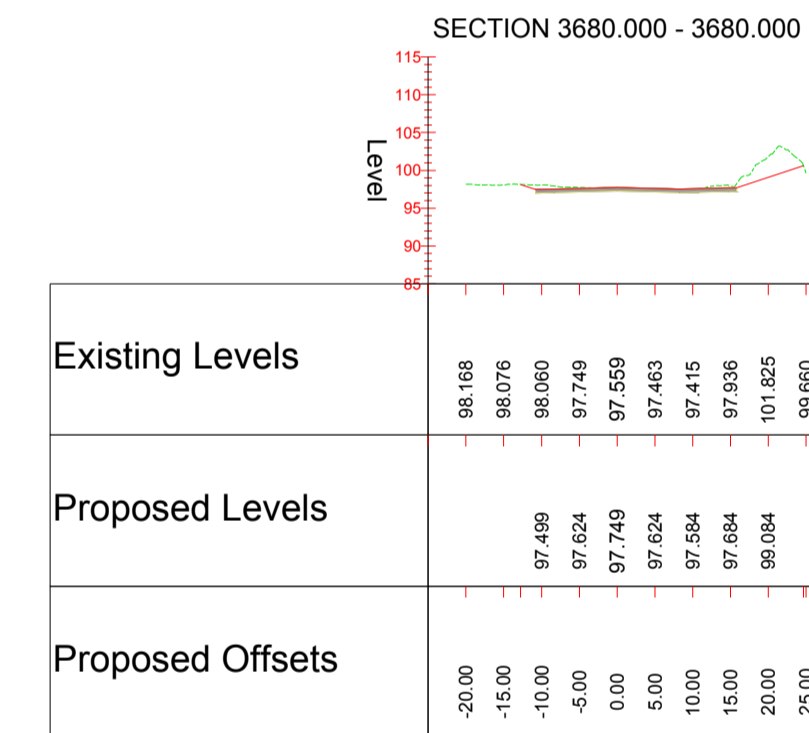
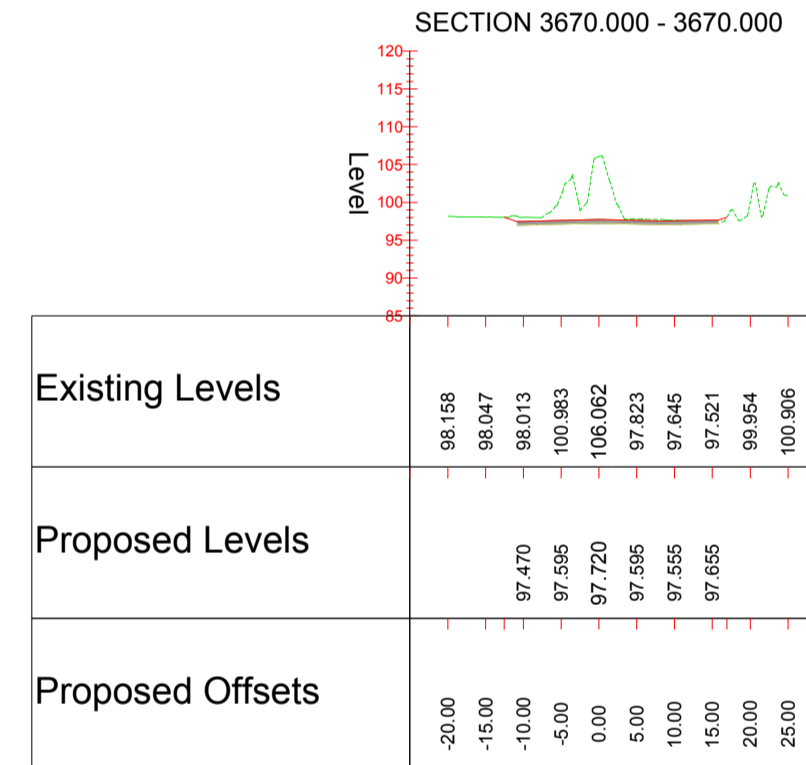
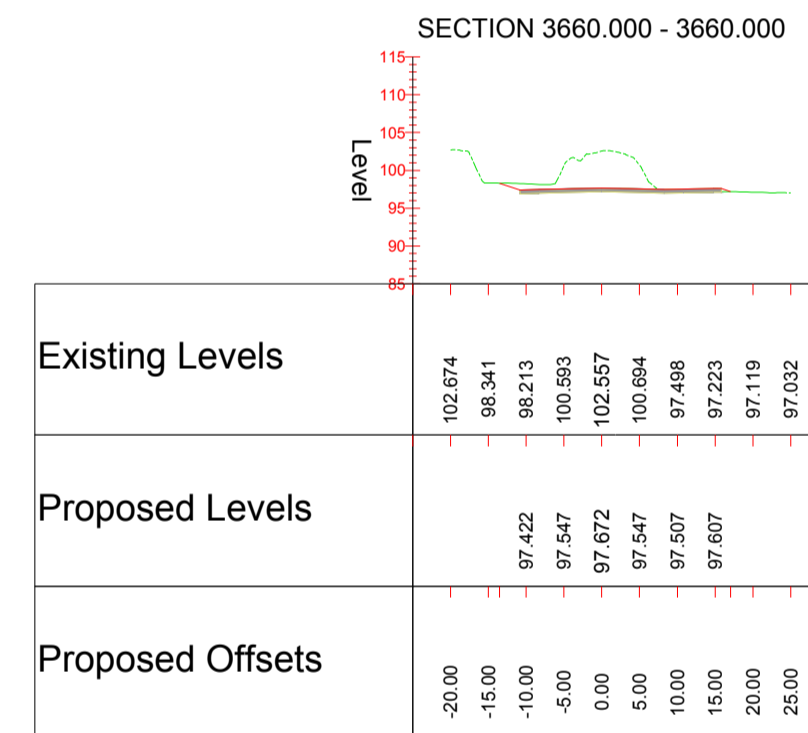
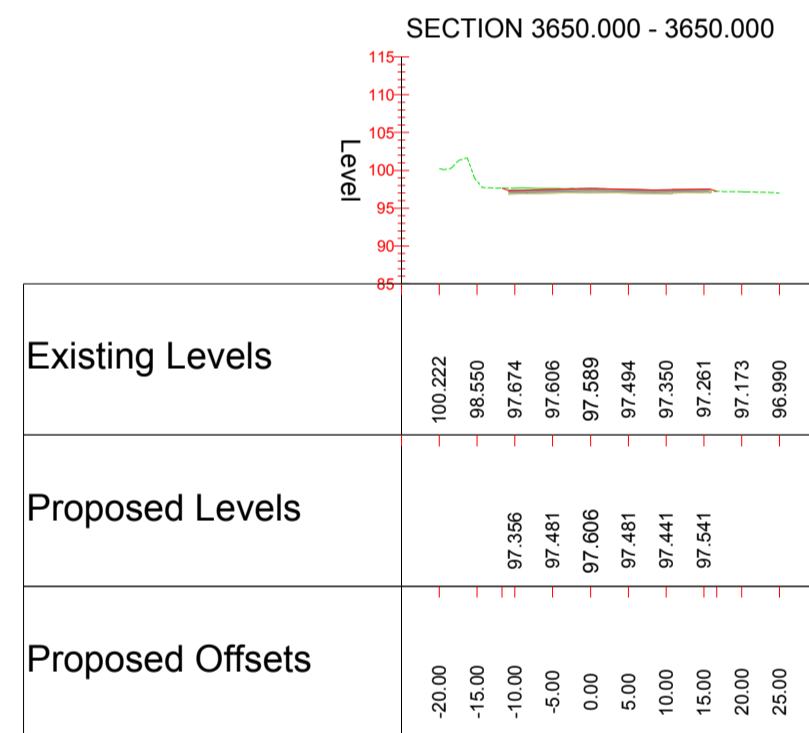
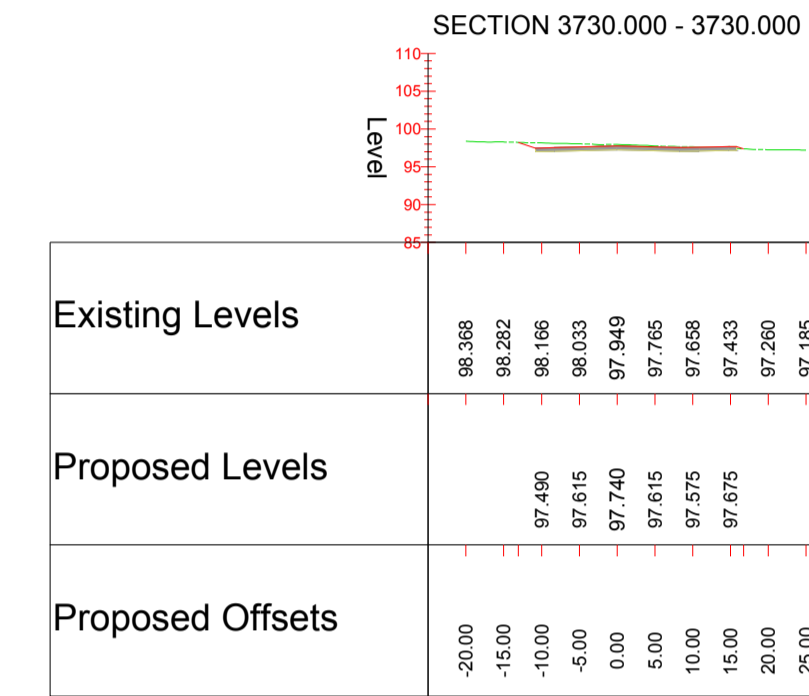
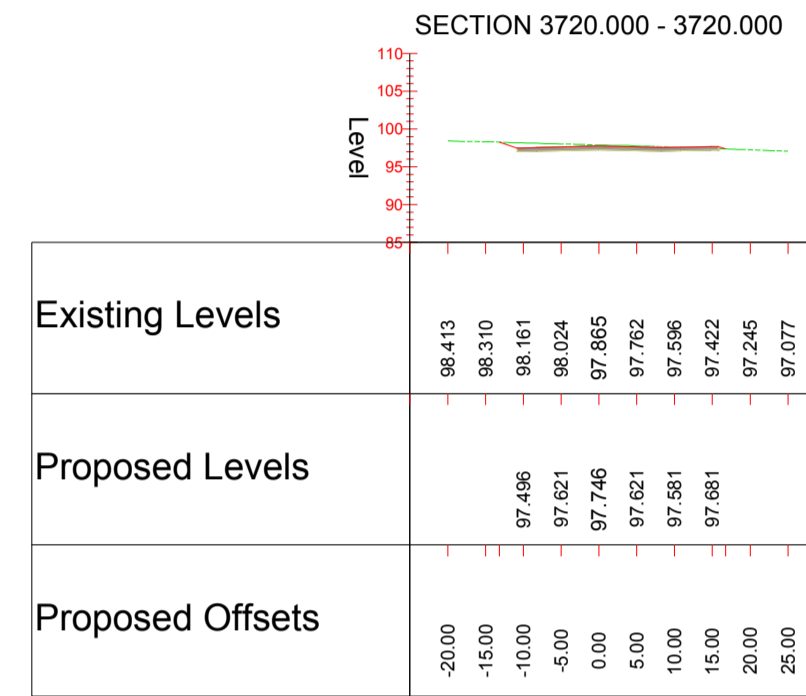
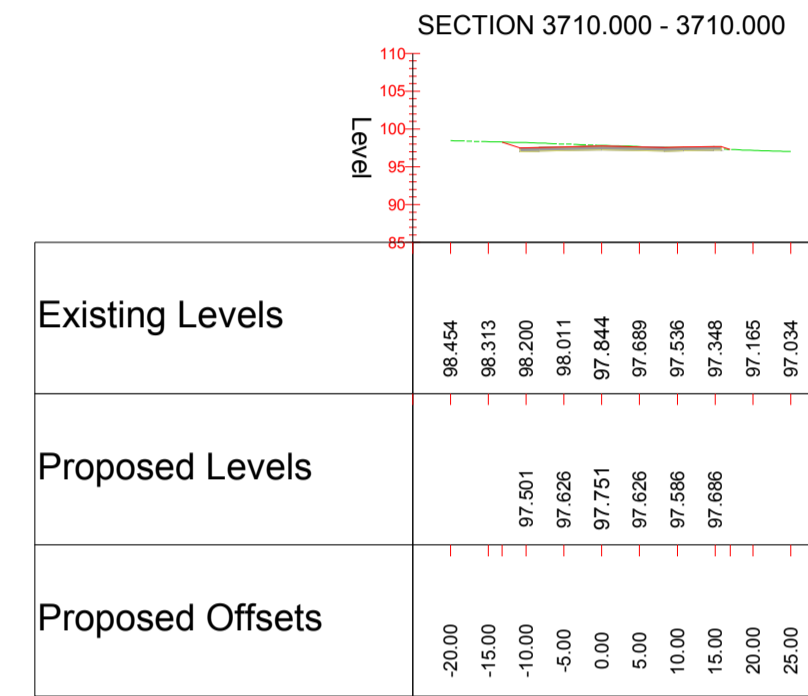
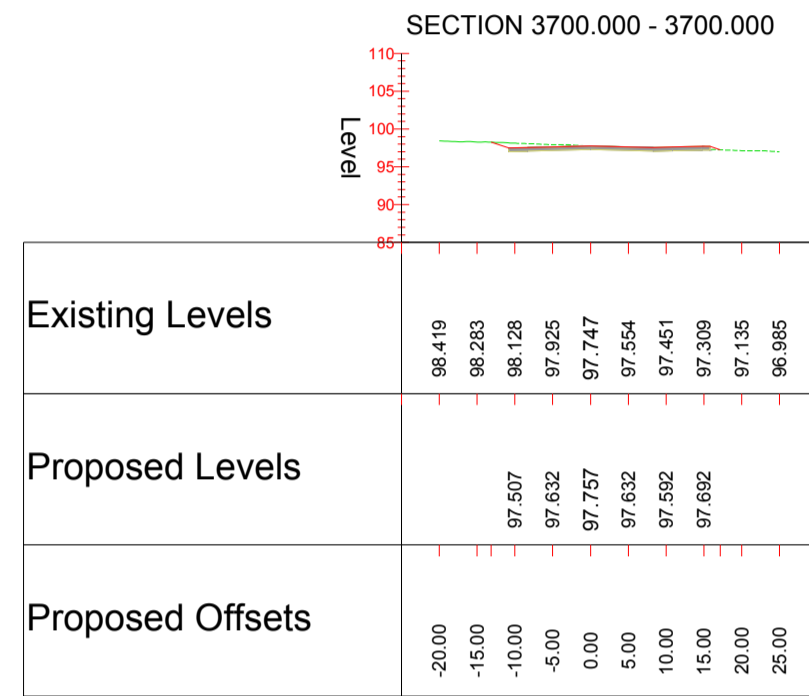
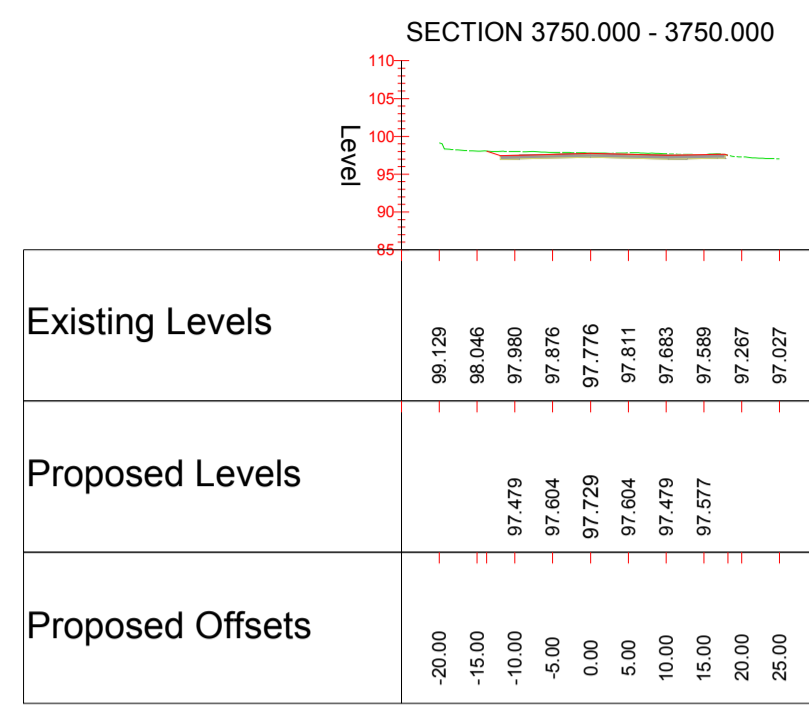
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## Appendix 6.2 Modelling methodology

# Technical note

<b>Project:</b>	West of England JSP	<b>To:</b>	Helen Young, Kevin O'Connor, Claire Cornelius, Chris Mason, Jodi Savickas
<b>Subject:</b>	Modelling and Economics Methodology Appendix for WP1/3/6a OARs	<b>From:</b>	Tracey Poole
<b>Date:</b>	10 <sup>th</sup> October 2018	<b>Reviewed by:</b>	Josie Drath, Sheng Peng, Pete Knightbridge (highway modelling)

## 1. Introduction

This appendix sets out the scope and methodology for the modelling and cost-benefit analysis of the schemes presented in the Options Assessment Report (OAR). The OAR presents the results of the assessments.

### 1.1. Economic Scope

Figure 1 illustrates the full range of economic impacts anticipated from transport interventions, in line with the latest Department for Transport (DfT) guidance and Value for Money (VfM) framework<sup>1</sup>.

The monetised impacts captured in the cost-benefit analysis are supported by non-monetised assessments presented in the OAR. This document focusses on the cost-benefit analysis.

Modelling and economic appraisal activities undertaken to date have been focused on quantifying and monetising scheme costs and the majority of Level 1 impacts (Types A and B in Figure 1) as follows:

- Public transport (PT) user benefits - generalised journey time savings for passengers;
- Highway user benefits - time and vehicle operating cost savings to highway users as a result of decongestion impacts from highway enhancements, or reduction in road trips due to mode shift from highway to MetroBus and / or cycling;
- Health benefits to slow mode users as a result of increases in cycling;
- Capital costs and an appropriate allowance for maintenance and renewal of new infrastructure; and
- MetroBus and Park & Ride service operating costs and generated revenues from new passengers.

For the OARs the non-user impacts in Level 1 (such as accident savings, air quality and noise impacts) and all Levels 2 and 3 (i.e. reliability and wider economic impacts) have not been quantified or monetised. The Level 3 impacts have been assessed as part of the WECA Outline Business Cases (OBC) (quantified or qualitatively, depending on the impact).

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<sup>11</sup> DfT Value for Money Framework (July 2017)  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/630704/value-for-money-framework.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/630704/value-for-money-framework.pdf)

# Technical note

**Figure 1** Illustration of the full range of economics impacts from transport interventions  
*Type of economic impacts* *Description*

	<i>Type of economic impacts</i>	<i>Description</i>
Costs	<b>A</b> Impact on Govt's Broad Transport Budget	Public sector cost of scheme delivery, operation and renewal Changes in revenues to public sector providers / operators
Level 1 impacts	User impacts	Journey time and operating cost savings Disruption impacts during construction and maintenance
	Non user impacts	Related air quality and noise impacts Reductions in accidents
	Private provider impacts	Costs and revenue impacts
Level 2 impacts	<b>C</b> Additional (lower certainty) impacts on Transport Network	improved journey reliability improved network resilience
	Wider economic impacts (no land use changes)	Agglomeration (static) Labour supply impacts (tax wedge on more people working) Increased economic output in imperfect competitive market
Level 3 impacts	<b>D</b> Wider economic impacts (with land use changes)	Agglomeration (dynamic) Moves into more productive jobs Welfare impact of induced increase in housing or commercial supply - dependent development
Non-monetised impacts	<b>E</b> Economic impacts	option value
	Environmental	landscape, townscape, heritage, natural habitats, water
	Social	improved security, reduced severance, access to services, health impacts, impact distribution by social groups

## 1.2. The Models and Analysis

This note sets out the models and assumptions that have been used to estimate the impact of the schemes presented in the OAR. It explains the approach taken to combining model outputs with an appropriate treatment of scheme costs into the cost-benefit analysis of the schemes, which helps to inform VfM.

The following models have been used:

- A **PT mode choice** model has been developed to test PT schemes and output PT user benefits, forecast mode shift to PT from car and the resulting generated revenue;
- The **Greater-Bristol Area Transport Study (G-BATS4) Strategic model** together with TUBA has been used as the basis for modelling the impact on highways – testing the impact of the highway schemes, and also, using outputs from the PT mode choice model and the DfT's Propensity to Cycle Tool<sup>2</sup> to capture the highway user benefits from mode shift to PT and cycle;
- Highways England's (HE) **VISSIM** model has been used to model one of the key junctions in the Thornbury Corridor;
- The DfT's **Propensity to Cycle Tool**<sup>3</sup> has been used to forecast mode shift to cycle as a result of increased facilities for cyclists;
- The **HEAT** (Health Assessment Tool)<sup>4</sup> has been used to estimate health benefits derived from increases in cycling; and
- Atkins' **PT operating cost model** has been used to estimate operating costs.

<sup>2</sup> Propensity to Cycle Tool <https://www.pct.bike/>

<sup>3</sup> Propensity to Cycle Tool <https://www.pct.bike/>

<sup>4</sup> HEAT <http://www.heatwalkingcycling.org/>

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In each of the models the impact of the scheme has been tested compared to a 'Do-Minimum' scenario which includes underlying growth and other committed transport schemes. The benefits, operating costs and revenues from these models have been brought together with capital costs and an allowance for maintenance and renewal with appropriate allowances for inflation, growth, risk and discounting to 2010 present values in accordance with WebTAG.

The rest of this note gives details of the highway modelling, the PT mode choice model and of the assumptions and collation of inputs into the economic analysis.

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## 2. Highway Modelling Overview

### 2.1. Introduction

G-BATS4 has been used for Work Package 1 (Whitchurch) and Work Package 3 (Yate) highway schemes, and provided flows for the VISSM modelling in Work Package 6a (Thornbury).

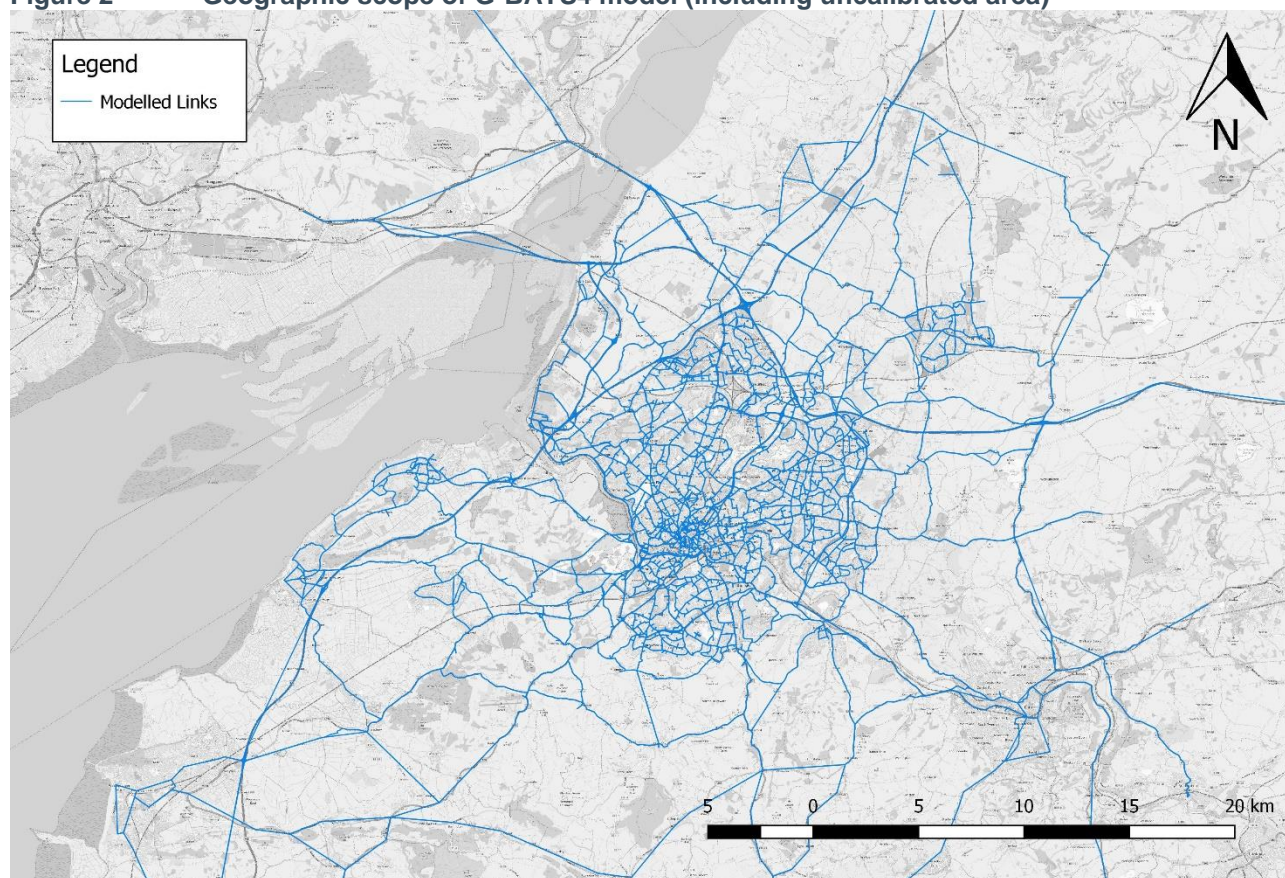
G-BATS4 model represents the highway network covering the Bristol urban area and wider sub-region, as seen in Figure 2. The base model has been developed and validated using traffic count, road side interview surveys and travel time data collected in 2013. It is important to note that the model has been specifically calibrated on the urbanised area within the M4/M5 box. Outside this area, whilst the network and travel demand is included, there is a limitation around the level of detail for specific corridors and junctions.

As the scheme designs progress, a more detailed appraisal and assessment of the G-BATS4 model functionality in these regions is recommended. Nevertheless, the G-BATS4 model is able to provide strategic analysis of current and expected future issues at the sub-regional level and has helped inform analysis of the potential for mode shift from the private car and the overall performance of the transport network<sup>5</sup>.

### 2.2. Geographic Scope

The area covered is shown in Figure 2. Outside the Bristol urban area, the G-BATS4 model becomes increasingly less detailed, however for a strategic overview of the interventions the model is still adequate.

**Figure 2 Geographic scope of G-BATS4 model (including uncalibrated area)**



<sup>5</sup> West of England Joint Transport Study, Final Report (October 2017)



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## 2.3. Time Periods

Highway schemes were modelled in all three time periods, AM peak (between 0800 and 0900), inter peak (1000-1600) and PM peak (1700-1800), with annualisation factors utilised in the economic assessment to expand to a 12-hour weekday and all year.

The impact on highways of the PT schemes (decongestion impacts) are modelled for the peak hour only, with a different annualisation factor applied. Note that the PT mode choice model is a 3-hour model (both AM and PM Peaks), and the PT mode choice model supplies a percentage change in car trips, which becomes the basis for decongestion modelling in G-BATS4.

Further details on PT mode choice modelling periods can be found in Section 3.2.3.

## 2.4. Forecast Spatial Planning Scenarios

There are two forecast spatial planning variants considered in this study: The 'core' forecast for the OARs is described as 'Spatially Neutral' (to align with WebTAG) with a 'Joint Spatial Plan' (JSP) sensitivity test.

### Spatially Neutral

The core forecast scenario was updated in January 2018 by CH2M/Jacobs using current WebTAG values of time and the DfT's National Trip End Model (NTEM 7.2) to represent the expected traffic on the network in 2036. Whilst this scenario includes projected demographic, employment and car ownership changes within the region, a large amount of growth will be classified as uncertain hence it is assumed to be spread across the region as per the base distribution of travel demand. This core scenario is therefore described as **Spatially Neutral**.

The Spatially Neutral scenario is consistent with the DfT WebTAG Unit M4 (Forecasting and Uncertainty) which recommends the establishment of an uncertainty log. This classifies future land development and infrastructure by the likelihood that they will occur. Only specific changes which are considered 'near certain' or 'more than likely', are to be included.

This scenario was created using a Variable Demand Model (VDM). The VDM process modifies the Reference Case demand forecasts to reflect the impact of vehicle operating costs, value of travel time and cost of alternative PT travel, resulting in a without-scheme (Do-Minimum) scenario.

The schemes and land use assumptions included in the Spatially Neutral model are consistent with the uncertainty log, which is included within the traffic forecast report provided by CH2M/Jacobs.

### JSP Scenario

Sensitivity testing was undertaken which assumes proposed housing and employment in the JSP, the 'With JSP' scenario. This was undertaken to demonstrate the impact of adding more demand to the specific development areas and therefore capturing an increased benefit of improving the transport network on some of the short listed schemes/packages given they are designed to directly relate to the JSP developments.

This scenario more accurately reflects the expected highway trip generation and distribution for each Strategic Development Location (SDL) and the changes in housing and employment quanta expected in the JSP. Whilst these SDLs are not yet committed and hence have insufficient certainty to be included in the Core tests, this JSP scenario seeks to provide evidence of the impact of the JSP development on the network and the proposed schemes.

The DfT TEMPro software has a function which allows the user to project trip growth resulting from alternate planning assumptions. These revised growth assumptions, combined with projected SDL trip generation, provided an estimate, within each Unitary Authority, of trip growth compared to the Spatially Neutral highway matrices.<sup>6</sup>

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<sup>6</sup> The 2036 Spatially Neutral highway matrices were based on the outputs from the updated multi-modal variable demand model. The JSP highway matrices are derived from these outputs rather than a full re-run of the VDM.

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The planning assumptions for the JSP are detailed in the JSP Transport Topic Paper<sup>7</sup>, Section 3.3.3. The assumptions behind the changes in households and jobs for the JSP are summarised in Table 1.

**Table 1 Planning Assumptions for Transport Modelling**

Households	2013	2036			Increase 2013-2036		
	Base TEMPRO 7.2	TEMPRO 7.2	2036 Excl JSP	2036 Incl JSP	2036 Excl JSP	2036 Incl JSP	Difference with JSP
West of England	<b>460,482</b>	<b>560,927</b>	<b>534,925</b>	<b>577,580</b>	<b>74,443</b>	<b>117,098</b>	<b>42,655</b>
B&NES	74,620	85,893	86,645	91,156	12,025	16,536	4,512
Bristol	185,375	221,583	207,583	223,284	22,208	37,910	15,702
North Somerset	90,265	116,631	106,249	117,016	15,984	26,751	10,767
South Gloucs	110,222	136,820	134,449	146,124	24,227	35,901	11,675
Jobs	Base TEMPRO 7.2	TEMPRO 7.2	2036 Excl JSP	2036 Incl JSP	2036 Excl JSP	2036 Incl JSP	Difference with JSP
West of England	<b>598,619</b>	<b>665,334</b>	<b>642,788</b>	<b>693,498</b>	<b>44,169</b>	<b>94,880</b>	<b>50,711</b>
B&NES	97,930	109,435	102,752	108,103	4,822	10,173	5,350
Bristol	256,166	284,175	266,151	286,282	9,984	30,116	20,132
North Somerset	90,537	101,412	99,703	109,807	9,166	19,270	10,104
South Gloucs	153,985	170,312	174,181	189,306	20,196	35,321	15,125

WoE JSP Transport Topic Paper / NTEM 7.2

Before applying constraints, the expected highway trip demand from the specific SDL was added to the 2036 VDM matrix. This is detailed in the Topic Paper section 3.3.4. A summary of the SDL trip generation is found in Table 2. These SDLs are specific zones: 900XX (see Table 2). The trip distribution was based on nearby zones which match the land use characteristics.

**Table 2 Trip generation of SDLs**

Location Name	Residential Dwellings	Employment (Ha)	Highway Zone	AM Peak		Inter Peak		PM Peak	
				Out	In	Out	In	Out	In
North Keynsham	1,400	14.0	90021	555	923	454	423	796	458
Whitchurch	1,600	0.0	90020	466	193	215	218	249	412
Brislington	500	0.0	90019	142	59	65	66	76	126
Backwell	700	10.5	90022	1,065	961	639	621	943	917
Nailsea	2,575	-	90022						
Churchill Garden Village	2,675	7.4	90024	857	721	500	487	722	741
Banwell Garden Village	1,900	5.0	90023	606	499	350	342	502	525
Buckover Garden Village	1,500	11.0	90028	553	773	410	387	688	463
Charfield	1,200	5.0	90026	402	414	256	246	393	344
Coalpit Heath	1,800	5.0	90025	577	487	337	328	487	499
Northwest Yate	1,000	0.0	90027	291	121	134	136	156	258
West Yate	-	30.0	90030	316	1,615	569	497	1,240	209
Thornbury	500	5.0	90029	198	330	162	151	284	164
<b>SDL Total</b>	<b>17,350</b>	<b>92.9</b>	-	<b>6,028</b>	<b>7,095</b>	<b>4,092</b>	<b>3,903</b>	<b>6,536</b>	<b>5,116</b>

October 2017 Housing Trajectory and TRICS database

The 2036 matrix, including SDLs was then constrained, by unitary authority, to match the projected NTEM alternate (i.e. JSP scenario) assumption growth. The matrix was furnished to fit as closely as possible the absolute estimated projected JSP growth rather than percentage change. The overall matrix totals for the AM, IP and PM are shown in Table 3.

<sup>7</sup> JSP Transport Topic Paper

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**Table 3 Highway Matrix Totals and NTEM Growth**

AM Peak Model Matrix								AM Peak NTEM		
Base	VDM		ExcJSP		Inc JSP		Car OD (Raw)	Exc JSP	Inc JSP	
2013	2036	vs Base	2036	vs Base	2036	vs Base	2036 vs Base			
WoE	108,450	127,444	17.5%	120,089	10.7%	130,441	20.3%	15.2%	10.3%	19.1%
Bath	4,858	6,190	27.4%	5,609	15.5%	6,771	39.4%	8.8%	7.9%	13.5%
Bristol	58,384	65,404	12.0%	62,578	7.2%	65,508	12.2%	18.0%	10.5%	18.9%
NSC	13,637	16,493	20.9%	13,704	0.5%	16,609	21.8%	18.1%	9.1%	20.2%
SGC	31,571	39,357	24.7%	38,198	21.0%	41,553	31.6%	13.3%	12.2%	21.9%
External	17,701	21,418	21.0%	20,793	17.5%	21,948	24.0%	-	-	-

Inter Peak Model								Inter Peak NTEM		
Base	VDM		Exc JSP		Inc JSP		Car OD (Raw)	Exc JSP	Inc JSP	
2013	2036	vs Base	2036	vs Base	2036	vs Base	2036 vs Base			
WoE	93,135	113,575	21.9%	110,257	18.4%	117,112	25.7%	18.6%	14.1%	23.2%
Bath	3,867	4,880	26.2%	4,439	14.8%	5,130	32.7%	16.2%	12.1%	18.0%
Bristol	52,325	61,093	16.8%	58,867	12.5%	61,001	16.6%	18.7%	11.2%	19.6%
NSC	9,558	11,729	22.7%	10,931	14.4%	12,643	32.3%	21.9%	15.7%	27.4%
SGC	27,385	35,873	31.0%	36,020	31.5%	38,338	40.0%	17.7%	18.4%	28.7%
External	14,056	17,985	28.0%	17,726	26.1%	18,267	30.0%	-	-	-

PM Peak Model Matrix								PM Peak NTEM		
Base	VDM		Exc JSP		Inc JSP		Car OD (Raw)	Exc JSP	Inc JSP	
2013	2036	vs Base	2036	vs Base	2036	vs Base	2036 vs Base			
WoE	110,278	127,626	15.7%	124,038	12.5%	134,001	21.5%	14.0%	10.0%	18.8%
Bath	4,817	5,568	15.6%	5,006	3.9%	5,942	23.4%	13.1%	8.1%	13.7%
Bristol	59,623	65,541	9.9%	63,035	5.7%	66,527	11.6%	14.1%	6.9%	15.0%
NSC	12,669	14,577	15.1%	13,315	5.1%	15,587	23.0%	16.5%	12.0%	23.3%
SGC	33,169	41,940	26.4%	42,682	28.7%	45,945	38.5%	12.8%	14.3%	24.2%
External	15,528	19,186	23.6%	18,885	21.6%	19,517	25.7%	-	-	-

Est 12Hr Model Matrix							
Base	VDM		Exc JSP		Inc JSP		
2013	2036	vs Base	2036	vs Base	2036	vs Base	
WoE	1,105,630	1,319,125	19.3%	1,271,860	15.0%	1,363,777	23.3%
Bath	47,390	58,675	23.8%	53,172	12.2%	62,563	32.0%
Bristol	608,968	693,921	14.0%	667,235	9.6%	696,094	14.3%
NSC	123,113	148,049	20.3%	133,134	8.1%	156,348	27.0%
SGC	326,160	418,481	28.3%	418,320	28.3%	448,773	37.6%
External	167,409	209,420	25.1%	205,551	22.8%	213,265	27.4%

GBATS Highway Matrices and NTEM7.2 data. The JSP matrices include the SDL trips

## 2.5. Use of Outputs in Economics

The outputs from G-BATS4 for highway schemes were run through TUBA using scheme parameters as set out in Section 4.4.

Due to the G-BATS only modelling being based on one year, post-TUBA benefit manipulation was completed. Using Value of Time (from WebTAG guidance) and benefits factors (derived from model change in (passenger car units (PCU) hours), the benefits are discounted back to the scheme opening year. Following this, the horizon year was adjusted, allowing the benefits to reflect the effects of the scheme from the opening year and over the 60-year appraisal period.

## 2.6. Model Caveats

To date, the modelling and analysis has been appropriate for the stage of the scheme development and case making, with no significant enhancements to pre-existing models. During the progress of model

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applications, a number of model limitations were observed, which are summarised below as recommendations for model enhancements in further stages of work:

- Calibration outside the Bristol urban area is minimal, meaning the model could be enhanced to more fully capture the observed/potential delay on key corridors;
- SATURN (the modelling program used) does not fully capture the benefits at junctions, a micro-simulation model could be used more widely in future stages to ensure the junctions function correctly and to capture delay and congestion benefits in more detail;
- Capture of the JSP demand in the models is relatively simplistic and reviews of the outputs show that it could be underestimated, also the JSP scenario in G-BATS is also not constrained to NTEM; and
- Currently only one forecast year is modelled, 2036, in future stages a second, more distant future year should be considered.

Potential enhancements to the above limitations is likely to lead to improved benefits capture and a more comprehensive VfM analysis.

## 2.7. VISSIM Modelling for Thornbury

### 2.7.1. Introduction

For the highway scheme being progressed in the A38 corridor (Work Package 6a), at M5 Junction 14, the G-BATS4 network is considered unsuitable for detailed testing as a strategic model is unlikely to pick up the full extent of the issues and benefits, and because the junction is in the model 'buffer' (less detailed part of the model). Hence a more detailed analysis has been undertaken using Highway's England's micro-simulation (VISSIM) model. This model has been specifically calibrated in the area, and is able to consider more detailed real time vehicle interactions. The expected strategic forecast change in highway travel demand from the G-BATS4 model has been applied to the validated base VISSIM model in order to assess the impact at this junction using the best available data.

### 2.7.2. Geographic Scope

VISSIM is more suited to junction modelling and for the location of the scheme it is used for in these corridor studies. Figure 3 shows the extent of the VISSIM model.

### 2.7.3. Time Periods

The VISSIM model was run using an AM Peak (07:30-08:30) and PM Peak (16:30-17:30), with a 30 minute warm up period (07:00-07:30 and 16:00-16:30) and a 30-minute cool down period (08:30-09:00 and 17:30-18:00). Note that there was no inter peak VISSIM model run, therefore annualisation factors were used to account for off peak benefits in the economics.

### 2.7.4. Modelled Flows

Modelled flows were taken from G-BATS4 for consistency. The base year VISSIM matrices were factored by growth from base year to the future year 2036 for all Origin-Destination (OD) movements in the VISSIM network.

### 2.7.5. Use of Outputs in Economics

The VISSIM model outputs were converted to a TUBA format using an Atkins spreadsheet. TUBA and post-TUBA manipulation was then completed.

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**Figure 3** Geographic scope of VISSIM model



## 2.7.6. M5 Junction 14 Modelling Limitations

As seen in Figure 3 the scope of the VISSIM model is limited, with no more than the junction and adjacent roads being modelled. This means that wider benefits and impacts are not, at this stage, captured. The VISSIM model has different time periods to that in G-BATS and using different software, meaning it is not directly comparable to the other highway schemes in detail, but the outputs give a broad indication of scheme performance. As with the G-BATS model, the HE VISSIM model has only one modelled year, meaning benefits require adjustment.

When the VISSIM model was run it was found that there was a high level of ‘un-met demand’<sup>8</sup> with one scheme option tested. This is due to higher levels of congestion. This means that some scenarios appeared to be performing better in TUBA as the demand was lower, despite high levels of congestion and vehicles not being able to enter; i.e. the modelling outputs are not realistic and the junction does not perform adequately to accommodate demand. In this instance, the scheme option was considered to not mitigate the impacts of the traffic flow at the junction.

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<sup>8</sup> ‘Unmet demand’ is when a vehicle cannot enter the network, due to congestion extending along the link preventing the vehicle from entering in their interval, meaning they are removed from the modelling.

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## 3. PT Mode Choice Modelling

### 3.1. Mode Choice Model Overview

The objective of the modelling was to undertake a proportionate assessment to establish which schemes are likely to have a good business case on further development. It is not necessary at this stage to produce detailed forecasts, e.g. for individual bus services. Outputs from the mode choice model were used for economic assessments of the schemes, together with highway impacts taken from G-BATS4. The outputs are for a WECA OBC, which is commensurate with the level of detail of a standard DfT Strategic Outline Business Case.

For PT schemes (MetroBus and Park & Ride), Atkins undertook PT demand modelling to estimate the level of demand for each of the proposed schemes. A bespoke spreadsheet modelling tool was developed to carry out the demand calculations since the existing transport model (G-BATS4) does not have suitably detailed spatial definition required for PT mode choice modelling outside of the existing urban area.

The requirement of the model was to produce patronage forecasts for bus and Park & Ride for the proposed schemes, and also resultant mode shift from highway travel which is input to the G-BATS4 model to forecast the impact on congestion. Rail patronage forecasts are not required.

This section sets out the development and specification of the mode choice model, covering:

- Model specification:
  - Model data;
  - Geographical scope;
  - Time periods modelled;
  - Functional scope;
- Calibration;
- Limitations;
- Demand growth;
- MetroBus scheme processing;
- Park & Ride scheme processing; and
- Combining MetroBus and Park & Ride schemes.

### 3.2. Model Specification

#### 3.2.1. Model data

The model uses demand data from the Census Travel to Work (TTW) dataset as an approximation for the AM Peak and the transpose is assumed to be the PM Peak. The volume of all-purpose peak period trips is roughly the same as all day (one way) commuting trips and therefore TTW data is a reasonable approximation. TTW data was used in preference to demand data held within the G-BATS demand model as it was considered to provide a better representation of demand for commuting travel patterns.

The TTW dataset was applied to the G-BATS model zoning system. The mode splits forecast by the model for each O-D movement are applied to the total travel demand for that O-D (taken from the TTW data).

Table 4 lists the elements of journey time and cost in its mode choice calculations considered in the mode choice model.

**Table 4 Cost terms considered in mode choice modelling**

Public Transport	Highway
In vehicle time (minutes)	In vehicle time (minutes)
Fares (£)	Parking cost (£)
Access time (minutes)	Tolls (£)
Waiting time (minutes)	Car operating costs (£)

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Public Transport	Highway
Interchange time (minutes)	
Walk times (minutes)	

Notes:

- Fares, parking costs, tolls and car operating costs are converted to time units (minutes) using standard WebTAG values of time,
- Fares and car operating costs are calculated using unit rates and journey distances, and
- Park & Ride costs are a combination of highway costs and PT costs

Travel time and other data needed for the generalised cost calculation is taken from the G-BATS model for the 2013 base year. This is close to the 2011 Census year and considered a reasonable fit for the data.

For the purpose of modelling the PT schemes, it has been assumed that only PT cost terms would change, and highway costs stay unchanged from the base.

## 3.2.2. Geographical scope

The PT mode choice model's coverage is approximately equal to the G-BATS model area. For how the geographical scope for each individual scheme is controlled, see Section 3.7.2.

## 3.2.3. Time periods modelled

The mode choice model considers travel in the AM period and the PM period. In each case, travel time characteristics are taken from the GBATS multi-modal model, which includes an AM Peak (0700-1000) and PM Peak (1600-1900) time period.

## 3.2.4. Functional scope

The PT mode choice modelling takes the form of a logit choice model, considering the choice between using the car or PT. The model calculates the mode split for each O-D movement, which when applied to the anticipated demand for that movement, will give an expected patronage figure for the scheme. This is an absolute form of model, calculating the mode split based on the time and cost of travel.

On reviewing the mode choice structure of the existing G-BATS4 model, a nested logit model was identified as the most appropriate approach with two levels:

- Main Mode: Highway / PT;
- Sub Mode Highway: car / Park & Ride; and
- Sub Mode PT: bus /rail.

Generalised cost formulation follows the form and weights used in G-BATS. The demand data is held in OD (origin-destination) format, not PA (production-attraction) which is more usual for demand models. This is due to limitations of the demand data.

Disaggregation in the model was carried out by purpose and by time of day. There will be no disaggregation by income or by car availability. The model was specified to estimate the split between available modes applied to forecast demand levels and travel patterns. It will not be specified to forecast the amount of demand, or to calculate the distribution of that demand.

The model does not take into account constraining factors such as car availability or car parking capacity.

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## 3.3. Calibration Results

### 3.3.1. Base Year Calibration

Model calibration was achieved by adjusting the mode choice scale parameters and including a limited number of mode specific constants to achieve the required mode split.

TTW data does not specify Park & Ride usage. It was assumed that all Park & Ride use is reported within the 'car' mode of travel. Counts from the existing Park & Ride sites were used in combination with the TTW data to determine the car/Park & Ride split.

### 3.3.2. Model Parameters

The final calibrated parameters are:

- Main mode choice (lambda): 0.028;
- Sub mode choice PT (lambda): 0.15;
- Sub mode choice highway (lambda): 0.15;
- Mode specific constant rail (minutes): 30; and
- Mode specific constant Park & Ride (minutes): 5.

The mode splits observed in the TTW data and achieved by the model are reported below. A number of calibration runs have been carried out, varying the mode choice parameters and the rail and Park & Ride mode specific constants.

The best results obtained from the calibration test runs are shown below. Since Park & Ride is not recorded separately in the Census data the Park & Ride trips are included with car in Table 5.

**Table 5 Mode choice demand calibration**

Travel mode	Demand		Mode split %	
	TTW	Model	TTW	Model
<b>Car and Park &amp; Ride</b>	232,347	230,275	86.16%	85.93%
<b>Bus</b>	29,975	30,831	11.11%	11.43%
<b>Rail</b>	6,790	7,815	2.51%	2.90%
<b>Total</b>	<b>269,112</b>	<b>268,921</b>	<b>100.00%</b>	<b>100.00%</b>

This shows a good fit between the model and the TTW data at a total travel demand level.

### 3.3.3. Park & Ride patronage for Existing Sites

Comparison between modelled and observed Park & Ride demand (person trips between 8AM and 9AM) at existing sites is in Table 6.

**Table 6 Park & Ride patronage (person trips, AM Peak hour 8-9AM)**

Site	Model patronage	Model split	Count patronage	Count split
Portway	251	34%	79	14%
Bath Road	318	42%	243	44%
Long Ashton	175	24%	232	42%
<b>Total Park &amp; Ride</b>	<b>744</b>	<b>100%</b>	<b>554</b>	<b>100%</b>

Count patronage is based on figures used in CH2M's validated base year Park & Ride model.



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At the mode choice level, Park & Ride patronage is over-predicted (744 trips in the model as compared to 554 trips from counts). The split between sites is more even in the model than in the count data, with the model overestimating use of the Portway site and underestimating use of the Long Ashton site. However, as the objective of this model is to predict patronage for new Park & Ride sites, the overall mode split is the more important measure. It is noted that the counted patronage of 79 trips at Portway appears low.

## 3.3.4. Realism testing

A realism test, increasing bus fares by 10%, was undertaken to see the effect on cost trip elasticity and is presented in Table 7.

**Table 7 Bus fare realism test**

	<b>Bus fare increase 10%</b>
Calculated own cost trip elasticity	-0.42

The elasticity reported is lower (in magnitude) than ideal (WebTAG suggests an elasticity of -0.7 to -0.9), meaning the model is likely to be conservative in estimating the impact of a fare change. However, since the model is only considering mode choice between car and PT and no other responses (such as trip redistribution, not making a trip or switching to walking and cycling) and calibrated only on commuting trips, which are expected to be less elastic than discretionary trips, this is a reasonable result.

PT tests carried out for the specified schemes suggest a reasonable degree of sensitivity of demand response to changing journey times.

## 3.4. Limitations and Next Steps with Model

This model is suitable to assess the likely impact of bus-based improvements on a corridor basis, an appropriate level of robustness to support the OARs. Results from the model can be used to inform operational or economic appraisal to inform decisions on taking schemes forward to a more detailed business case. As with all modelling exercises, and at this stage of development, there are caveats around the model outputs and a list of the limitations of the approach is given below. As appropriate, at subsequent stages of scheme and modelling development commensurate with DfT OBC or Full Business Case (FBC) stage, further modelling refinement will be undertaken either to enhance the PT mode choice model, and/or to enhance G-BATS4 to a greater level of granularity in the specific corridors.

The key limitations of the mode choice model are as follows:

- Forecasts are intended to give a scale of Value for Money, the level of detail is proportionate to the early stage of scheme development;
- There is no trip generation or trip distribution included, the only decision being modelled is the choice of mode applied to forecast demand;
- The modelling does not detail time-of-day choice, peak spreading or period switching;
- The model does not go to the level of boarding and alighting at individual bus stops, or loadings on individual buses;
- Corridor bus patronage is captured at this stage rather than forecasting how demand might move between individual services within each mode, and therefore the modelling is not detailed enough to indicate how many people will switch to MetroBus from existing bus services;
- Patronage forecasts are provided for each key origin for the time period as a whole. This may smooth out the high peak within each peak period;
- Generalised costs are calculated based on assumptions of route choices, and the flows captured for each scheme are manually generated. This may have led to a smaller set of flows captured than would have been if journey time changes are determined through an assignment program;
- The PT mode choice modelling does not consider constraining factors such as car availability or car parking capacity;
- Modelling of PT schemes have only considered changes to PT journey times and costs, and those for car are assumed to be fixed. These are reasonable assumptions for the schemes as specified for this commission; and

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- Each element of modelling undertaken was carried out in line with WebTAG guidance. However, given the simplification at this early stage of development, the modelling approach does not consider the full range of responses set out in WebTAG.

Subsequent stages of scheme development should consider addressing some of the above.

# Technical note

## 3.5. Summary of Key Assumptions

Table 8 shows the key assumptions made in the PT and mode choice modelling.

**Table 8 Key PT Mode Choice Modelling Assumptions**

Assumption	Rationale	Impact	Notes
<i>Park &amp; Ride is modelled in the PT mode choice model for AM only</i>	No reliable Park & Ride data in PM	Park & Ride traffic impacts in PM assumed to be reverse of AM	Highway Benefits: Park & Ride outputs were included in the SATURN PM model and therefore PM benefits are captured in the economic benefits. No IP model was run at this stage therefore benefits may be underestimated. PT Benefits: Annualisation factors were used to uplift the benefits (6.83 for AM or 7.09 for PM). Future Park & Ride modelling would benefit from further data collection (e.g. for inter peak and PM-peak periods) to for better model calibration and forecasting
<i>Growth based on highway matrix rather than mode specific growth</i>	No full forecast matrix available	Growth rates may vary slightly compared to all-modes growth	This is a limitation but is proportionate at this stage of analysis and scheme development
<i>Census TTW data is used for demand</i>	Client request	Only covers commuting demand; no adjustment made for specific time periods or other trip purposes.	The model forecasts for the AM Peak and uses demand that reflects all commuters, however some commuting will occur outside of the AM Peak period. This is a simplifying assumption for this stage of modelling and whilst use of this data would over represent commuting in the AM Peak, this broadly balances with under representation of other trip purposes.
<i>In scope zones - 500m radius at origin end; 1.5km in Bristol</i>	Passengers are unlikely to walk further	There could be a wider catchment from interchange with other buses or cycle therefore patronage may be under estimated a little.	A sensitivity test has been undertaken where this is thought to be a particular issue (Thornbury) to give an indication of an alternative more relaxed assumption.
<i>In scope zones - only where directly served by bus stop</i>	Calculating all potential journeys is not proportionate	Could under estimate patronage slightly.	A sensitivity test gives an indication of an alternative assumption.

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Assumption	Rationale	Impact	Notes
<b><i>No changes to fares</i></b>	Fares strategy uncertain	Fares are an element of the cost used to calculate mode shift. OpEx revenue calculated separately	This is a limitation but is proportionate at this stage of analysis and scheme development.
<b><i>Bus quality factor of 15% applied to in vehicle time</i></b>	MetroBus is higher quality than existing buses	Will make MetroBus more attractive compared to normal bus or car with same journey time	This is an acceptable assumption for this stage of development. It is recommended that further work in later stages of scheme development is undertaken. to confirm the MetroBus 'concept', to what extent this is delivered by the services and infrastructure, the relationship between this and the value of 15% and whether this is the correct proportion.
<b><i>GBATS used as source of journey times</i></b>	Best data source for all journeys in Bristol	Model may not be completely accurate in all locations	Alternative sources and more detailed verification could be considered at later stages of scheme development when modelling in more detail.
<b><i>Yate loop passengers take first bus</i></b>	Passengers unlikely to wait for following bus	Journey time to stops on circle is average of the two directions, not the quickest direct	Simplification is appropriate for this stage of scheme development and analysis. We recommend a reality check on the potential impact (if any) of this simplifying assumption when forecasting in more detail.

# Technical note

## 3.6. Demand growth

Growth in demand from base year to future year, 2036, is determined by applying factors at the origin zone, calculated from the G-BATS highway matrices as the best available source at the time the analysis was undertaken. This assumes no change in distribution between base and future years which is a simplifying assumption at this stage of scheme development and could be enhanced in the future.

Two scenarios are considered:

- ‘Spatially Neutral’ where growth in demand is applied evenly across wide areas; and
- ‘With JSP’ where growth in demand is targeted in specific zones to reflect new development areas.

As the base year data is only available for existing zones and growth is applied multiplicatively, new zones in the ‘With JSP’ scenario are paired with an appropriate nearby zone sharing the same journey characteristics. The demand from the ‘new’ zone is moved to the ‘old’ zone for the purposes of the mode choice calculations, so that all demand is accounted for in the future year scenario.

## 3.7. MetroBus scheme processing

### 3.7.1. Schemes assessed

The schemes to be tested consist of improvements to bus services on many routes between Bristol City Centre and towns just outside the Bristol urban area. Journey times and bus service details were specified for each section of the route.

### 3.7.2. Zones affected

As the mode choice model is configured to calculate mode splits for each OD pair, it was necessary to define the zones, and the OD pairs, affected by the new bus routes and Park & Ride sites. The overall principle for this was to capture only the OD pairs directly affected by introducing the new route, and not any others even though they may see a marginal improvement.

The affected zones were defined as:

- Bristol City Centre: any zone within 1.5km of a stop served by MetroBus, according to the Travelwest website; and
- Outside Bristol: any zone within 500m of stops served by the new service. Where the services leave the existing MetroBus corridors, this includes the last stop on the shared section of route and all stops thereafter.

Journeys in scope are:

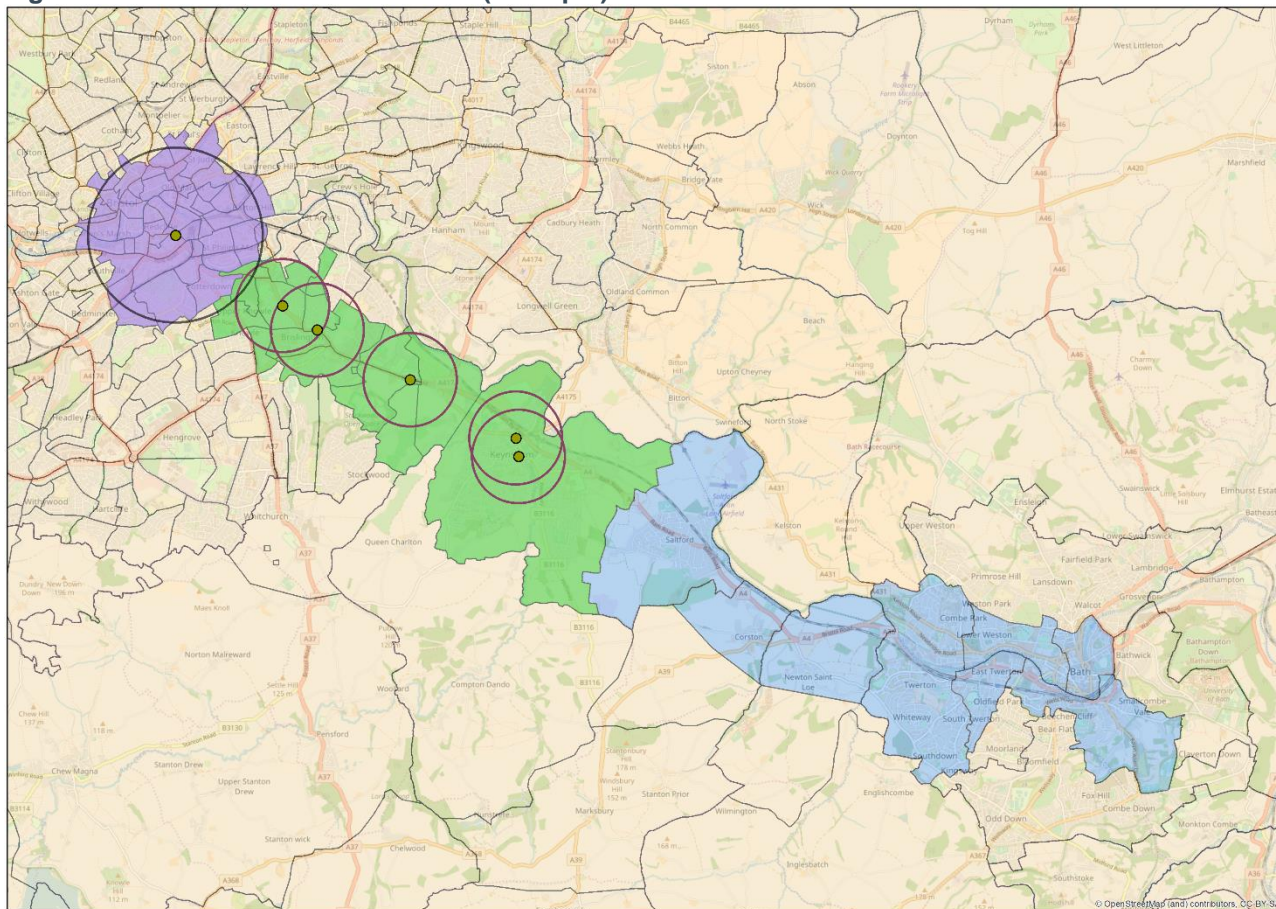
- Journeys between all OD pairs in the ‘outside Bristol’ range; and
- Journeys between ‘Outside Bristol’ and ‘Bristol City Centre’, but not journeys within ‘Bristol City Centre’.

The selection of in-scope zones forming the in-scope OD pairs is referred to as a corridor.

Figure 4 is an example of such a corridor. For the A4 scheme, PT journey time changes are considered for movements between all coloured zones.

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**Figure 4 A4 MetroBus Corridor (Example)**



### 3.7.3. Scheme specification

The mode choice model calculates the generalised cost for bus services based on the journey time, frequency, walk and interchange time information provided to it. The data preparation therefore required the relevant information to be updated for those OD pairs in scope of the assessment as set out below. No changes were made to the other journey attributes (distance, fare, access etc).

#### 3.7.3.1. Journey time

The journey time for each OD pair was calculated from the journey time specification provided for the scheme, by linking each zone to the nearest bus stop.

The in-vehicle journey time was reduced by 15%<sup>9</sup> to reflect the better quality of MetroBus compared to existing bus services, and therefore an improvement in perceived journey quality.

#### 3.7.3.2. Waiting time

The waiting time at each bus stop was specified as half the headway for the service, assuming a random arrival profile at the stop. The bus services provided are relatively frequent (10-20 minute headways), so this is a reasonable assumption. Waiting time changes were applied for schemes intended to deliver improved frequency of services along key corridors.

<sup>9</sup> This factor was based on the factor used in the Cambridge multi-modal model to represent their high-quality and guided bus services.

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## 3.7.4. Post-model processing

Output highway demand change matrices are fed back into G-BATS then TUBA is used to calculate highway decongestion benefits. Summary statistics for bus user benefits are fed directly into TUBA.

## 3.8. Park & Ride site processing

The preparation of Park & Ride data was independent of the MetroBus data. The Park & Ride sites modelled are served by the MetroBus schemes being tested, and so share key journey data characteristics with them.

### 3.8.1. Generalised costs

For Park & Ride sites, the generalised costs are a direct input to the model, and therefore needed to be calculated outside the model.

The generalised cost for a Park & Ride service consists of several elements:

- Car generalised cost from origin to the zone representing the Park & Ride site (with adjustments made to reflect differences between the location of the zone and the Park & Ride site where the two are different);
- Bus in-vehicle time (calculated on the same basis as the MetroBus in-vehicle time);
- Waiting time (half the headway); and
- Interchange time of 10 minutes, reflecting parking time and inconvenience of changing modes.
- Fares are assumed to be the same as MetroBus fares from that location.

The other attributes are unchanged.

### 3.8.2. Zones in scope

The mode choice model only considers the choice of one Park & Ride site for each OD pair. To calculate which OD pairs should be considered in scope for the purposes of the assessment, the generalised cost of using the new Park & Ride site was calculated for all OD pairs. If this generalised cost was lower than the existing model generalised cost, that OD pair was allocated to the new Park & Ride site and considered in scope. For all OD pairs where the generalised cost with the new site was higher than existing, they were considered out of scope and remained with their existing generalised cost and Park & Ride site option.

## 3.9. Combined scheme (MetroBus and Park & Ride site) testing

A combined scheme, consisting of both MetroBus and Park & Ride site testing is input to the model by including both the Park & Ride and MetroBus scheme inputs. The model uses this information to determine the mode used to travel given the availability of both MetroBus and Park & Ride options.

# 4. Economics Overview

## 4.1. Introduction

This section explains how the costs, benefits and revenues are brought together into the cost-benefit analysis, and the assumptions or approaches that are adopted.

The Economic Assessment has been carried out using standard procedures and economic parameters as defined by TAG Unit A1- Cost Benefit Analysis with efforts made to quantify and monetise costs and other impacts where appropriate.

A VfM Statement is presented in the OAR to provide a summary of the conclusions from the VfM assessment. The VfM categories and their relationship with benefit-cost ratios (BCRs) generated through cost-benefit analysis, is presented in Table 9. Though it should be noted that other non-monetised considerations should be included in VfM assessments.

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**Table 9 DfT VfM categories**

DfT Value for Money categories	
BCR	Category
Less than 1.0	Poor
1.0 to 1.5	Low
1.5 to 2.0	Medium
2.0 to 4.0	High
Greater than 4.0	Very High

## 4.2. Estimation of Scheme Benefits in TUBA (applicable to all schemes)

The impacts of the options on travel times and vehicle operating costs for trips using the scheme were assessed using the DfT’s TUBA program (v1.9.9)<sup>10</sup>.

TUBA is a bespoke software package developed on behalf of the DfT to estimate the impacts of transport schemes in terms of the costs and benefits experienced by users and providers of the transport system, and the associated indirect taxation impacts.

TUBA estimates costs and benefits by comparing transport conditions in a Do-something scenario against conditions in a Do-minimum scenario. To this end, for the schemes tested, TUBA uses information from the transport models to:

- Calculate user benefits by vehicle type and for each element of journey cost (i.e. travel time and vehicle operating costs - fuel and non-fuel);
- Calculate the changes in the indirect tax income received by the government (for highway schemes this primarily reflects the levels of indirect taxation incurred on fuel cost); and
- Calculate the changes in the greenhouse gases emissions.

For the scheme assessments, the user and provider related costs and benefits in each year produced by TUBA were combined with estimates of costs and discounted to 2010 values.

## 4.3. Economic parameters

TUBA provides a complete set of default economic parameters in its standard economics file, including values for variables such as values of time, vehicle operating cost data, tax rates and economic growth rates.

TUBA v1.9.9 has been used which enables appraisal to be undertaken by varying the Value of Time, either by distance-band or as a continuous function varying by distance for the business users, as defined in the WebTAG data book (v1.8.1). It should be noted that for this analysis TUBA method 1 is selected which uses varying values of time by distance for business users.

<sup>10</sup> The most recent TUBA program (v1.9.10) was released part of the way through the appraisal, however, for consistency, it was decided to continue the appraisal with v1.9.9.



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## 4.4. Scheme parameters

The scheme related parameters in the TUBA scheme file were largely determined by the parameters used in the forecasting model, namely:

- First year – 2036;
- Last year – 2095;
- Modelled years – 2036, 2037;
- Current (appraisal) year – 2018.

The GBATS model only has one modelled year, 2036, therefore this was taken to be the first year and the second year (required by TUBA) was taken to be 2037. The model outputs were used for both of these years and post-TUBA manipulation was undertaken to account for this and the incorrect opening/first year.

## 4.5. Time slices and annualisation factors for G-BATS4

The TUBA assessment was based on three time slices:

- AM (weekday 07:00 to 10:00);
- IP (weekday 10:00 to 16:00);
- PM (weekday 16:00 to 19:00).

Annualisation factors were applied to expand the G-BATS modelled benefits to represent a 12-hour weekday and full year. The AM and PM Peak hour is multiplied by 3 to get peak periods and is multiplied to account for all working days. For the inter peak, a factor of 1518 was used as there are 6 Inter Peak hours per day. The off-peak periods were omitted, as the majority of benefits from the infrastructure would come from weekday traffic.

## 4.6. Public Transport Benefits

The generalised cost saving (time saving and reduced waiting time) was taken from the PT mode choice model, appropriate values of time from WebTAG were applied and annualisation factors were applied to reflect all time periods. A factor of 6.83 is applied to the AM Peak hour and a factor of 7.09 is applied to the PM Peak hour to convert to a full day and are factored up to cover the full year. The benefits were then factored to adjust for the scheme opening year, as the model used a future year of 2036.

## 4.7. MetroBus and Park & Ride service operating costs and revenues

In order to calculate **bus operating costs**, Atkins used its bespoke bus operating cost model. This model takes key inputs, such as one-way journey time (AM Peak, inter peak and PM Peak), frequency, vehicle type and layover time, and provides outputs around the number of vehicles required at peak (Peak Vehicle Requirement), direct and indirect costs, giving a total cost per annum of operation. In order to do this, it is also necessary to make assumptions around hours of operation, including evenings and weekends. The outputs from this model have been benchmarked with known outturn operating costs elsewhere to ensure consistency.

The process of calculating **revenue** generation begins with the outputs from the PT mode choice model. Using peak hour boarders from the model, Atkins first estimated annual patronage, using known factors from other work to convert from the AM Peak to all day, before converting from all day to annual. It is then necessary to multiply annual patronage by an assumed yield per passenger to derive total revenue. The yield per passenger calculation takes account of the likely mix of users of the service – for example, some users may be children, some may have a concessionary pass (and hence are eligible to travel free of charge during the hours of the scheme – albeit with the bus operator receiving a level of reimbursement for each journey made), and some may be making regular commuting journeys using some form of season or multi-journey ticket. To take account of this range of users and ticket types, Atkins used its revenue generation model which is based on a ‘basket’ of fares, covering adult and child single, return, daily, weekly and monthly tickets (using operator websites to access ticket prices for appropriately comparable journeys). The

# Technical note

assessment also makes an assumption regarding the level of concessionary reimbursement that the operator could be expected to receive.

Having determined operating costs and revenue, a direct comparison can be made to determine the extent to which the service is likely to be commercially viable. If revenue is below operating costs, this may mean that the service is not commercially viable, unless there are other factors to consider such as funding from new development.

## 4.8. Capital and Maintenance and Renewal Costs

Scheme costs were calculated by Atkins based on the scheme concept designs. The costs produce include:

- Construction costs;
- Preparatory costs, including detailed design and business case fees (a variable percentage was applied for detailed design, and business case fees were 10% of construction costs);
- Site supervision costs;
- Land costs; and
- Risk budget, at 40% due to the early stage of the schemes, and Optimism Bias of 44% included in the PVC used in the BCR calculation.

Schemes were costed based on 2D or 3D concept designs. 3D design focused on schemes with the greatest changes in vertical alignment, which allowed the volume of cut and fill to be estimated to inform excavation and disposal costs. It should be noted, that schemes designed in 3D are to concept design level, not detailed design.

Works costs were built up on a 'per m2' or 'per m3' or 'per item' basis for different elements, using rates from similar projects, including:

- Rates derived from live projects under construction in the West of England area;
- Typical industry standard rates where the above were not appropriate;
- Consultation with local industry, and professionals; and
- Peer review and benchmarking against completed schemes.

These unit rates have been used alongside appropriate percentage allowances for preliminary items and design fees. This approach is a proportionate hybrid between a high level 'per km' costing and a full Bill of Quantities. Items such as fencing, landscaping and utility diversions were calculated using an average percentage of the total scheme costs found on similar projects. Land costs were based on an indicative unit rate of £40k/per hectare for all land, there have been no discussions with landowners at this stage.

Structures were calculated at a high level based on the scale of works anticipated, and have amended where necessary dependant on the size and location.

Percentage allowances were included for preparation, site supervision, risk and environmental mitigation.

To derive outturn costs (to include inflation to allow for opening year), schemes costs were profiled evenly over the relevant time period based on the high-level programme in the OAR. The costs were profiled according to the schemes' opening year and period of construction and appropriate inflation and discounting were applied.<sup>11</sup> Scheme opening years are generally based on previous work by the councils in relation to the proposed housing trajectories in the JSP. Adjustments were made if the opening year needed to be extended to allow for preparation and design. Appropriate construction and design periods have been specified ahead of opening year, and including a period back to present day for preparatory work on developing a business case and gaining funding, planning permission and land purchase.

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<sup>11</sup> Inflation values were agreed with the Client Role as 2.5% until 2021 and 4% beyond that. Discounting values were -2.44%.

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Relevant Construction Price inflation, at 2.5% until 2021 and 4% thereafter, was included to calculate the outturn cost for the financial case and affordability considerations, where Optimism Bias is also excluded.

Maintenance and renewal costs, taken as 4% of construction costs, over the 60-year appraisal period. At this early stage of scheme design and development Park & Ride operating costs have not been specifically estimated but there is an indicative allowance for maintenance and renewal assumed at 4% of the construction cost.

## 4.9. Cost-benefit Analysis Collation

The monetised benefits output from the PT mode choice model and from TUBA are collated together with the HEAT benefits calculated using the DfT tool. The capital, maintenance and renewal and bus operating costs were collated with generated revenue to give the inputs for the PVC.

The scheme benefits and costs were input into an Atkins spreadsheet to produce the Present Value Costs and Benefits (PVC and PVB) used for the BCR calculation. All present values reported are in 2010 prices, discounted over a 60-year appraisal period and are quoted in the market price unit of account unless otherwise stated.

## 4.10. Sensitivity Tests

Two sensitivity tests have been provided to provide a range due to the potential uncertainties around the modelling.

### Catchment Sensitivity Test (Thornbury only)

The central assumption for capturing MetroBus trips was based on being within approximately a 10 minute walk of the MetroBus stop at the 'home' end. In Bristol city centre, a distance equating to a 20 minute walk was assumed, on the basis that people are more inclined to walk further in city centres to access their chosen mode. In this sensitivity test, the catchment of bus passengers was relaxed to capture access via bus services feeding into the newly proposed services.

### JSP 'Off-Model' Sensitivity Test (Thornbury and Whitchurch only)

Given the reasonably coarse level of granularity of the models as developed to date, the full extent of the demand from JSP developments is not considered to be fully demonstrated. To estimate the impact of the JSP demand more fully, a relatively simplistic uplift has been applied using an 'off-model' estimation of trips generated by the JSP. This trip generation estimate uses a DfT dataset for the number of bus trips in South Gloucestershire, which is converted to trips per head based on population, and then used to factor from size of dwelling for the developments. The impact on modelled benefit to capture this uplift is a simple pro rating on the basis of difference in demand rather than modelling the relationship between additional trips and benefit generation, therefore is a simple approximation at this stage. There is a small element of over-estimation with the simplistic sensitivity analysis approach as the Spatially Neutral scenario includes some of the JSP demand but not in the specific locations.

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## 5. Summary

This appendix has set out the modelling and economics methodology.

For the highway schemes in WP1 and WP3 the G-BATS4 model was used and for WP6a HE's VISSIM model was used. These models were run in a Spatially Neutral scenario, where growth was added across the area based on existing housing, and in a 'With JSP' scenario, where the growth for each SDL was added to the specific location. Limitations at this stage of scheme development have been noted, including granularity of coverage for the areas, the presence of only one future year forecast and there are some additional benefits that could be captured at later stages of scheme development such as reliability, accidents and Wider Economic Impacts. Economic results were obtained using the DfT's programme TUBA, and adjusted to reflect the relevant opening year and appraisal period.

PT schemes were modelled using a bespoke spreadsheet tool to estimate the mode shift to MetroBus/Park & Ride services. This gave an estimate of the PT patronage and the generalised cost savings, which was used to calculate the economic benefit of the scheme to PT users. These results, as well as the increase in cyclists and the associated health benefits, calculated using the DfT's Propensity to Cycle Tool, were then used to adjust the G-BATS4 highway model and obtain decongestion benefits in TUBA. Finally, Atkins PT operating cost model was used to obtain PT operating costs and revenues.

The benefits calculated were combined with the costs, extrapolated over the 60 year appraisal period with appropriate growth and discounted to 2010 prices, to produce BCRs, which helps to inform the VfM of the schemes.

## **Appendix 6.3 Environmental Assessment worksheets**

**Contents**

This workbook provides WebTAG worksheets, and proformas consistent with WebTAG principles for the following scheme options:

Orbital Route A4-A37	North Alignment 1 and South Alignment 1 (Option A)
Orbital Route A4-A37	North Alignment 1 and South Alignment 2 (Option B)
Orbital Route West of A37	Washing Pound Lane (Option C)
Orbital Route West of A37	Half Acre Lane (Option D)
Hicks Gate Junction Improvement	At-grade improvement A4174-A4 (Option E)

Scheme option worksheets are grouped by environmental impact:

Section 1	Noise (NO)
Section 2	Air Quality (AQ)
Section 3	Landscape (LA)
Section 4	Townscape (TO)
Section 5	Historic Environment (HE)
Section 6	Biodiversity (BI)
Section 7	Water Environment (WE)

**NOISE ASSESSMENT - Option A&B - Orbital Route A4-A37 - Blue Route**

<p>• How many households will be affected by the scheme?                      • Could the scheme lead to a change in traffic flow &gt;25% or change in average speeds &gt;10kph?</p>	<p><b>Assessment</b></p>
<p>There are no noise important areas within 200m of the proposed link road route alignment, although a number of noise important areas are located on roads that may experience a change in traffic flow volume due to the scheme.</p> <p>There are approximately 65 noise sensitive receptors located within 200m of the proposed route alignment, and facades of these receptors could be exposed to an increase in noise directly from the scheme, however a number of these same noise sensitive receptors may also benefit from decreases in noise on other facades due to the rerouting of traffic. There is the potential for minor to moderate increases in noise at properties located in Bifield Road due to the bypass itself, with the potential for nearby properties located on Stockwood Lane to experience a minor decrease due to traffic rerouting.</p> <p>There are approximately 6600 noise sensitive receptors located within 200m of roads that may be expected to experience a decrease in road traffic volume due to the scheme, including ~230 which are located within designated noise important areas.</p> <p>There are just over 2000 noise sensitive receptors located within 200m of roads that may be expected to experience an increase in road traffic volume due to the scheme (A4174, A4175, A37), including ~400 which are located within designated noise important areas.</p> <p>It is anticipated that these changes in road traffic volume in the wider area are likely to result in a negligible change in road traffic noise experienced at the majority of these noise sensitive receptors.</p>	<p>Likely Slightly Adverse</p>

**NOISE ASSESSMENT - Option C - Orbital Route West of A37 (Washing Pound Lane) – Grey route**

<b>• How many households will be affected by the scheme? • Could the scheme lead to a change in traffic flow &gt;25% or change in average speeds &gt;10kph?</b>	<b>Assessment</b>
<p>There is 1 noise important area within 200m of the proposed link road route alignment, this same noise important area is located on a road that is anticipated to experience a decrease in road traffic volume due to the scheme.</p> <p>There are approximately 340 noise sensitive receptors within 200m of the proposed route alignment, and could be exposed to an increase in noise directly from the scheme, of which ~16 are located within a designated noise important area. Properties located on Washing Pound Lane, Churchways, Charnwood Road, and Maggs Lane might be expected to experience a minor to moderate increase in noise due to the introduction of the new link.</p> <p>There are just over 4200 noise sensitive receptors located within 200m of roads that may be expected to experience a decrease in road traffic volume due to the scheme, including ~69 which are located within designated noise important areas.</p> <p>There are just over 1000 noise sensitive receptors located within 200m of roads that may be expected to experience an increase in road traffic volume due to the scheme (Whitchurch Lane).</p> <p>It is anticipated that these changes in road traffic volume in the wider area are likely to result in a negligible change in road traffic noise experienced at the majority of these noise sensitive receptors.</p>	Likely Slightly Adverse



**NOISE ASSESSMENT - Option D - Orbital Route West of A37 (Half Acre Lane) – Orange route**

<b>• How many households will be affected by the scheme? • Could the scheme lead to a change in traffic flow &gt;25% or change in average speeds &gt;10kph?</b>	<b>Assessment</b>
<p>There are no noise important areas within 200m of the proposed link road route alignment, although there is a noise important area located on a road anticipated to experience a decrease in road traffic flow volume due to the scheme.</p> <p>There are approximately 470 noise sensitive receptors within 200m of the proposed route alignment, and could be exposed to an increase in noise directly from the scheme. Properties located on Stoneberry Road, Church Road, Half Acre Lane, and Charnwood Road might be expected to experience a minor to moderate increase in noise due to the introduction of the new link.</p> <p>There are just over 4200 noise sensitive receptors located within 200m of roads that may be expected to experience a decrease in road traffic volume due to the scheme, including ~69 which are located within designated noise important areas.</p> <p>There are just over 1000 noise sensitive receptors located within 200m of roads that may be expected to experience an increase in road traffic volume due to the scheme (Whitchurch Lane).</p> <p>It is anticipated that these changes in road traffic volume in the wider area are likely to result in a negligible change in road traffic noise experienced at the majority of these noise sensitive receptors.</p>	Likely Slightly Adverse

**NOISE ASSESSMENT - Option E - Hicks Gate Junction Improvement (A4 Keynsham to A4174) - Brown route**

<ul style="list-style-type: none"><li>• How many households will be affected by the scheme?</li><li>• Could the scheme lead to a change in traffic flow &gt;25% or change in average speeds &gt;10kph?</li></ul>	Assessment
No noise important areas or noise sensitive receptors are located within 200m of the proposed Hicks Gate roundabout junction improvements (for both the at-grade and grade-separated options).	Neutral

**AIR QUALITY ASSESSMENT - Option A&B - Orbital Route A4-A37 - Blue Route**

Summary of Key Impacts	Assessment (see key)
<p>No AQMA within 200 m of the link road. The Bristol AQMA (encompassing the A4 and the A37) could benefit if traffic is redirected from the A4174 to the link road. There are approximately 65 sensitive properties within 200 m of roads that could be positively affected. There are no designated sites within 200m of the proposed route. An increase in traffic on the A4174, the A4175 and the A37 could adversely affect air quality at over 2,000 sensitive receptors, 920 of which are within 200 m of Defra's PCM model links with roadside concentrations above the EU Limit Value of 40 µg/m<sup>3</sup> in 2015; these receptors are on the A4174 between the A420 and Gallagher Retail Park. The reduction in traffic on alternative routes could positively affect 6,600 sensitive properties, including 540 within the Bristol AQMA and Keynsham High Street AQMA. There may be an overall reduction in NO<sub>2</sub> and PM<sub>10</sub>, depending on the magnitude of traffic changes.</p>	3

1	PCM links and/or AQMA/designated sites with increases and overall likely <b>negative outcome</b>
2	PCM links and/or AQMA/designated sites with increases and overall likely neutral outcome OR overall likely <b>negative outcome</b>
3	PCM links and/or AQMA/designated sites or > 100 properties with deterioration but overall likely <b>neutral/ positive outcome</b>
4	No PCM, AQMA or designated sites with increases, >100 properties with deterioration but overall likely <b>neutral/beneficial outcome</b>
5	No PCM, AQMA or designated sites or <100 properties with increases, and overall likely <b>neutral/beneficial outcome</b>

**AIR QUALITY ASSESSMENT - Option C - Orbital Route West of A37 (Washing Pound Lane) – Grey route**

Summary of Key Impacts	Assessment (see key)
<p>No AQMAs or designated ecological sites within 200 m of the link road. There are approximately 340 sensitive properties within 200 m of the link road itself which would have a deterioration in air quality.</p> <p>The expected reduction in traffic in Hengrove could result in an improvement at 4,200 sensitive properties whilst the increase of traffic on Whitchurch Lane could adversely affect 1,000 sensitive properties. There may be an overall reduction in NO2 and PM10, depending on the magnitude of traffic changes.</p>	4

1	PCM links and/or AQMA/designated sites with increases and overall likely negative outcome
2	PCM links and/or AQMA/designated sites with increases and overall likely neutral outcome OR overall likely negative outcome
3	PCM links and/or AQMA/designated sites or > 100 properties with deterioration but overall likely neutral/ positive outcome
4	No PCM, AQMA or designated sites with increases, >100 properties with deterioration but overall likely neutral/beneficial outcome
5	No PCM, AQMA or designated sites or <100 properties with increases, and overall likely neutral/beneficial outcome

**AIR QUALITY ASSESSMENT - Option D - Orbital Route West of A37 (Half Acre Lane) – Orange route**

Summary of Key Impacts	Assessment (see key)
<p>No AQMAs or designated ecological sites within 200 m of the link road. There are approximately 470 sensitive properties within 200 m of the link road itself.</p> <p>The expected reduction in traffic in Hengrove could result in an improvement at 4,200 sensitive properties whilst the increase of traffic on Whitchurch Lane could adversely affect 1,000 sensitive properties. Overall, there may be a positive change in NO2 and PM10, depending on the magnitude of traffic changes.</p>	4

1	PCM links and/or AQMA/designated sites with increases and overall likely negative outcome
2	PCM links and/or AQMA/designated sites with increases and overall likely neutral outcome OR overall likely negative outcome
3	PCM links and/or AQMA/designated sites or > 100 properties with deterioration but overall likely neutral/ positive outcome
4	No PCM, AQMA or designated sites with increases, >100 properties with deterioration but overall likely neutral/beneficial outcome
5	No PCM, AQMA or designated sites or <100 properties with increases, and overall likely neutral/beneficial outcome

**AIR QUALITY ASSESSMENT - Option E - Hicks Gate Junction Improvement - Brown Route**

<b>Summary of Key Impacts</b>	<b>Assessment (see key)</b>
No AQMAs, sensitive properties or designated ecological sites within 200 m of the proposed junction changes. The effect on air quality is therefore assessed as neutral at this stage.	5

**TAG Landscape Impacts Worksheet - Option A&B - Orbital Route A4-A37 - Blue Route**

Features	Step 2		Step 3			Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	<p>Undulating landscape with medium scale irregular shaped pastoral fields &amp; meadows, with some arable farmland, bounded by hedgerows &amp; woodland copses.</p> <p>Tributary valleys have intimate character enclosed by hedges, trees and side slopes.</p> <p>Sinuuous &amp; meandering form of the River Avon &amp; River Chew with its associated bankside vegetation defines the area N &amp; E of the scheme.</p> <p>Low ridge to the E forms along Stockwood Vale forms the backbone to the landscape with slopes down to the Avon Valley and Stockwood Vale.</p>	Local - features are valued at the local level.	Pattern of landscape common at a local level with River Avon a distinctive feature within the landscape.	High at the local level - the pattern of the landscape is distinctive and a key component of the character of this landscape type.	Limited opportunity for substitution, but consideration of design & allowance of mitigation for any loss of features and disturbance of pattern.	<p>The proposed scheme would pass through rural landscape adjacent to urban fringe settlements, linking the A4 with the A37, &amp; with associated earthworks &amp; junctions. Pastoral fields, hedgerows and trees would be severed as a result. The scheme would alter the local pattern of the landscape &amp; landform in the vicinity.</p> <p>Judged on the scale of the impacts through permanent modification of field patterns, the impacts are considered to be slight - moderate adverse.</p>
Tranquillity	<p>The busy transport corridors of the A4, A4174, A4175, A37 &amp; the railway on the fringe of Keynsham, Stockwood &amp; Brislington, mean that there is a low level of tranquillity N, W &amp; S of the route. The hedge &amp; tree lined transport corridors provide some visual screening, particularly along A4175 &amp; Scotland Lane N &amp; W of the route but with more open views as the ground rises along Stockwood Lane.</p> <p>Away from these busy areas, the wider rural landscape, some of which the route passes through is tranquil especially to valley floors, despite being near urban centres.</p> <p>Users of recreational routes (PROWs, River Avon Trail, Two Rivers Way trail &amp; National Cycle Routes 3 &amp; 16) experience limited tranquillity in the vicinity of these transport corridors, however the sense of tranquillity &amp; isolation increases rapidly away from them &amp; the urban areas.</p>	Local - tranquillity is valued at the local level.	Rare at a local level due to busy transport corridors & urban centres.	High at the local level - valued due to the diminishing rural landscape away from urban centres & busy transport corridors.	Limited opportunity for substitution, but consideration of design & mitigation features could aid perception of greater tranquillity.	<p>The proposed scheme is located in an area which has variable levels of tranquillity.</p> <p>The rural area currently experience higher levels of tranquillity, &amp; as a result of the scheme, would experience increased levels of disturbance.</p> <p>The impact on tranquillity is judged to be slight - moderate adverse.</p>
Cultural	<p>The main settlements of Longwell Green, Keynsham, Brislington, Stockwood &amp; Whitchurch to the NW, W, NW &amp; W respectively, dominate the area, with more isolated farms &amp; clusters of dwellings interspersed between them &amp; office developments at Durlay Park, &amp; small industrial estate on the flatter land by the River Avon. These areas are linked by busy transport corridors.</p> <p>There are a few areas of Common Land &amp; Village Greens, including Hanham Common within 1.8km N of the scheme &amp; 3 areas of Common Land within 1.5km NE &amp; SE of the scheme. Housworth is within the scheme extents on the edge of Whitchurch/Stockwood.</p> <p>There are designated historical features within 1km, including 2 SMs (Roman Settlement at Keynsham Hams &amp; Maes Knoll Camp) located 1km E &amp; W of the scheme &amp; Brislington House Registered Park &amp; Garden approx 500m to the W.</p> <p>Farmsteads are scattered within the landscape.</p> <p>Local, regional &amp; national recreational routes are also in the area, including 2 PROW's crossing the scheme (including those in the vicinity) &amp; National Cycle Routes 3 &amp; 16 which passes close to the scheme along the A4 &amp; the River Avon Trail within 500m of scheme, linking with the Two Rivers Way trail to the E.</p>	Settlements & transport corridors valued at regional level.	Modern settlements & transport corridors not rare at all levels.	High importance of settlements & designated features at all levels.	SM's & Reg Park & Garden not substitutable.	<p>Due to the extent of the scheme, impacts on cultural features would be likely.</p> <p>Main settlements, isolated properties, farmsteads and associated recreational facilities are within 1km of the scheme, some of which are directly adjacent.</p> <p>Recreational routes within 500m may experience some minor degradation in visual quality.</p> <p>There is partial visual connectivity with other cultural features &amp; they may experience degradation in their visual setting due to the proximity to the scheme.</p> <p>The impact on cultural features is judged to be slight-moderate adverse.</p>
Landcover	<p>Outside the urban areas, landcover comprises medium scale, irregular shaped fields of mainly pastoral farmland. Fields are bounded by clipped or overgrown hedgerows.</p> <p>The LCA area is largely unwooded, however the localised area linear belts to the valley floors close to the route to the E &amp; W and the designated Bickley &amp; Cleeve Ancient Woodland &amp; Bickley Wood SSSI which follow the line of the River Avon 0.8km north of the scheme.</p>	SSSI & Ancient Woodland valued at national level.	SSSI & Ancient Woodland are rare at national, regional & local levels.	High importance of nationally designated sites & Ancient Woodland as a rapidly diminishing resource.	Opportunity for substitution with incorporation of mitigation planting.	<p>The proposed scheme would result in a loss of pastoral agricultural land, including loss of trees &amp; hedgerows, however mitigation through replacement planting would help recreate these features over time.</p> <p>No direct impacts are anticipated on the SSSI &amp; Ancient Woodland.</p> <p>Due to the scale of the scheme &amp; presence of features affected, the impact on landcover is judged to be slight-moderate adverse.</p>
Summary of character	<p>Landscape in this area is designated as Greenbelt by Bristol City Council, B&amp;NES Council &amp; South Gloucestershire Council.</p> <p>A medium scale landscape, diverse &amp; discordant in nature &amp; influenced by busy transport corridors, adjacent urban areas, valley floors, low ridges &amp; outlying farms &amp; small settlements.</p> <p>The rural character is of medium scale, with mainly pastoral fields bounded by hedgerows of varying quality.</p> <p>Woodland is limited to linear woodland along the River Avon, along shallow valley sides to the E &amp; W, &amp; along the road corridors, the latter helping to contain the disruptive influence of the roads over the wider landscape, allowing tranquil pockets to remain in the rural areas separating the settlements.</p>	Some features valued at national level.	Some features, eg designated sites, are rare at national, regional & local level.	Designated sites are of high importance at national, regional & local level.	Designated sites & Ancient Woodland are not substitutable at any level.	<p>No impacts on designated sites are anticipated, although there may be minor impacts on Greenbelt.</p> <p>The route is large in scale, altering the pattern of the landscape in the immediate vicinity, with loss of some landscape elements (hedgerows, trees).</p> <p>Mitigation planting for screening &amp; recreating severed or lost linear elements, would not have appreciable benefits for up to 15 years.</p> <p>Although the scheme would be seen in context with the existing road network &amp; other urban influences in close proximity to the scheme.</p> <p>The impacts of the scheme on completion are judged to be slight-moderate adverse.</p> <p>With mitigation planting after 15 years impacts judged to be neutral - slight adverse.</p>

**Reference Sources**

- B&NES Landscape Character Assessment
- South Gloucestershire Landscape Character Assessment (2014)
- Natural England
- Ordnance Survey Mapping
- Aerial Mapping
- Magic - Geographical mapping
- Sustrans

**Step 5 - Summary Assessment Score**

Slight - moderate on completion.  
Slight adverse 15 years after completion.

**Qualitative Comments**

A 2km offset from the scheme boundary has been prescribed for the study area within this local character area of which baseline assessment only has been conducted due to the early stages of this design & optioneering stage. It is considered that significant effects are unlikely beyond this.

The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the landscape.

**TAG Landscape Impacts Worksheet - Option C - Orbital Route West of A37 (Washing Pound Lane) - Grey Route**

Features	Step 2		Step 3			Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	A rolling open landscape with medium scale irregular shaped pastoral fields, bounded by hedgerows & trees. Low ridge to the S & E forms the backbone to the landscape with slopes down to the Avon Valley and Stockwood Vale.	Local - features are valued at the local level.	Pattern of landscape common at a local level.	Medium at the local level - the pattern of the landscape is commonplace but also a key component of the character of this landscape type.	Some opportunity for substitution, with consideration of design & allowance of mitigation for any loss of features and disturbance of pattern.	The proposed scheme would pass through rural landscape adjacent to the urban fringe, linking A37 with Church Road & Maggs Lane SE of Whitchurch. The proposals would incorporate associated earthworks & new junctions. Pastoral fields and their associated hedgerows and trees would be severed. The scheme would alter the local pattern of the landscape and landform within the adjacent vicinity. Judged on the scale of the impacts through permanent modification of field pattern offset with the presence of current road network in place and urban influence, the impacts would be considered to be slight adverse.
Tranquillity	Due to the proximity to urban settlements and the presence of the A37 bisecting through Whitchurch & Stockwood, the tranquillity is relatively low within this landscape. Away from these settlements, the wider rural landscape, some of which the route passes through is more tranquil, despite being near urban centres. Users of recreational routes (PROWs, Three Peaks Walk Trail & National Cycle Route 3) experience limited tranquillity in the vicinity of these transport corridors and urban areas, however the sense of tranquillity & isolation increases away from these areas further S.	Local - tranquillity is valued at the local level.	Rare at a local level due to busy transport corridors & urban centres.	High at the local level - valued due to the diminishing rural landscape away from urban centres & busy transport corridors.	Limited opportunity for substitution, but consideration of design & mitigation features could aid perception of greater tranquillity.	The proposed scheme is located in an area which has mixed levels of tranquillity. The rural areas experience higher levels of tranquillity & therefore would experience increased disturbance as a result of the scheme. The impact on tranquillity is judged to be slight adverse.
Cultural	The main settlements of Stockwood & Whitchurch to the N & W respectively, dominate the area, with more isolated farms & clusters of dwellings interspersed between them. Horseworld is within the study area on the edge of Whitchurch/Stockwood. There are designated historical features within 1km, including 1 SM (Maes Knoll Camp) located 1km SW of the scheme. Lyons Court Farm & Church Farm are adjacent to the scheme. Local, regional & national recreational routes are also in the area, with 2 PROW's crossing the scheme (including those in the vicinity) & National Cycle Route 3 passing across the eastern end of the route & Three Peaks Walk 1km SW. Other recreational facilities such as Whitchurch Cricket Club & Bristol Barbarians Rugby Club & Whitehall Garden Centre are adjacent or within 300m of the eastern end of the route.	Settlements & transport corridors valued at regional level. SM valued at national level. Recreational routes valued at regional & local level.	Modern settlements & transport corridors not rare at all levels. SM rare at local & national level. Regional recreational routes not rare at local or regional level. PROW's common at all levels.	Medium importance of settlements & designated features at all levels. Medium importance of recreational routes.	SM not substitutable. Limited opportunity for substitution of features associated with modern settlements & recreational routes.	Due to the scale of the scheme, impacts on cultural features will be likely. Main settlements, isolated properties, farmsteads and associated recreational facilities are within 1km of the scheme, some of which are directly adjacent, particularly the Rugby Club through which the scheme passes. Recreational routes within 500m may experience some minor degradation in visual quality. There is partial visual connectivity with other cultural features such as Maes Knoll Camp SM & impacts on its setting are likely to be adverse due to the proximity to the scheme. The impact on cultural features is judged to be slight-moderate adverse.
Landcover	Outside the urban areas, landcover comprises medium scale, irregular shaped fields of mainly pastoral farmland. Fields are bounded by clipped or overgrown hedgerows. The LCA is largely unwooded with some tree belts to field boundaries.	Local - landcover is valued at the local level.	Pastoral fields, hedgerows, woodland & linear tree belts common at all levels.	Features & elements such as fields, trees & hedgerows, of medium - high importance within the local landscape.	Opportunity for substitution with incorporation of mitigation planting.	The proposed scheme would result in a loss of pastoral agricultural land, including loss of trees & hedgerows, however mitigation through replacement planting would help recreate these features over time. When judged on the scale of the scheme and quantity of features effected, the impact on landcover is judged to be slight adverse.
Summary of character	Landscape in this area is designated as Greenbelt by Bristol City Council, B&NES Council & South Gloucestershire Council. A medium scale landscape influenced by busy transport corridors, adjacent urban areas & outlying farms & small settlements. The rural character is of medium scale, with mainly pastoral fields bounded by hedgerows and trees of varying quality. Tree & hedges provide screening to settlements & transport routes which help to contain the urban edge influence, allowing tranquil pockets to remain in the rural areas separating the settlements.	Some features valued at national level. Landscape elements valued at mainly local level.	Some features, eg designated sites, are rare at national, regional & local level. Many landscape features are commonplace at all levels.	Designated sites are of high importance at national, regional & local level. Many landscape elements are of medium importance at the local level.	Designated sites are not substitutable at any level. Some opportunity for substitution of features associated with modern settlements & recreational routes. Some opportunity for substitution of landscape elements, eg trees, linear woodland & grassland, & re-creation of appropriate landforms.	No impacts are anticipated on designated sites, with minor impacts anticipated on Greenbelt. The route would cut through the landscape pattern with limited loss of landscape elements (hedgerows, trees). There would be a slight loss of tranquillity & adverse impact on cultural features. Initial mitigation would consist of careful design & location of intersection with existing roads. Mitigation planting for screening & recreating severed or lost linear elements, would not have appreciable benefits for up to 15 years. Overall, the scheme would be seen in context with the existing road network & other urban influences. The impacts of the scheme on completion are judged to be slight adverse. With mitigation planting after 15 years impacts judged to be neutral - slight adverse.

**Reference Sources**

- B&NES Landscape Character Assessment
- South Gloucestershire Landscape Character Assessment (2014)
- Natural England
- Ordnance Survey Mapping
- Aerial Mapping
- Magis - Geographical mapping
- Sustrans

**Step 5 - Summary Assessment Score**

Slight adverse on completion  
Neutral - slight adverse after 15 years.

**Qualitative Comments**

A 2km offset from the scheme boundary has been prescribed for the study area within this local character area of which baseline assessment only has been conducted due to the early stages of this design & optioneering stage. It is considered that significant effects are unlikely beyond this. The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the landscape.



**TAG Landscape Impacts Worksheet - Option D - Orbital Route West of A37 (Half Acre Lane) - Orange Route**

Features	Step 2		Step 3			Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	A rolling open landscape with medium scale irregular shaped pastoral fields, bounded by hedgerows & trees. Low ridge to the S & E forms the backbone to the landscape with slopes down to the Avon Valley and Stockwood Vale.	Local - features are valued at the local level.	Pattern of landscape common at a local level.	Medium at the local level - the pattern of the landscape is commonplace but also a key component of the character of this landscape type.	Some opportunity for substitution, with consideration of design & allowance of mitigation for any loss of features and disturbance of pattern.	The proposed scheme would pass through rural landscape adjacent to urban fringe settlements Linking A37 with Stonebery Road & Whitchurch Lane SE of Whitchurch. The proposals would incorporate associated earthworks & new junctions. Pastoral fields and their associated hedgerows and trees would be severed. The scheme would alter the local pattern of the landscape and landform within the adjacent vicinity. Judged on the scale of the impacts through permanent modification of field pattern offset with the presence of current road network in place and urban influence, the impacts would be considered to be slight adverse.
Tranquillity	Due to the proximity to urban settlements and the presence of the A37 bisecting through Whitchurch & Stockwood, the tranquillity is relatively low within this landscape. Away from these settlements, the wider rural landscape, some of which the route passes through is more tranquil, despite being near urban centres. Users of recreational routes (PRoWs, Three Peaks Walk Trail & National Cycle Route 3) experience limited tranquillity in the vicinity of these transport corridors and urban areas, however the sense of tranquillity & isolation increases away from these areas further S.	Local - tranquillity is valued at the local level.	Rare at a local level due to busy transport corridors & urban centres.	High at the local level - valued due to the diminishing rural landscape away from urban centres & busy transport corridors.	Limited opportunity for substitution, but consideration of design & mitigation features could aid perception of greater tranquillity.	The proposed scheme is located in an area which has mixed levels of tranquillity. The rural areas experience higher levels of tranquillity therefore would experience increased disturbance as a result of the scheme. The impact on tranquillity is judged to be slight adverse.
Cultural	The main settlements of Stockwood & Whitchurch to the N & W respectively, dominate the area, with more isolated farms & clusters of dwellings interspersed between them. Horseworld is within the study area on the edge of Whitchurch/Stockwood. There are designated historical features within 1km, including 1 SM (Maes Knoll Camp) located 1km SW of the scheme. Lyons Court Farm & Church Farm are adjacent to the scheme. Local, regional & national recreational routes are also in the area, with 2 PRoW's crossing the scheme (including those in the vicinity) & National Cycle Route 3 passing across the eastern end of the route & Three Peaks Walk 11km SW. Other recreational facilities such as Whitchurch Cricket Club & Bristol Barbarians Rugby Club & Whitehall Garden Centre are adjacent or within 300m of the eastern end of the route.	Settlements & transport corridors valued at regional level. SM valued at national level. Recreational routes valued at regional & local level.	Modern settlements & transport corridors not rare at all levels. SM rare at local & national level. Regional recreational routes not rare at local or regional level. PRoW's common at all levels.	Medium importance of settlements & designated features at all levels. Medium importance of recreational routes.	SM not substitutable. Limited opportunity for substitution of features associated with modern settlements & recreational routes.	Due to the scale of the scheme, impacts on cultural features would be likely. Main settlements, isolated properties, farmsteads and associated recreational facilities are within 1km of the scheme, some of which directly adjacent. Mitigation planting & design consideration would help reduce these impacts over time. Recreational routes within 500m may experience some minor degradation in visual quality. There is partial visual connectivity with other cultural features such as Maes Knoll Camp SM & impacts on its setting are likely to be adverse due to the proximity to the scheme. The impact on cultural features is judged to be slight adverse.
Landcover	Outside the urban areas, landcover comprises medium scale, irregular shaped fields of mainly pastoral farmland. Fields are bounded by clipped or overgrown hedgerows. The LCA is largely unwooded with some tree belts to field boundaries.	Local - landcover is valued at the local level.	Pastoral fields, hedgerows, woodland & linear tree belts common at all levels.	Features & elements such as fields, trees & hedgerows, of medium - high importance within the local landscape.	Opportunity for substitution with incorporation of mitigation planting.	The proposed scheme would result in a loss of pastoral agricultural land, including loss of trees & hedgerows, however mitigation through replacement planting would help recreate these features over time. When judged on the scale of the scheme and quantity of features effected, the impact on landcover is judged to be slight adverse.
Summary of character	Landscape in this area is designated as Greenbelt by Bristol City Council, B&NES Council & South Gloucestershire Council. A medium scale landscape influenced by busy transport corridors, adjacent urban areas & outlying farms & small settlements. The rural character is of medium scale, with mainly pastoral fields bounded by hedgerows and trees of varying quality. Tree & hedges provide screening to settlements & transport routes which help to contain the urban edge influence, allowing tranquil pockets to remain in the rural areas separating the settlements.	Some features valued at national level. Landscape elements valued at mainly local level.	Some features, eg designated sites, are rare at national, regional & local level. Many landscape features are commonplace at all levels.	Designated sites are of high importance at national, regional & local level. Many landscape elements are of medium importance at the local level.	Designated sites are not substitutable at any level. Some opportunity for substitution of features associated with modern settlements & recreational routes. Some opportunity for substitution of landscape elements, eg trees, linear woodland & grassland, & re-creation of appropriate landforms.	No impacts are anticipated on any designated sites, with minor impacts anticipated on regionally designated Greenbelts. The route would cut through the landscape pattern with loss of landscape elements (hedgerows, trees). There would be a slight loss of tranquillity & adverse impact on cultural features. Initial mitigation would consist of careful design & location of intersection with existing roads. Mitigation planting for screening & recreating severed or lost linear elements, would not have appreciable benefits for up to 15 years. Overall, would be seen in context with the existing road network & other urban influences. The impacts of the scheme on completion are judged to be slight adverse. With mitigation planting after 15 years impacts judged to be neutral - slight adverse.

**Reference Sources**

B&NES Landscape Character Assessment  
 South Gloucestershire Landscape Character Assessment (2014)  
 Natural England  
 Ordnance Survey Mapping  
 Aerial Mapping  
 Magic - Geographical mapping  
 Sustrans

**Step 5 - Summary Assessment Score**

Slight adverse on completion  
 Neutral - slight adverse after 15 years.

**Qualitative Comments**

A 2km offset from the scheme boundary has been prescribed for the study area within this local character area of which baseline assessment only has been conducted due to the early stages of this design & optioneering stage. It is considered that significant effects are unlikely beyond this. The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the landscape.

**TAG Landscape Impacts Worksheet - Option E - Hicks Gate Junction Improvement - Brown Route**

Features	Step 2		Step 3			Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	Relatively flat landscape with medium scale irregular shaped pastoral fields & meadows, with some arable farmland, bounded by hedgerows & woodland copses. Sinuous & meandering form of the River Avon with its associated bankside vegetation defines the area N of the scheme. Low ridge to the S forms the backbone to the landscape with slopes down to the Avon Valley and Stockwood Vale. Tree lined transport routes provide localised screening to roads, especially in views from the S.	Local - features are valued at the local level.	Pattern of landscape common at a local level with River Avon a distinctive feature within the landscape.	High at the local level - the pattern of the landscape is distinctive and a key component of the character of this landscape type.	Opportunity for local substitution with consideration of design to ensure minimal disturbance and allowance of mitigation for any loss of features and disturbance of pattern.	The proposed scheme would involve junction improvements to the Hicks Gate roundabout with associated earthworks that would slightly alter the local pattern of the landscape and landform within the immediate vicinity only. Judged on the scale of the impacts with only minor changes to the roundabout, the impacts on landscape pattern would be considered to be neutral.
Tranquility	The busy transport corridors of the A4, the A4174 & the railway on the fringe of Keynsham, Stockwood & Brislington, mean that there is a low level of tranquility in the area. The tree lined transport corridors provide visual screening in views, particularly to the S & SE, which help contain the disturbance associated with these routes. The presence of the Keynsham Motocross centre is also a disruptive feature in the vicinity. Away from these busy areas, the wider rural landscape is tranquil, despite being near urban centres. Users of recreational routes (PRoW's, River Avon Trail, Two Rivers Way Trail & National Cycle Route16) experience limited tranquility in the vicinity of these transport corridors, however the sense of tranquility & isolation increases rapidly away from them & the urban areas.	Local - tranquility is valued at the local level.	Rare at a local level due to busy transport corridors & urban centres.	High at the local level - valued due to the diminishing rural landscape away from urban centres & busy transport corridors.	Limited opportunity for substitution, but consideration of design & mitigation features could aid perception of greater tranquility.	The proposed scheme is located in an area which is not tranquil. It would be evident over a restricted area & mainly to road users & users of the PRoW's & Trails which intersect with the site area. Users of the Keynsham Motocross area, & the Avon Fire & Rescue centre would also have views of the scheme. However, due to the linear vegetation belts along the transport corridors both within the scheme & offsite along adjacent routes, receptors further afield & in the wider landscape would be unlikely to experience visual intrusion or loss of tranquility as a result of the scheme.  The impact on tranquility is judged to be neutral.
Cultural	The main settlements of Longwell Green, Keynsham, Stockwood, & Brislington to the NE, E, SW & W respectively, dominate the area, with more isolated farms & clusters of dwellings interspersed between them & office developments at Durley Park, & small industrial estate on the flatter land by the River Avon. These areas are linked by busy transport corridors. There are a few areas of Common Land, including Hanham Common within 1km of the scheme. There are designated historical features within 2km, including a SM (Roman Settlement at Keynsham Hams) located 900m E of the scheme & Brislington House Registered Park & Garden approx. 700m to the W. Local, regional & national recreational routes are also in the area, including 5 PRoW's & National Cycle Route 16 which intersect with the scheme & the River Avon Trail within 250m of scheme, linking with the Two Rivers Way trail to the E.	Settlements & transport corridors valued at regional level. SM & Reg Park & Garden valued at national level. Recreational routes valued at regional & local level.	Modern settlements & transport corridors not rare at all levels. SM rare at local & national level. Regional recreational routes not rare at local or regional level. PRoW's common at all levels.	High importance of settlements & designated features at all levels.  Medium importance of recreational routes.	SM & Reg Park & Garden not substitutable.  Limited opportunity for substitution of features associated with modern settlements & recreational routes.	Due to the localised extent of the scheme, impacts on cultural features will be limited. Settlements are not within 1km of the scheme, & intervening vegetation, roads & distance would reduce the scale of any impacts. Keynsham Motocross site, which is adjacent to the scheme, would experience some impacts due to loss of land & screening. Recreational routes within 500m may experience some minor degradation in visual quality, but mitigation planting would improve this over time. There is limited visual connectivity with other cultural features and impacts on their setting are considered neutral due to the presence of the existing A4. The impact on cultural features is judged to be neutral-slight adverse.
Landcover	Outside the urban areas, landcover comprises medium scale, irregular shaped fields of mainly pastoral farmland. Fields are bounded by clipped or overgrown hedgerows. The area is considered to be mainly un-wooded apart from Bickley & Cleeve Ancient Woodland & Bickley Wood SSSI which follow the line of the River Avon 250m north of the scheme.	SSSI & Ancient Woodland valued at national level.	SSSI & Ancient Woodland are rare at national, regional & local levels. Pastoral fields, hedgerows & linear tree belts common at all levels.	High importance of nationally designated sites & Ancient Woodland as a rapidly diminishing resource. Features & elements such as fields, trees & hedgerows, of medium - high importance within the local landscape.	Some opportunity for substitution with incorporation of mitigation planting.	The proposed scheme would result in no loss of pastoral agricultural land. Minor loss of land & screening associated with Keynsham Motocross, including some loss of trees & hedgerows. No impacts are anticipated on the SSSI & Ancient Woodland. The impact on landcover overall is judged to be neutral-slight adverse.
Summary of character	Landscape in this area is designated as Greenbelt by Bristol City Council, BANES Council & South Gloucestershire Council. A medium scale landscape, diverse & discordant in nature & heavily influenced by busy transport corridors, adjacent urban areas & outlying farms & small settlements. The rural character is of medium scale, with mainly pastoral fields bounded by hedgerows of varying quality. Woodland is limited to linear woodland along the River Avon, along shallow valley sides to the S, & along the main road corridors, the latter helping to contain the disruptive influence of the roads over the wider landscape, allowing tranquil pockets to remain in the rural areas separating the settlements.	Some features valued at national level. Many landscape elements valued at mainly local level.	Some features, eg designated sites, are rare at national, regional & local level. Many landscape features are commonplace at all levels.	Designated sites are of high importance at national, regional & local level. Many landscape elements are of medium - high importance at the local level.	Designated sites & Ancient Woodland are not substitutable at any level. Some opportunity for substitution of features associated with modern settlements & recreational routes. Some opportunity for substitution of landscape elements, eg trees, linear highway woodland & grassland, & re-creation of appropriate landforms.	The proposals are limited in scale & extent & providing linear tree belts along the main road corridors are unaffected, impacts would be contained. There would be no change to landscape pattern or tranquility but there would be minor loss of landscape elements (hedgerows, trees). No impacts are anticipated on designated sites. Very minor impacts anticipated on regionally designated Greenbelt. Overall, anticipated impacts are of small scale & the scheme would be seen in context with the existing road network & contained within a small area.  The impacts of the scheme on completion are judged to be neutral - slight adverse.  With mitigation planting after 15 years impacts judged to be neutral.

**Reference Sources**

BANES Landscape Character Assessment  
 South Gloucestershire Landscape Character Assessment (2014)  
 Natural England  
 Ordnance Survey Mapping  
 Aerial Mapping  
 Magic - Geographical mapping  
 Sustrans

**Step 5 - Summary Assessment Score**

Neutral-slight adverse on completion.  
 Neutral after 15 years

**Qualitative Comments**

A 2km offset from the scheme boundary has been prescribed for the study area within this local character area of which baseline assessment only has been conducted due to the early stages of this design & optioning stage. It is considered that significant effects are unlikely beyond this.  
 The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the landscape.

**TAG Townscape Impacts Worksheet - Option A&B - Orbital Route A4-A37 - Blue Route**

Features	Step 2		Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Impact
Layout	The townscape within the study area is characterised as being suburban located on edge of Bristol city bordering the rural context. The area is influenced by the busy A4, A4174 & A37 corridors & Bristol to Bath railway. The area is dominated by residential use with some retail & commercial areas. Settlements within the study area include Keynsham, Brislington, Stockwood, Queen Charlton & Whitchurch interspersed with isolated properties & farmsteads.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to layout, eg introduction of new housing developments & other urban elements such as retail/industrial units.	It is not anticipated that there would be any notable impacts on the layout as a result of the scheme due to its distance from townscape features and passing through open farmland, therefore the impact is judged to be neutral.
Density and mix	Density is of low - medium scale within a suburban & rural edge context comprising mainly residential housing linked with road networks intermixed with some retail, industry and commercial use.	Local	Common at the local level	Medium at the local level	Some opportunity for substitution	Medium potential for change eg in areas of regeneration, brownfield sites & urban fringe areas & alteration to mix of urban elements.	Density & mix will increase slightly with the introduction of a new visually intrusive urban element to the edge of Stockwood, Whitchurch & Keynsham.  It is anticipated that there would be visual disturbance on townscape features SE of Whitchurch, S of Stockwood & Queen Charlton, therefore the impact is judged to be slight adverse.
Scale	Built elements are mainly of a domestic scale, generally 1-3 storey including residential properties with some areas retail & industry use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the scale as a result of the scheme due to its distance from townscape features and passing through open farmland, therefore the impact is judged to be neutral.
Appearance	The housing is a mixture of ages with modern, private, commercial offices & retail buildings. Some features/buildings retain historical associations which add to the local distinctiveness of the area.	Local	Common at the local level	Medium at a local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the appearance of the townscape as a result of the scheme due to its distance from townscape features and passing through open farmland, therefore the impact is judged to be neutral.
Human interaction	The primary human interaction is focused around domestic use such as schools, shops, pubs, churches, community facilities etc. with some retail & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change as a result of land use, density & mix & layout.	It is not anticipated that there would be any notable impacts on human interaction as a result of the scheme due to its distance from townscape features and passing through open farmland, therefore the impact is judged to be neutral.
Cultural	There is a mix of council housing & post war development with some more modern features interspersed with areas of historical interest including Listed Buildings within Keynsham, Queen Charlton & Whitchurch village to the S, NE & SW of the scheme. The main settlements of Keynsham, Brislington, Stockwood & Whitchurch to the NW, W, NW & W respectively, dominate the area, with more isolated farms & clusters of dwellings interspersed between them. Office developments at Durlay Park, & a small industrial estate on the flatter land by the River Avon are also in the localised vicinity. These areas are linked by busy transport corridors. Horseworld is within the scheme extents on the edge of Whitchurch/Stockwood. There are designated historical features within 1km, including various Listed Buildings & 2 SM's (Roman Settlement at Keynsham Harris & Maes Knoll Camp) located 1km E & W of the scheme. Keynsham & Queen Charlton are designated as Conservation Areas.	Settlements & transport corridors valued at regional level.  SM's, Listed Buildings, & CA's valued at national level.	Rare at local level	Medium at local level  Medium at Regional & National level	Limited opportunity for substitution	Low potential for change due to limited opportunity for substitution.	It is anticipated that there would be visual disturbance on the setting of cultural features close to the scheme due to the introduction of a new urban element, therefore the impact is judged to be slight adverse.
Land use	Land use is primarily domestic including residential & recreational areas with some retail, industry & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to land use.	It is not anticipated that there would be any notable impacts on land use as a result of the scheme due to its distance from townscape features and passing through open farmland, therefore the impact is judged to be neutral.
Summary of character	The study area is characterised as a suburban townscape on the edge of Bristol transitioning to rural landscape with primarily residential settlements with some historic & cultural associations. These are connected with the busy transport corridors & network of rural lanes linking smaller settlements & farmsteads.	Some features valued at national level. Many townscape elements valued at local level.	Some features, eg designated cultural sites, are rare at national, regional & local level. Many townscape features are commonplace at all levels.	Low to medium at local, regional & national level.	Some opportunity for substitution	Low-medium potential for change as a result of other influences.	This route runs primarily through a rural corridor between Keynsham & Whitchurch. Mitigation for Townscape impacts will be limited to careful design & siting of the intersection at Whitchurch, combined with planting for screening of views from these urban edges. It is not anticipated that there would be any notable impacts on this townscape as a result of the scheme due to its distance to urban areas, however minor impacts are anticipated on the density & mix & on the setting of some cultural features. The impacts overall are therefore judged to be slight adverse.

**Reference Sources**

B&NES Landscape Character Assessment  
 South Gloucestershire Landscape Character Assessment (2014)  
 Ordnance Survey Mapping  
 Aerial Mapping  
 Magic - Geographical mapping  
 Bristol City Council

**Step 5 - Summary Assessment Score**

Slight adverse

**Qualitative Comments**

A 1km offset from the scheme boundary has been prescribed for the study area within this townscape area of which baseline assessment only has been conducted due to the early stages of this design & optioneering stage. It is considered that significant effects are unlikely beyond this.  
 The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the townscape.

**TAG Townscape Impacts Worksheet - Option C - Orbital Route West of A37 (Washing Pound Lane) - Grey Route**

Features	Step 2	Step 3					Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Impact
Layout	The townscape within the study area is characterised as being suburban located on edge of Bristol city bordering the rural context. The area is influenced by the busy A37 corridor with minor roads connecting surrounding settlements. The area is dominated by residential use with some retail, industry & commercial areas towards Hengrove. Settlements include Stockwood & Whitchurch to the N & W respectively interspersed with isolated properties & farmsteads.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to layout, eg introduction of new housing developments & other urban elements such as retail/industrial units.	It is not anticipated that there would be any notable impacts on the layout as a result of the scheme due to its distance from townscape features and passing through mainly open farmland, therefore the impact is judged to be neutral.
Density and mix	Density is of low - medium scale within a suburban & rural edge context comprising mainly residential housing linked with road networks intermixed with some retail, industry and commercial use.	Local	Common at the local level	Medium at the local level	Some opportunity for substitution	Medium potential for change eg in areas of regeneration, brownfield sites & urban fringe areas & alteration to mix of urban elements.	Density & mix will increase slightly with the introduction of a new visually intrusive urban element to the edge of Whitchurch.  It is anticipated that there would be visual disturbance on townscape features S of Whitchurch, therefore the impact is judged to be slight adverse.
Scale	Built elements are mainly of a domestic scale, generally 1-3 storey including residential properties with some areas retail & industry use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the scale as a result of the scheme due to its distance from townscape features and passing through mainly open farmland, therefore the impact is judged to be neutral.
Appearance	The housing is a mixture of ages with modern, private, commercial offices & retail buildings. Some features/buildings retain historical associations which add to the local distinctiveness of the area.	Local	Common at the local level	Medium at a local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the appearance of the townscape as a result of the scheme due to its distance from townscape features and passing through mainly open farmland, therefore the impact is judged to be neutral.
Human interaction	The primary human interaction is focused around domestic use such as schools, shops, pubs, churches, community facilities etc. with some retail & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change as a result of land use, density & mix & layout.	It is not anticipated that there would be any notable impacts on human interaction as a result of the scheme due to its distance from townscape features and passing through mainly open farmland, therefore the impact is judged to be neutral.
Cultural	There is a mix of council housing & post war development with some more modern features interspersed with areas of historical interest including Listed Buildings & traditional houses within Whitchurch village N of the scheme. Horseworld is within the study area on the edge of Whitchurch/Stockwood. There are designated historical features within 1km, including 1 SM (Maes Knoll Camp) located 1km SW of the scheme. Lyons Court Farm & Church Farm are adjacent to the scheme. Other recreational facilities such as Whitchurch Cricket Club & Bristol Barbarians Rugby Club &	Settlements & transport corridors valued at regional level.  SM's, Listed Buildings & Reg Park & Garden valued at national level.	Rare at local level	Medium at local level  Medium at Regional & National level	Limited opportunity for substitution	Low potential for change due to limited opportunity for substitution.	It is anticipated that there would be visual disturbance on the setting of some cultural features to the edge of Whitchurch due to the introduction of a new urban element, therefore the impact is judged to be slight adverse.
Land use	Land use is primarily domestic including residential & recreational areas with some retail, industry & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to land use.	It is not anticipated that there would be any notable impacts on land use as a result of the scheme due to its distance from townscape features and passing through mainly open farmland, therefore the impact is judged to be neutral.
Summary of character	The study area is characterised as a suburban townscape on the edge of Bristol transitioning to rural landscape with primarily residential settlements with some historic & cultural associations. These are connected with the busy A37 corridor & network of rural lanes linking smaller settlements & farmsteads.	Some features valued at national level. Many townscape elements valued at local level.	Some features, eg designated cultural sites, are rare at national, regional & local level. Many townscape features are commonplace at all levels.	Low to medium at local, regional & national level.	Some opportunity for substitution	Low-medium potential for change as a result of other influences.	Mitigation for this scheme would consist of careful design & location of elements within the urban edge, along with planting for visual screening & to recreate severed landscape features within the rural area.  It is not anticipated that there would be many notable impacts on this townscape as a result of the scheme due to its distance from urban areas. However, adverse impacts are anticipated on density & mix & on the setting of cultural features close to the scheme as a result of visual disturbance. The overall impacts therefore judged to be slight adverse.

**Reference Sources**

B&NES Landscape Character Assessment  
 South Gloucestershire Landscape Character Assessment (2014)  
 Ordnance Survey Mapping  
 Aerial Mapping  
 Magic - Geographical mapping  
 Bristol City Council

**Step 5 - Summary Assessment Score**

Slight adverse

**Qualitative Comments**

A 1km offset from the scheme boundary has been prescribed for the study area within this townscape area of which baseline assessment only has been conducted due to the early stages of this design & optioneering stage. It is considered that significant effects are unlikely beyond this.  
 The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the townscape.

**TAG Townscape Impacts Worksheet - Option D - Orbital Route West of A37 (Half Acre Lane) - Orange Route**

Features	Step 2		Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Impact
Layout	The townscape within the study area is characterised as being suburban located on edge of Bristol city bordering the rural context. The area is influenced by the busy A37 corridor with minor roads connecting surrounding settlements. The area is dominated by residential use with some retail, industry & commercial areas towards Hengrove. Settlements include Stockwood & Whitchurch to the N & W respectively interspersed with isolated properties & farmsteads.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to layout, eg introduction of new housing developments & other urban elements such as retail/industrial units.	It is not anticipated that there would be any notable impacts on the layout as a result of the scheme due to its distance from townscape features and passing through mainly open farmland, therefore the impact is judged to be neutral.
Density and mix	Density is of low - medium scale within a suburban & rural edge context comprising mainly residential housing linked with road networks intermixed with some retail, industry and commercial use.	Local	Common at the local level	Medium at the local level	Some opportunity for substitution	Medium potential for change eg in areas of regeneration, brownfield sites & urban fringe areas & alteration to mix of urban elements.	Density & mix will increase slightly with the introduction of a new visually intrusive urban element to the edge of Whitchurch. It is anticipated that there would be visual disturbance on townscape features S of Whitchurch, therefore the impact is judged to be slight adverse.
Scale	Built elements are mainly of a domestic scale, generally 1-3 storey including residential properties with some areas retail & industry use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the scale as a result of the scheme due to its distance from townscape features and passing through mainly open farmland, therefore the impact is judged to be neutral.
Appearance	The housing is a mixture of ages with modern, private, commercial offices & retail buildings. Some features/buildings retain historical associations which add to the local distinctiveness of the area.	Local	Common at the local level	Medium at a local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the appearance of the townscape as a result of the scheme due to its distance from townscape features and passing through mainly open farmland, therefore the impact is judged to be neutral.
Human interaction	The primary human interaction is focused around domestic use such as schools, shops, pubs, churches, community facilities etc. with some retail & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change as a result of land use, density & mix & layout.	It is not anticipated that there would be any notable impacts on human interaction as a result of the scheme due to its distance from townscape features and passing through mainly open farmland, therefore the impact is judged to be neutral.
Cultural	There is a mix of council housing & post war development with some more modern features interspersed with areas of historical interest including Listed Buildings & traditional houses within Whitchurch village N of the scheme. Horseworld is within the study area on the edge of Whitchurch/Stockwood. There are designated historical features within 1km, including 1 SM (Maes Knoll Camp) located 1km SW of the scheme. Lyons Court Farm & Church Farm are adjacent to the scheme. Other recreational facilities such as Whitchurch Cricket Club & Bristol Barbarians Rugby Club & Whitehall	Settlements & transport corridors valued at regional level. SM's, Listed Buildings & Reg Park & Garden valued at national level.	Rare at local level	Medium at local level Medium at Regional & National level	Limited opportunity for substitution	Low potential for change due to limited opportunity for substitution.	It is anticipated that there would be visual disturbance on the setting of some cultural features to the edge of Whitchurch due to the introduction of a new urban element, therefore the impact is judged to be slight adverse.
Land use	Land use is primarily domestic including residential & recreational areas with some retail, industry & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to land use.	It is not anticipated that there would be any notable impacts on land use as a result of the scheme due to its distance from townscape features and passing through mainly open farmland, therefore the impact is judged to be neutral.
Summary of character	The study area is characterised as a suburban townscape on the edge of Bristol transitioning to rural landscape with primarily residential settlements with some historic & cultural associations. These are connected with the busy A37 corridor & network of rural lanes linking smaller settlements & farmsteads.	Some features valued at national level. Many townscape elements valued at local level.	Some features, eg designated cultural sites, are rare at national, regional & local level. Many townscape features are commonplace at all levels.	Low to medium at local, regional & national level.	Some opportunity for substitution	Low-medium potential for change as a result of other influences.	Mitigation for this scheme would consist of careful design & location of elements within the urban edge, along with planting for visual screening & to recreate severed landscape features within the rural area. It is not anticipated that there would be any notable impacts on this townscape as a result of the scheme due to its distance from urban areas. However, adverse impacts are anticipated on density & mix & on the setting of cultural features close to the scheme as a result of visual disturbance. The overall impacts are therefore judged to be slight adverse.

**Reference Sources**

B&NES Landscape Character Assessment  
 South Gloucestershire Landscape Character Assessment (2014)  
 Ordnance Survey Mapping  
 Aerial Mapping  
 Magic - Geographical mapping  
 Bristol City Council

**Step 5 - Summary Assessment Score**

Slight adverse

**Qualitative Comments**

A 1km offset from the scheme boundary has been prescribed for the study area within this townscape area of which baseline assessment only has been conducted due to the early stages of this design & optioneering stage. It is considered that significant effects are unlikely beyond this. The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the townscape.

**TAG Townscape Impacts Worksheet - Option E - Hicks Gate Junction Improvement - Brown Route**

Features	Step 2		Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Impact
Layout	The townscape within the study area of Hicks Gate roundabout is characterised as being suburban located on edge of Bristol city. The area is influenced by the busy A4 & A4174 corridors & Bristol to Bath railway. The area is dominated by residential use with some retail & commercial areas. Settlements within the study area include Keynsham, Hanham, Brislington, Stockwood, Queen Charlton & Whitchurch interspersed with isolated properties & farmsteads.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to layout within suburban context, eg introduction of new housing developments & other urban elements such as retail/industrial units.	It is not anticipated that there would be any notable impacts on the layout as a result of the scheme due to its scale & distance from townscape features, therefore the impact is judged to be neutral.
Density and mix	Density is of low - medium scale within a suburban & rural edge context comprising mainly residential housing linked with road networks intermixed with some retail, industry and commercial use.	Local	Common at the local level	Medium at the local level	Some opportunity for substitution	Medium potential for change eg in areas of regeneration, brownfield sites & urban fringe areas & alteration to mix of urban elements.	It is not anticipated that there would be any notable impacts on the density and mix as a result of the scheme due to its scale & distance from townscape features, therefore the impact is judged to be neutral.
Scale	Built elements are mainly of a domestic scale, generally 1-3 storey including residential properties with some areas retail & industry use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the scale as a result of the scheme due to its scale & distance from townscape features, therefore the impact is judged to be neutral.
Appearance	The housing is a mixture of ages with modern, private, commercial offices & retail buildings. Some features/buildings retain historical associations which add to the local distinctiveness of the area.	Local	Common at the local level	Medium at a local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the appearance of the townscape as a result of the scheme due to its scale & distance from townscape features, therefore the impact is judged to be neutral.
Human interaction	The primary human interaction is focused around domestic use such as schools, shops, pubs, churches, community facilities etc. with some retail & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change as a result of land use, density & mix & layout.	It is not anticipated that there would be any notable impacts on human interaction as a result of the scheme due to its scale & distance from townscape features, therefore the impact is judged to be neutral.
Cultural	There is post war development mixed with modern features interspersed with areas of historical interest, such as Brislington & Keynsham Conservation Areas and Listed Buildings within the study area. Most notably, Keynsham contains various historical features including Listed Buildings which line Bristol Road & The High Street. Also, The Abbey SM in Keynsham is in close proximity to the scheme alongside the A4. The Park & Garden to Brislington House is a Reg Park & Garden with associated Listed Buildings within 1km of the scheme. There are also office developments at Durlay Park, & a small industrial estate on the flatter land by the River Avon. These areas are linked by busy transport corridors.	Settlements & transport corridors valued at regional level. SM's, CA's & Listed Buildings valued at national level.	Rare at local level	Medium at local level Medium at Regional & National level	Limited opportunity for substitution	Low potential for change due to limited opportunity for substitution.	It is not anticipated that there would be any notable impacts on cultural features as a result of the scheme due to its scale & distance from townscape features, therefore the impact is judged to be neutral.
Land use	Land use is primarily domestic including residential & recreational with some retail, commercial & industry use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to land use.	It is not anticipated that there would be any notable impacts on land use as a result of the scheme due to its scale & distance from townscape features, therefore the impact is judged to be neutral.
Summary of character	The study area is characterised as a suburban townscape on the edge of Bristol transitioning to rural landscape with primarily residential settlements with some historic & cultural associations. These are connected with the busy transport corridors & network of rural lanes linking smaller settlements & farmsteads.	Some features valued at national level. Many townscape elements valued at local level.	Some features, eg designated cultural sites, are rare at national, regional & local level. Many townscape features are commonplace at all levels.	Low to medium at local, regional & national level.	Some opportunity for substitution	Low-medium potential for change as a result of other influences.	It is not anticipated that there would be any notable impacts on townscape as a result of the scheme due to its scale & distance from townscape features, therefore the impact is judged to be neutral.

**Reference Sources**

B&NES Landscape Character Assessment  
 South Gloucestershire Landscape Character Assessment (2014)  
 Ordnance Survey Mapping  
 Aerial Mapping  
 Magic - Geographical mapping  
 Bristol City Council

**Step 5 - Summary Assessment Score**

Neutral

**Qualitative Comments**

A 1km offset from the scheme boundary has been prescribed for the study area within this townscape area of which baseline assessment only has been conducted due to the early stages of this design & optioning stage. It is considered that significant effects are unlikely beyond this.  
 The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the townscape.

**SE Bristol and Whitchurch Strategic Corridor - Biodiversity AST Assessments**

Scheme	Option	Summary of Key Impacts	Assessment
Orbital Highway Route	Option A&B - Orbital Route A4-A37 - Blue Route	<p>The WP1-A4A37 Link Road Scheme (BlueLine) has potential for impacts on the: Mells Valley SAC (19.6km south east), Bath and Bradford on Avon Bats SAC (15km east), North Somerset and Mendip Bat Sites SAC (15km west) or Wye Valley and Forest of Dean Bat Sites SAC (28km south east). This is through loss of commuting or foraging habitat for bats within the local area linked to this SAC. One SSSI is present within 1km of the Scheme which is designated for geographical reasons, considering the geological nature of the site and the distance away from the Scheme it is considered unlikely that there will be impacts on this site as a result of the Scheme. One LNR and five SNCIs are within 1km distance from the Scheme route. The River Avon SNCI is situated 540m south east of the route. Considering the distances of the sites away from the Scheme area and the nature of the Scheme it is considered unlikely that the Scheme will result in impacts to these sites.</p> <p>The WP1-A4A37 Link Scheme may result in loss of deciduous woodland, hedgerows and agricultural habitats. Wood pasture, parkland Priority Habitats and traditional orchards are present within 1km of the Scheme, these are not predicted to be impacted.</p> <p>There is a Granted European Protected Species Application within 1 km of the Scheme, this was granted in 8/10/2015 and ends in 7/10/2020, this is for Common pipistrelle, Soprano pipistrelle, Lesser horseshoe, Serotine and Whiskered bats. Loss of trees, hedgerow, grassland, scrub habitats and ponds could result in loss of areas potentially suitable for associated protected species. Overall, due to the scale of the off-line scheme and potential impacts to habitats of value to bats over a wide area, impacts to these SACs are possible.</p> <p>Mitigation against the loss of habitat and landscape features incurred as a result of this Scheme could include re-planting of hedgerows lost.</p>	Slight adverse
Orbital Highway Route	Option C - Orbital Route West of A37 (Washing Pound Lane) - Grey Route	<p>The WP1-A4-A37 Whitchurch Option 2 (GreyLine) has potential for impacts to; Mells Valley SAC (13km south east), Bath and Bradford on Avon Bats SAC (16km west) or Wye Valley and Forest of Dean Bat Sites SAC (29km south east). This is through loss of commuting or foraging habitat for bats within the local area linked to this SAC. No designated sites within 1km. Two SNCIs are within 1km from the Scheme route. Considering the distances of the sites away from the Scheme area and the nature of the Scheme it is considered unlikely that the Scheme will result in impacts to these sites.</p> <p>The WP1-A4A37 Link may result in loss of hedgerows and agricultural habitats. There are areas of Priority Habitat (including deciduous woodland, wood pasture and parkland, and traditional orchards) within 1km of the Scheme, these are not predicted to be impacted.</p> <p>No previously granted European Protected Species Applications have been found within 1km of the Scheme. Loss of hedgerow, grassland, scrub habitats and ponds could result in loss of areas potentially suitable for associated protected species. Overall, due to the scale of the off-line scheme and potential impacts to habitats of value to bats over a wide area, impacts to these SACs are possible.</p> <p>Mitigation against the loss of habitat and landscape features incurred as a result of this Scheme could include re-planting of hedgerows lost.</p>	Slight adverse
Orbital Highway Route	Option D - Orbital Route West of A37 (Half Acre Lane) Orange Route	<p>The WP1-A4-A37 (OrangeLine) has potential for impacts on the Mells Valley SAC (13km south east), Bath and Bradford on Avon Bats SAC (16km west) or Wye Valley and Forest of Dean Bat Sites SAC (29km south east). This is through loss of commuting or foraging habitat for bats within the local area linked to this SAC. Two SNCIs are within 1km of the Scheme, considering the distances of the sites away from the Scheme area and the nature of the Scheme it is considered unlikely that the Scheme will result in impacts to these sites.</p> <p>The WP1-A4A37 (Orange Line) Link may result in loss of hedgerows and agricultural habitats. Unlike the Blue option, it does not cut through a section of deciduous woodland. There are areas of Priority Habitats (deciduous woodland, wood pasture and parkland and traditional orchards) within 1km of the Scheme, these are not predicted to be impacted.</p> <p>There are no Granted European Protected Species Applications within 1 km of the Scheme. Loss of hedgerow, grassland, scrub habitats and ponds could result in loss of areas potentially suitable for associated protected species. Overall, due to the scale of the off-line scheme and potential impacts to habitats of value to bats over a wide area, impacts to these SACs are possible.</p> <p>Mitigation against the loss of habitat and landscape features incurred as a result of this Scheme could include re-planting of hedgerows lost.</p>	Slight adverse

## TAG Biodiversity Impacts Worksheet - Option A&amp;B - Orbital Route A4-A37 - Blue Route

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Bickley Wood SSSI (approximately 600 m north west of the north end of the Scheme)	(Geographical) Most extensive exposure of carboniferous downend group striation in the Bristol coalfields	National	High - site designated as a SSSI	N/A	High	Neutral	Neutral
Avon Valley Woodland LNR (approximately 600m north west, part of Bickley wood SSSI)	Maturing broadleaved woodlands- oak, willow scrub and pasture	Regional	Medium - site designated at a local level for nature	N/A	Medium	Neutral	Neutral
Stockwood Open Space SNCI, LNR and Avon Wildlife Trust Nature Reserve (approximately 260m west at Scheme line mid-point)	Grassland meadows, thick headgerows and woodland	Regional	Medium - site designated at a local level for nature conservation	N/A	Medium	Neutral	Neutral
Stockwood Vale Woods SNCI (approximately 240m west)	Broad leaved woodlands	Regional	Medium - site designated at a local level for nature	N/A	Medium	Neutral	Neutral
Charlton Bottom & Queen Charlton Watercourse SNCI (approximately 510m south west)	Running water (streams), with associated marginal habitats, semi-natural broadleaved woodland and scrub.	Regional	Medium - site designated at a local level for nature	N/A	Medium	Neutral	Neutral
West Keynsham Field SNCI (approximately 200 m west)	Unimproved and semi-improved neutral grassland, marshy grassland, hedges and scrub.	Regional	Medium - site designated at a local level for nature conservation	N/A	Medium	Neutral	Neutral
Stockwood Golf Course SNCI (approximately 240 m north west)	Unimproved calcareous grassland	Regional	Medium - site designated at a local level for nature conservation	N/A	Medium	Neutral	Neutral
Sturminster Road SNCI (approximately 410m east)	Woodland, scrub, tall ruderal vegetation, grassland & stream, with associated marginal vegetation	Regional	Medium - site designated at a local level for nature conservation	N/A	Medium	Neutral	Neutral
River Avon SNCI (approximately 540m south east)	Invertebrates and aquatic plants	Regional	Medium - site designated at a local level for nature conservation	N/A	Medium	Neutral	Neutral
Mells Valley SAC (approximately 19.6km south east).	Sites known for Greater horseshoe bat populations, cave networks.	International	Very high - internationally designated site	N/A	Very high	Neutral	Neutral
North Somerset and Mendip Bat SAC sites (approximately 15km west).	Sites known for Lesser horseshoe and greater horseshoe bat roost populations	International	Very high - internationally designated site	N/A	Very high	Minor negative	Slight adverse
Wye Valley and Forest of Dean Bat Sites SAC (approximately 28km south east).	Sites known for Lesser horseshoe and Greater horseshoe bat roost populations	International	Very high - internationally designated site	N/A	Very high	Minor negative	Slight adverse
Bath and Bradford on Avon Bats SAC (approximately 15km east).	Sites known for Greater horseshoe, Lesser horseshoe and Bechstein's bat roost populations	International	Very high - internationally designated site	N/A	Very high	Minor negative	Slight adverse
<b>Habitats assemblage</b> consist mainly of trees, hedgerow, grassland, scrub habitats and ponds. The Scheme could result in loss of areas these areas which are potentially suitable for associated protected species, including bats, dormouse, great crested newts and other amphibians, reptiles, birds and invertebrates.							

## Reference Sources

Magic Maps - <http://www.magic.gov.uk/MagicMap.aspx>  
<http://map.n-somerset.gov.uk/southglos.html>

## Summary Assessment Score

Slight adverse

## Qualitative Comments

As a result of this assessment, a slight adverse assessment score was given to this Scheme as this was the highest assessment score found within the features assessed.



**TAG Biodiversity Impacts Worksheet - Option C - Orbital Route West of A37 (Washing Pound Lane) – Grey route**

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Sturminster Road SNCI (approximately 600m east)	Woodland, scrub, tall ruderal vegetation, grassland & stream, with associated marginal vegetation	Regional	Medium-site designated at a local level for nature conservation	N/A	Medium	Neutral	Neutral
Mells Valley SAC (approximately 13km south east)	Sites designated for greater horseshoe bat populations, cave networks.	International	Very high-internationally designated site	N/A	Very high	Minor negative	Slight adverse
Bath and Bradford on Avon bats SAC (approxiamtely 16km west).	Sites designated for Greater horseshoe, Lesser horseshoe and Bechstein's bat roost populations	International	Very high-internationally designated site	N/A	Very high	Minor negative	Slight adverse
Wye Valley and Forest of Dean Bat Sites SAC (approximately 29km south east).	Sites designated for Lesser horseshoe and Greater horseshoe bat roost populations	International	Very high-internationally designated site	N/A	Very high	Minor negative	Slight adverse
<b>Habitats assemblage</b> consist mainly of trees, hedgerow, grassland, scrub habitats and ponds. The Scheme could result in loss of areas these areas which are potentially suitable for associated protected species, including bats, dormouse, great crested newts and other amphibians, reptiles, birds and invertebrates.							

**Reference Sources**

Magic Maps - <a href="http://www.magic.gov.uk/MagicMap.aspx">http://www.magic.gov.uk/MagicMap.aspx</a> , <a href="http://map.n-somerset.gov.uk/southglos.html">http://map.n-somerset.gov.uk/southglos.html</a> <a href="https://isharemaps.bathnes.gov.uk/atmycouncil.aspx">https://isharemaps.bathnes.gov.uk/atmycouncil.aspx</a>
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**Summary Assessment Score**

Slight adverse
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**Qualitative Comments**

As a result of this assessment, a slight adverse assessment score was given to this Scheme as this was the highest assessment score found within the features assessed.
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**TAG Biodiversity Impacts Worksheet - Option D - Orbital Route West of A37 (Half Acre Lane) – Orange route**

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Sturminster Road SNCI (approximately 560 m east)	Woodland, scrub, tall ruderal vegetation, grassland & stream, with associated marginal vegetation	Regional	Medium-site designated at a local level for nature conservation	N/A	Medium	Neutral	Neutral
Mells Valley SAC (approximately 13km south east)	Sites designated for Greater horseshoe bat populations, cave networks.	International	Very high-internationally designated site	N/A	Very high	Minor negative	Slight adverse
Bath and Bradford on Avon Bats SAC (approximately 16km west).	Sites designated for Greater horseshoe, Lesser horseshoe and Bechstein's bat roost populations	International	Very high-internationally designated site	N/A	Very high	Minor negative	Slight adverse
Wye Valley and Forest of Dean Bat Sites SAC (approximately 29km south east).	Sites designated for Lesser horseshoe and Greater horseshoe bat roost populations	International	Very high-internationally designated site	N/A	Very high	Minor negative	Slight adverse
<p><b>Habitats assemblage</b> consist mainly of trees, hedgerow, grassland, scrub habitats and ponds. The Scheme could result in loss of areas these areas which are potentially suitable for associated protected species, including bats, dormouse, great crested newts and other amphibians, reptiles, birds and invertebrates.</p>							

**Reference Sources**

Magic Maps - <http://www.magic.gov.uk/MagicMap.aspx>  
<http://map.n-somerset.gov.uk/southglos.html>

**Summary Assessment Score**

Slight adverse

**Qualitative Comments**

As a result of this assessment, a slight adverse assessment score was given to this Scheme as this was the highest assessment score found within the features assessed.

## TAG Biodiversity Impacts Worksheet - Option E - Hicks Gate Junction Improvement - Brown Route

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Bickley Wood ancient and semi-natural woodland SSSI (approximately 540m north)	(Geographical) Most extensive exposure of carboniferous downland group striation in the Bristol coalfields	National	High-sited designated as a SSSI	N/A	High	Neutral	Neutral
Avon valley woodland LNR (520m north).	Maturing broadleaved woodlands	Regional	Medium- site designated at local level for nature conservation	N/A	Medium	Neutral	Neutral
Stockwood open space LNR (approximately 800m south west)	Old farm meadows, hedgerows, broadleaved & coniferous woodland, scrub, marshland, ponds, a stream, a reedbed and a restored tip.	Regional	Medium- site designated at local level for nature conservation	N/A	Medium	Neutral	Neutral
East Wood and Keynsham Humpy Tumps Complex SNCI (approximately 200m south)	Floristically rich acidic grassland	Regional	Medium- site designated at local level for nature conservation	N/A	Medium	Neutral	Neutral
Stockwood Vale Woods SNCI (approximately 760m south west)	Semi-natural broadleaved woodland and scrub	Regional	Medium- site designated at local level for nature conservation	N/A	Medium	Neutral	Neutral
Charlton Bottom and Queen Charlton watercourse SNCI (approximately 810m south west)	Running water (streams), with associated marginal habitats, semi-natural broadleaved woodland and scrub.	Regional	Medium- site designated at local level for nature conservation	N/A	Medium	Neutral	Neutral
River Avon SNCI (approximately 700m east)	Invertebrates and aquatic plants	Regional	Medium- site designated at local level for nature conservation	N/A	Medium	Neutral	Neutral
Mells Valley SAC (approximately 13km south east)	Sites known for Greater horseshoe bat populations, cave networks.	International	Very high-internationally designated site	N/A	Very high	Neutral	Neutral
Bath and Bradford on Avon Bats SAC (approximately 16km west)	Sites known for Greater horseshoe, Lesser horseshoe and Bechstein's bat roost populations	International	Very high-internationally designated site	N/A	Very high	Neutral	Neutral
Wye Valley and Forest of Dean Bat Sites SAC (approximately 29km south east)	Sites known for Lesser horseshoe and Greater horseshoe bat roost populations	International	Very high-internationally designated site	N/A	Very high	Neutral	Neutral
North Somerset and Mendip Bat Sites SAC (approximately 16km south west)	Sites known for Lesser horseshoe and Greater horseshoe bat roost populations	International	Very high-internationally designated site	N/A	Very high	Neutral	Neutral
<b>Habitats present that could be lost include arable farmland, hedgerow, grassland, scrub habitats and ponds could result in loss of areas potentially suitable for associated protected species.</b>							

## Reference Sources

Magic Maps - <http://www.magic.gov.uk/MagicMap.aspx>,  
<https://isharemaps.bathnes.gov.uk/atmycouncil.aspx>  
<http://maps.bristol.gov.uk/policies/>

## Summary Assessment Score

Neutral

## Qualitative Comments

As a result of this assessment, a neutral assessment score was given to this Scheme as all features assessed were found to have neutral assessment scores.

**TAG Historic Environment Impacts Worksheet - Option A&B - Orbital Route A4-A37 - Blue Route**

Feature	Step 2		Step 3		Step 4
	Description	Scale it matters	Significance	Rarity	Impact
Form	<p>There are 11 Grade II listed buildings within an approximate 500m study area surrounding the proposed scheme [1365675, 1384637, 1384612, 1384613, 1384638, 1129499, 1384633, 1136454, 1129500, 1384635, 1365674].</p> <p>The buildings are scattered across the study area with the majority being located along the boundary between Bristol City Council and Bath and North East Somerset Council at Stockwood. The remaining buildings can either be found towards the north of the scheme (around Hicks Gate Roundabout) or the south (around Whitchurch).</p> <p>The buildings consist of various forms including a mid-17th century manor farmhouse, an 18th century manor house with farmhouse, late 18th to early 19th century houses, an early 19th century farmhouse, mortuary chapels at Keynsham Cemetery, a barn (mid 18th to early 19th century), early 18th century gate piers and a milestone.</p> <p>A small part of the Avon Valley Conservation Area is present within the most western extent of the study area. Predominant architectural features are pantiled and slate roofs, random stone walling, painted, rendered walls with timber window frames and doors, generally proportioned and detailed in the cottage vernacular of the period.</p>	<p>The listed buildings are of medium importance (mostly on a local to regional level).</p> <p>The conservation area is of regional to national importance.</p>	<p>There are 11 Grade II listed buildings of medium value within the study area.</p> <p>The conservation area presents important local architectural design and a secluded riverside landscape enhanced by an 18th century settlement pattern, and also contains one of the first purpose built/private lunatic asylums in Britain and is therefore considered to be of medium to high value.</p>	<p>In general, the form of the listed buildings is not rare regionally, with the exception of Grade II listed Durlay Cottage, which has been described as a 'modest but rare example of the local cottage vernacular' as part of its listings entry.</p> <p>The form of the conservation area is not rare in a regional context.</p>	<p><b>Negligible</b> - there will be no change to the form of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Survival	<p>The level of survival of the listed buildings is generally good. Aside from some alterations, additions and repairs (internally and externally), which represent multiple phases of development and use, the buildings have mainly retained their characteristic elements.</p> <p>The survival of the conservation area is generally good with limited development within its boundary since its designation in 1980.</p>	<p>The survival of the listed buildings is a matter of local to regional interest.</p> <p>The survival of the conservation area is a matter of regional to national interest.</p>	<p>The survival of the listed buildings is important in understanding the historic development of the study area.</p> <p>The survival of the conservation area within the study area is central to its significance as a regionally and nationally important asset.</p>	<p>The survival of listed buildings similar to those present within the study area is not rare in this region.</p> <p>The survival of the conservation area similar to those present within the study area is not rare in this region.</p>	<p><b>Negligible</b> - there will be no change to the survival of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Condition	<p>The condition of the listed buildings is generally good. The majority of buildings are in residential use (aside from the mortuary chapels and the milestone).</p> <p>The condition of the conservation area is generally good.</p>	<p>The condition of the listed buildings is a matter of local to regional interest.</p> <p>The condition of the conservation area is a matter of regional to national interest.</p>	<p>The condition of the listed buildings is important due to their association with the development of the area.</p> <p>The condition of the conservation area is important to ensure its long term survival.</p>	<p>The condition of the listed buildings is not rare.</p> <p>The condition of the conservation area is not rare.</p>	<p><b>Negligible</b> - there will be no change to the condition of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Complexity	<p>The listed buildings are generally of low to moderate complexity.</p> <p>The conservation area is generally of low to moderate complexity.</p>	<p>The complexity of the listed buildings is a matter of local to regional interest.</p> <p>The complexity of the conservation area is a matter of regional to national interest.</p>	<p>The complexity of the listed buildings represents some variety in form and function of post-medieval buildings.</p> <p>The complexity of the conservation area largely represents 18th century settlements patterns stretching alongside the river. This forms an important component of its significance.</p>	<p>The level of complexity of the listed buildings is not rare.</p> <p>The level of complexity of the conservation area is not rare.</p>	<p><b>Negligible</b> - there will be no change to the complexity of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Context	<p>The landscape surrounding the scheme is predominantly rural, with larger residential areas located at Stockwood (to the west of the scheme), Keynsham (to the east of the scheme) and Whitchurch (to the south of the scheme).</p> <p>The listed buildings mainly reflect the post-medieval village/town development of the area and still retain parts their original context of being sited within a relatively sub-urban area outside of the cities of Bristol and/or Keynsham.</p> <p>The conservation area is primarily formed of a 18th century settlement pattern along the River Avon and has mainly retained this context. The area surrounding it, however, is dominated by post-medieval and modern developments.</p>	<p>The context of the listed buildings is largely valued at a local level, while the conservation area is valued at a regional to national level. The setting of these assets is also a material consideration under national policy.</p>	<p>The context of the listed buildings and conservation area within the study area reflects the local and wider regional changes in settlement pattern and development.</p>	<p>The context of the listed buildings is not rare.</p> <p>The context of the conservation area is not rare.</p>	<p><b>Minor Adverse</b> - there is potential for adverse setting impacts to the identified designated heritage assets. The assets are likely to have visibility to and from the proposed scheme, and creating a new link road between Stockwood and Queen Charlton will harm the rural setting that currently still exists between the two settlements.</p>
Period	<p>All of the listed buildings date to the post-medieval period.</p> <p>The conservation area largely traces the 18th century settlement pattern and therefore primarily dates to the post-medieval area.</p>	<p>The period captured by the listed buildings and conservation area (i.e. post-medieval) is typical and of regional and national interest.</p>	<p>The listed buildings cover the post-medieval period which is well represented within the wider area.</p> <p>Furthermore, the post-medieval period is also well represented within the conservation area.</p>	<p>The period represented by the listed buildings and conservation area is not considered rare in this region.</p>	<p><b>Negligible</b> - there will be no significant change to the periods represented by assets within the scheme study area.</p>
<b>Reference Sources</b>					
Historic England's <i>The National Heritage List for England</i> (NHLE) database, Know Your Place (for Conservation Areas in Bristol City Council)					
<b>Step 5 - Summary Assessment Score</b>					
This option is likely to have an overall Slight Adverse Effect on Cultural Heritage.					
<b>Qualitative Comments</b>					
The adverse effects relate to the potential setting impacts on the above identified designated heritage assets present within the study area. Appropriate design to reduce setting impacts (i.e. screening), could potentially reduce the effect to Neutral.					

**TAG Historic Environment Impacts Worksheet - Option C - Orbital Route West of A37 (Washing Pound Lane) - Grey Route**

	Step 2	Step 3	Step 3	Step 3	Step 4
Feature	Description	Scale it matters	Significance	Rarity	Impact
Form	<p>There are 8 listed buildings within an approximate 500m study area surrounding the proposed scheme [1136454, 1129499, 1129502, 1136453, 1365675, 1136442, 1129498, 1365674]. Out of these 2 are Grade II* [Church of St Nicholas 1136442; Lyons Court Farmhouse 1136453] and 6 are Grade II. The Grade II* listed church can be found to the east of the scheme at the junction between Bristol Road and Church Road, while the Grade II* farmhouse is located to the west of the scheme south of Church Road.</p> <p>With the exception of Grade II* Lyons Court Farmhouse, which is located to the west of the scheme, the remaining listed buildings are all located within the eastern and south-eastern extent of the study area.</p> <p>The buildings consist of various forms including a milestone, a monument in a churchyard, a church, an 18th century manor house, a 15th and 17th century farmhouse, a 17th century cottage and an 18th century house with gatepiers.</p>	<p>The Grade II* listed buildings are of high importance, while the Grade II buildings are of medium importance.</p>	<p>There are 2 Grade II* of high value, and 6 Grade II listed buildings of medium value within the study area.</p>	<p>The form of the listed buildings is not rare locally or regionally, however, the Grade II* church is a good example of a potential early-medieval (12th century) church and is not common in both a local and regional context.</p>	<p><b>Negligible</b> - there will be no change to the form of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Survival	<p>The level of survival of the listed buildings is generally good. Aside from some alterations, additions and repairs (internally and externally) which represent multiple phases of development and use, the buildings have mainly retained their characteristic elements.</p>	<p>The survival of the listed buildings is a matter of regional to national interest.</p>	<p>The survival of the listed buildings is important in understanding the historic development of the study area.</p>	<p>The survival of the listed buildings is not rare, while good survival of post-Norman conquest churches is not common.</p>	<p><b>Negligible</b> - there will be no change to the survival of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Condition	<p>The listed buildings are generally in a good condition. The majority of buildings are in residential use (aside from the church, churchyard monuments and milestone).</p>	<p>The condition of the listed buildings is a matter of regional to national interest.</p>	<p>The condition of the listed buildings is important due to their association with the development of their area.</p>	<p>The condition of the listed buildings is not rare.</p>	<p><b>Negligible</b> - there will be no change to the condition of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Complexity	<p>The listed buildings are generally of low to moderate complexity, with the church and the manor farmhouses presenting moderate complexity levels due to their alterations which either span across multiple centuries or having now been subdivided.</p>	<p>The complexity of the listed buildings is a matter of regional to national interest.</p>	<p>The complexity of the listed buildings represents some variety in form and function of medieval and post-medieval buildings.</p>	<p>The complexity of the listed buildings is not uncommon, however, the church is a good example of an early-medieval church, which has been subject to change over the centuries, representing moderate complexity.</p>	<p><b>Negligible</b> - there will be no change to the complexity of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Context	<p>The landscape surrounding the scheme is largely rural to the east, south and west. At its northern point, the scheme connects to a residential development at Whitchurch.</p> <p>The context of the majority of the listed buildings presents a mixture between a sub-urban to semi-rural environment which has been subject to development pressures to the north of the scheme.</p>	<p>The context of the listed buildings is largely valued at a local level.</p> <p>The setting of such assets is also a material consideration under national policy.</p>	<p>The context of the listed buildings within the study area reflects the local and wider regional changes in settlement pattern and development.</p>	<p>The context of the listed buildings within the study area is not rare. Even the context of the Grade II* listed church is not uncommon on a national level.</p>	<p><b>Minor Adverse</b> - there is potential for adverse impacts on the setting of designated heritage assets. The assets are likely to have visibility to and from the proposed scheme.</p>
Period	<p>With the exception of the medieval church, the remaining listed buildings are of post-medieval date.</p>	<p>The post-medieval period is typical within the area and of regional and national interest. The medieval period (represented by the church) is of regional to national interest.</p>	<p>The medieval and post-medieval periods are well represented within the wider study area.</p>	<p>The medieval and post-medieval periods are not rare.</p>	<p><b>Negligible</b> - there will be no significant change to the periods represented by assets within the scheme study area.</p>

**Reference Sources**

Historic England's *The National Heritage List for England* (NHLE) database

**Step 5 - Summary Assessment Score**

This option is likely to have an overall Slight Adverse Effect on Cultural Heritage.

**Qualitative Comments**

The main adverse effects relate to potential temporary setting impacts during the construction of the scheme. Sensitive design and appropriate mitigation such as screening could reduce the overall effect of the scheme to Neutral.

**TAG Historic Environment Impacts Worksheet - Option D - Orbital Route West of A37 (Half Acre Lane) - Orange Route**

Step 2		Step 3		Step 4	
Feature	Description	Scale it matters	Significance	Rarity	
Form	<p>There are 9 listed buildings within an approximate 500m study area surrounding the proposed scheme [1136454, 1129499, 1129502, 1136453, 1365675, 1136442, 1129498, 1365674, 1202259]. Out of these 2 are Grade II* [Church of St Nicholas 1136442; Lyons Court Farmhouse 1136453] and 7 are Grade II. The Grade II* listed church can be found to the east of the scheme at the junction between Bristol Road and Church Road, while the Grade II* farmhouse is located to the west of the the scheme south of Church Road.</p> <p>With the exception of Grade II* Lyons Court Farmhouse and Grade II Bridge Farmhouse, which are located to the west of the scheme, the remaining listed buildings are all located within the eastern and south-eastern extent of the study area.</p> <p>The buildings consist of various forms including a milestone, a monument in a churchyard, a church, an 18th century manor house, a 15th and 17th century farmhouse, a 17th century cottage and an 18th century house with gatepiers.</p>	The Grade II* listed buildings are of high importance, while the Grade II buildings are of medium importance.	There are 2 Grade II* of high value, and 7 Grade II listed buildings of medium value within the study area.	The form of the listed buildings is not rare locally or regionally, however, the Grade II* church is a good example of a potential early-medieval (12th century) church and is not common in both a local and regional context.	<p><b>Negligible</b> - there will be no change to the form of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Survival	The level of survival of the listed buildings is generally good. Aside from some alterations, additions and repairs (internally and externally) which represent multiple phases of development and use, the buildings have mainly retained their characteristic elements.	The survival of the listed buildings is a matter of regional to national interest.	The survival of the listed buildings is important in understanding the historic development of the study area.	The survival of the listed buildings is not rare, while good survival of post-Norman conquest churches is not common.	<p><b>Negligible</b> - there will be no change to the survival of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Condition	The listed buildings are generally in a good condition. The majority of buildings are in residential use (aside from the church, churchyard monuments and milestone).	The condition of the listed buildings is a matter of regional to national interest.	The condition of the listed buildings is important due to their association with the development of their area.	The condition of the listed buildings is not rare.	<p><b>Negligible</b> - there will be no change to the condition of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Complexity	The listed buildings are generally of low to moderate complexity, with the church and the manor farmhouses presenting moderate complexity levels due to their alterations which either span across multiple centuries or having now been subdivided.	The complexity of the listed buildings is a matter of regional to national interest.	The complexity of the listed buildings represents some variety in form and function of medieval and post-medieval buildings.	The complexity of the listed buildings is not uncommon, however, the church is a good example of an early-medieval church, which has been subject to change over the centuries, representing moderate complexity.	<p><b>Negligible</b> - there will be no change to the complexity of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Context	<p>The landscape surrounding the scheme is largely rural to the east, south and west. At its northern point, the scheme connects to a residential development at Whitchurch.</p> <p>The context of the majority of the listed buildings presents a mixture between a sub-urban to semi-rural environment which has been subject to development pressures to the north of the scheme.</p>	<p>The context of the listed buildings is largely valued at a local level.</p> <p>The setting of such assets is also a material consideration under national policy.</p>	The context of the listed buildings within the study area reflects the local and wider regional changes in settlement pattern and development.	The context of the listed buildings within the study area is not rare. Even the context of the Grade II* listed church is not uncommon on a national level.	<b>Minor Adverse</b> - there is potential for adverse impacts on the setting of designated heritage assets. The assets are likely to have visibility to and from the proposed scheme.
Period	With the exception of the medieval church, the remaining listed buildings are of post-medieval date.	The post-medieval period is typical within the area and of regional and national interest. The medieval period (represented by the church) is of regional to national interest.	The medieval and post-medieval periods are well represented within the wider study area.	The medieval and post-medieval periods are not rare.	<b>Negligible</b> - there will be no significant change to the periods represented by assets within the scheme study area.

**Reference Sources**

Historic England's <i>The National Heritage List for England</i> (NHLE) database
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**Step 5 - Summary Assessment Score**

This option is likely to have an overall Slight Adverse Effect on Cultural Heritage.
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**Qualitative Comments**

The main adverse effects relate to potential temporary setting impacts during the construction of the scheme. Sensitive design and appropriate mitigation such as screening could reduce the overall effect of the scheme to Neutral.
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**TAG Historic Environment Impacts Worksheet - Option E - Hicks Gate Junction Improvement - Brown Route**

Step 2		Step 3			Step 4
Feature	Description	Scale it matters	Significance	Rarity	Impact
Form	<p>There are 7 Grade II listed buildings within an approximate 500m study area surrounding the proposed scheme [1384614, 1384612, 1116829, 1409195, 1230936, 1410955, 1384613].</p> <p>All of the buildings are located to the east of the scheme (either towards Keynsham or north of the River Avon).</p> <p>The buildings consist of various forms including converted hunting lodges, late 18th century to late 19th century houses and/or cottages, a bridge, a stream culvert and mortuary chapels.</p>	The listed buildings are of medium importance (mostly on local to regional level).	There are 7 Grade II listed buildings of medium value within the study area.	The form of the listed buildings is not rare regionally, with the exception of the Grade II culvert designed by I.K. Brunel which is a rare example of a culvert to survive intact from the earliest phase of the Great Western Railway.	<p><b>Negligible</b> - there will be no change to the form of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Survival	The level of survival of the listed buildings is generally good. Aside from some alterations, additions and repairs (internally and externally) which represent multiple phases of development and use, the buildings have largely retained their characteristic elements.	The survival of the listed buildings is a matter of local to regional interest.	The survival of the listed buildings is important in understanding the historic development of the study area.	As a collection, the survival of the listed buildings within the study area is not rare.	<p><b>Negligible</b> - there will be no change to the survival of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Condition	The listed buildings are generally in a good condition. The majority of buildings are in residential use (aside from the bridge, the culvert and the mortuary chapels).	The condition of the listed buildings is a matter of local to regional national interest.	The condition of the listed buildings is important due to their association with the development of their area.	The conditions of the listed buildings are not rare.	<p><b>Negligible</b> - there will be no change to the condition of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Complexity	The listed buildings are generally of low to moderate complexity.	The complexity of the listed buildings is a matter of local to regional interest.	The complexity of the listed buildings represents some variety in form and function of post-medieval buildings.	The level of complexity represented by the listed buildings within the study area is not uncommon for the area.	<p><b>Negligible</b> - there will be no change to the complexity of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Context	<p>The landscape surrounding the scheme is largely rural, with the larger towns of Longwell Green, Keynsham and Stockwood to the north, east and south, and the City of Bristol to the west (between 1-1.5km distances).</p> <p>The context of the listed buildings is semi-rural in character, which has previously been impacted by the addition of the major road network (A4174 and A4) between Bristol and Keynsham.</p>	<p>The context of the listed buildings is largely valued at a local level.</p> <p>The setting of listed buildings is also a material consideration under national policy.</p>	The context of the listed buildings within the study area reflects the local and wider regional changes in settlement pattern and development.	The context of the listed buildings is not rare.	<p><b>Minor Adverse</b> - there is potential for temporary impacts on the setting of listed buildings during construction, particularly those which may have visibility to and from the proposed scheme.</p> <p>The assets are likely to have visibility to and from the proposed scheme. Creating a new link road between Stockwood and Queen Charlton will change the rural setting that currently still exists between the two settlements.</p> <p>No significant adverse setting impacts on designated heritage assets are anticipated.</p>
Period	All of the listed buildings are of post-medieval origin.	The period captured by the listed buildings (i.e. post-medieval) is typical within the area and of regional and national interest.	The listed buildings identified stretch across the post-medieval period which is well represented within the wider study area.	Post-medieval listed buildings are not rare within the study area or wider landscape.	<b>Negligible</b> - there will be no significant change to the periods represented by assets within the scheme study area.

**Reference Sources**

Historic England's *The National Heritage List for England* (NHLE) database

**Step 5 - Summary Assessment Score**

This option is likely to have a Slight Adverse Effect on Cultural Heritage.

**Qualitative Comments**

The main adverse effects relate to potential temporary setting impacts during the construction of the scheme. Sensitive design and appropriate mitigation such as screening could reduce the overall effect of the scheme to Neutral.

**TAG Water Environment Impacts Worksheet - Option A&B - Orbital Route A4-A37 - Blue Route**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Study area: A4 Whitchurch to A37 Hicks Gate Bristol. Highway Orbital Route A4/A37 - Blue Route									
Potential Impacts:									
The route is located entirely within Flood Zone 1. The RoFSW flood maps indicate that the route would cross a number of small watercourses and overland flow routes. Dependent on the proposals within these floodplain areas there is a potential for a loss of floodplain storage, although based on the RoFSW floodplain extents the impacts are not likely to be large (i.e. there are not large areas of floodplains across the route length). Mitigation (such as compensatory floodplain storage areas) measures may be required to ensure that flood risk is not increased; such mitigation would need to take into account the impacts of climate change. Nearby watercourses include Charlton Bottom (approximately 0.6km East) the River Avon (approximately 1km North East), the Queen Charlton watercourse (approximately 1.7km East) and the River Chew (approximately 4.2km East).	Charlton Bottom watercourse (tributary of the River Avon) and floodplain	Conveyance of flood flows and floodplain storage	The Proposed scheme crosses Surface Water floodplain and could potentially reduce conveyance and storage	Local	At a local level the floodplain provided by the site is important in helping to reduce flooding to residential and commercial properties. Charlton Bottom and the Queen Charlton watercourses are both designated as Sites of Nature Conservation Importance (SNCI). They also provide a source of recreational value to the area. For the reasons stated above the site is considered	At this stage of design assumed to not be possible for this site	Medium	Moderate Adverse	Low Significance
The scheme appears to cross several small watercourses/ditches and surface water flow paths therefore new culverts or watercourse diversions are likely to be necessary as part of the Scheme. These would need to ensure conveyance of flows is maintained and floodplain storage is not reduced.		Conveyance of flood flows and floodplain storage	The Proposed scheme crosses Surface Water floodplain and could potentially reduce conveyance and storage			At this stage of design assumed to not be possible for this site	Medium	Moderate Adverse	Low Significance
Increased runoff resulting from increase in impermeable area from the proposed link road. Mitigation will be required to ensure runoff rates are not increased as a result of the scheme, SuDS should be used where appropriate. A Drainage Strategy would be required if this site is taken forward.		Surface water runoff	The River Avon is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.			At this stage of design assumed to not be possible for this site	Medium	Major Adverse	Significant
Discharge of pollutants from road runoff; potential impacts on water quality of the watercourse, with potential implications on Water Framework Directive (WFD) status. The Scheme crosses several watercourses/ditches and therefore new culverts or watercourse diversions are likely to be necessary, this also has the potential to impact WFD status. SuDS should be used to ensure pollutants are managed on site, both during construction and operation. A Drainage Strategy would be required if this site is taken forward.		Water quality / WFD	The River Avon is used for recreational fish and boat navigation. The River Avon is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.			At this stage of design assumed to not be possible for this site	Medium	Moderate Adverse	Low Significance

**Reference Sources**

<https://flood-map-for-planning.service.gov.uk/>  
<http://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/9>  
 West Keynsham Development Concept Options Report, Arup (2013): <http://www.bathnes.gov.uk/sites/default/files/sitedocuments/Planning-and-Building-Control/Planning-Policy/Core-Strategy/ConceptOptions/COR-West-Keynsham.pdf>  
 Bing Maps  
 Google Maps

**Summary Assessment Score**

The scheme is considered to have a Significant adverse impact on the water environment (excluding mitigation)

**Qualitative Comments**

Because the scheme has the potential to increase flood risk to residential and commercial properties, and potentially have impacts on water quality, a more detailed assessment would be required, including a Flood Risk Assessment and potentially hydrological and hydraulic modelling. A WFD assessment may be needed for the minor watercourse crossings/diversions. Mitigation measures such as SuDS and potentially flood compensatory storage would be required as part of the scheme - these would need to be tested as part of the Flood Risk Assessment and Drainage Strategy.



**TAG Water Environment Impacts Worksheet - Option C - Orbital Route West of A37 (Washing Pound Lane) - Grey Route**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance				
Study area: Highway Orbital Route West of A37 - Grey Route Whitchurch, South Bristol.													
Potential Impacts:													
The route length sits within the upper reaches of the Brislington Brook catchment, a tributary of the River Avon. The entire route length is within Flood Zone 1. Aerial mapping and the RoFSW maps indicate that at least 3 Ordinary Watercourses/ditches are crossed by the route. The route is therefore within the 3.3% AEP event floodplain in a number of locations. The RoFSW flood maps indicate a number of overland flow and Ordinary Watercourse crossings across the route. Dependent on the proposals within these floodplain areas there is a potential for a loss of floodplain storage. Mitigation (such as compensatory floodplain storage areas) measures may be required to ensure that flood risk upstream and downstream is not increased; such mitigation would need to take into account the impacts of climate change. Some form of hydraulic modelling and mitigation testing will be required to assess the potential impacts on the Ordinary Watercourses.	Upper reaches of Brislington Brook watercourse (tributary of the River Avon) and floodplain	Conveyance of flood flows and floodplain storage	The Proposed scheme crosses Surface Water Flood Zones and could potentially reduce conveyance and storage	Local	At a local level the floodplain provided by the site is important in helping to reduce flooding to residential and commercial properties. For the reasons stated above the site is considered to have a high rarity.	At this stage of design assumed to not be possible for this site	High	Major Adverse	Highly Significant				
There appear to be at least three watercourse/ditch crossings along the route length, therefore new culverts or watercourse diversions are likely to be required necessary as part of the Scheme. If required these would need to ensure conveyance of flows is maintained and floodplain storage is not reduced.		Conveyance of flood flows and floodplain storage	The Proposed scheme crosses Surface Water Flood Zones and could potentially reduce conveyance and storage							At this stage of design assumed to not be possible for this site	High	Moderate Adverse	Significant
Increased runoff resulting from increase in impermeable area from the new highway, the increase in runoff is likely to be greater than for Option 1 owing to the longer route length. Mitigation will be required to ensure runoff rates are not increased as a result of the scheme, SuDS should be used where appropriate. A Drainage Strategy would be required if this site is taken forward.		Surface water runoff	The Brislington Brook is a tributary of the River Avon, which is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.							At this stage of design assumed to not be possible for this site	High	Major Adverse	Significant
Discharge of pollutants from road runoff; potential impacts on water quality of the watercourse, with implications on Water Framework Directive status. There appears to be at least three watercourses/ditches along the route length, therefore new culverts or watercourse diversions are likely to be required, and thus a WFD assessment may be needed. SuDS should be used to ensure pollutants are managed on site, both during construction and operation. A Drainage Strategy would be required if this site is taken forward.		Water quality / WFD	The Brislington Brook is a tributary of the River Avon is used for recreational fish and boat navigation. The River Avon is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.							At this stage of design assumed to not be possible for this site	High	Moderate Adverse	Significant

**Reference Sources**

<https://flood-map-for-planning.service.gov.uk/>  
<http://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/9>  
 Bing Maps  
 Google Maps

**Summary Assessment Score**

The scheme is considered to have a Highly Significant adverse impact on the water environment (excluding mitigation)

**Qualitative Comments**

Because the scheme has the potential to increase flood risk to residential and commercial properties, and potentially have impacts on water quality, a more detailed assessment would be required, including a Flood Risk Assessment and potentially hydrological and hydraulic modelling. A WFD assessment is likely to be required given the requirement for watercourse crossings/diversions. Mitigation measures such as SuDS and potentially flood compensatory storage would be required as part of the scheme - these would need to be tested as part of the Flood Risk Assessment and Drainage Strategy.

**TAG Water Environment Impacts Worksheet - Option D - Orbital Route West of A37 (Half Acre Lane) - Orange Route**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance				
Study area: Highway Orbital Route Wst of A37 - Orange Route Whitchurch, South Bristol													
Potential Impacts:													
The route length sits within the upper reaches of the Brislington Brook catchment, a tributary of the River Avon. The entire route length is within Flood Zone 1. Aerial mapping and the RoFSW maps indicate that at least 3 Ordinary Watercourses/ditches are crossed by the route. The route is therefore within the 3.3% AEP event floodplain in a number of locations. The RoFSW flood maps indicate a number of overland flow and Ordinary Watercourse crossings across the route. Dependent on the proposals within these floodplain areas there is a potential for a loss of floodplain storage. Mitigation (such as compensatory floodplain storage areas) measures may be required to ensure that flood risk upstream and downstream is not increased; such mitigation would need to take into account the impacts of climate change. Some form of hydraulic modelling and mitigation testing will be required to assess the potential impacts on the Ordinary Watercourses.	Upper reaches of Brislington Brook watercourse (tributary of the River Avon) and floodplain	Conveyance of flood flows and floodplain storage	The Proposed scheme crosses Surface Water Flood Zones and could potentially reduce conveyance and storage	Local	At a local level the floodplain provided by the site is important in helping to reduce flooding to residential and commercial properties. For the reasons stated above the site is considered to have a high rarity.	At this stage of design assumed to not be possible for this site	High	Major Adverse	Highly Significant				
There appear to be at least three watercourse/ditch crossings along the route length, therefore new culverts or watercourse diversions are likely to be required necessary as part of the Scheme. If required these would need to ensure conveyance of flows is maintained and floodplain storage is not reduced.		Conveyance of flood flows and floodplain storage	The Proposed scheme crosses Surface Water Flood Zones and could potentially reduce conveyance and storage							At this stage of design assumed to not be possible for this site	High	Moderate Adverse	Significant
Increased runoff resulting from increase in impermeable area from the new highway. Mitigation will be required to ensure runoff rates are not increased as a result of the scheme. SuDS should be used where appropriate. A Drainage Strategy would be required if this site is taken forward.		Surface water runoff	The Brislington Brook is a tributary of the River Avon, which is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.							At this stage of design assumed to not be possible for this site	High	Major Adverse	Significant
Discharge of pollutants from road runoff; potential impacts on water quality of the watercourse, with implications on Water Framework Directive status. There appears to be at least three watercourses/ditches along the route length, therefore new culverts or watercourse diversions are likely to be required, and thus a WFD assessment may be needed. SuDS should be used to ensure pollutants are managed on site, both during construction and operation. A Drainage Strategy would be required if this site is taken forward.		Water quality / WFD	The Brislington Brook is a tributary of the River Avon is used for recreational fish and boat navigation. The River Avon is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.							At this stage of design assumed to not be possible for this site	High	Moderate Adverse	Significant

**Reference Sources**

<https://flood-map-for-planning.service.gov.uk/>  
<http://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/9>  
 Bing Maps  
 Google Maps

**Summary Assessment Score**

The scheme is considered to have a Highly Significant adverse impact on the water environment (excluding mitigation)

**Qualitative Comments**

Because the scheme has the potential to increase flood risk to residential and commercial properties, and potentially have impacts on water quality, a more detailed assessment would be required, including a Flood Risk Assessment and potentially hydrological and hydraulic modelling. A WFD assessment is likely to be required given the requirement for watercourse crossings/diversions. Mitigation measures such as SuDS and potentially flood compensatory storage would be required as part of the scheme - these would need to be tested as part of the Flood Risk Assessment and Drainage Strategy.

**TAG Water Environment Impacts Worksheet - Option E - Hicks Gate Junction Improvements - Brown Route**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance				
Study area: Hicks Gate Junction Improvement - Brown Route													
Potential Impacts:													
A small proportion of the embankment works on the north-west side of the existing roundabout falls within Flood Zone 2 and 3, and the scheme crosses the Scotland Bottom watercourse (extension of an existing crossing). The majority of the site however is in Flood Zone 1. The RoFSW flood maps indicate limited overland flow routes across the site. The proposals within these floodplain areas will lead to a potential loss of floodplain storage. Mitigation (such as compensatory floodplain storage areas) may be required to ensure that flood risk upstream and downstream is not increased; such mitigation would need to take into account the impacts of climate change. Works are located in Flood Zone 2 and 3 and require an extension of an existing culvert, thus hydrological and hydraulic modelling and mitigation testing will be required. Other nearby watercourses include the Brislington Brook (2.6km North), the River Avon (4km North East) and the River Chew (approximately 3.1km South).	Scotland Bottom watercourse (tributary of the River Avon) and floodplain	Conveyance of flood flows and floodplain storage	The Proposed scheme crosses Flood Zones 2 and 3, and surface water floodplains, and could potentially reduce conveyance and storage	Local	At a local level the floodplain provided by the site is important in helping to reduce flooding to residential and commercial properties. For the reasons stated above the site is considered to have a high rarity.	At this stage of design assumed to not be possible for this site	High	Major Adverse	Highly Significant				
The Scotland Bottom watercourse is crossed by the scheme and will therefore require a culvert extension or watercourse diversion. This would need to ensure conveyance of flows is maintained and floodplain storage is not reduced.		Conveyance of flood flows and floodplain storage	The Proposed scheme crosses Flood Zones 2 and 3, and surface water floodplains, and could potentially reduce conveyance and storage							At this stage of design assumed to not be possible for this site	High	Major Adverse	Highly Significant
Increased runoff resulting from increase in impermeable area from the new road embankment. Mitigation will be required to ensure runoff rates are not increased as a result of the scheme. SuDS should be used where appropriate. A Drainage Strategy would be required if this site is taken forward.		Surface water runoff	The River Avon is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.							At this stage of design assumed to not be possible for this site	High	Moderate Adverse	Significant
Discharge of pollutants from road runoff; potential impacts on water quality of the watercourse, with potential implications on Water Framework Directive status. There is a watercourse crossing required, therefore a culvert extension or watercourse diversion is likely to be necessary. A WFD assessment is likely to be needed. SuDS should be used to ensure pollutants are managed on site, both during construction and operation. A Drainage Strategy would be required if this site is taken forward.		Water quality / WFD	The River Avon is used for recreational fish and boat navigation. The River Avon is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.							At this stage of design assumed to not be possible for this site	High	Moderate Adverse	Significant

**Reference Sources**

<https://flood-map-for-planning.service.gov.uk/>  
<http://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/9>  
 Bing Maps  
 Google Maps

**Summary Assessment Score**

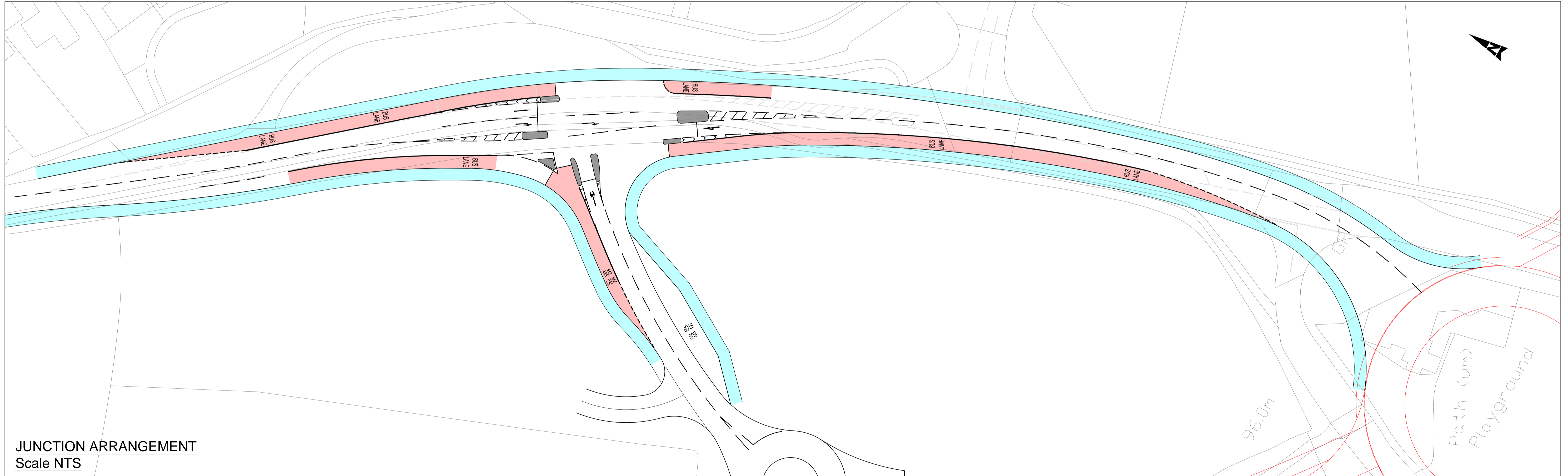
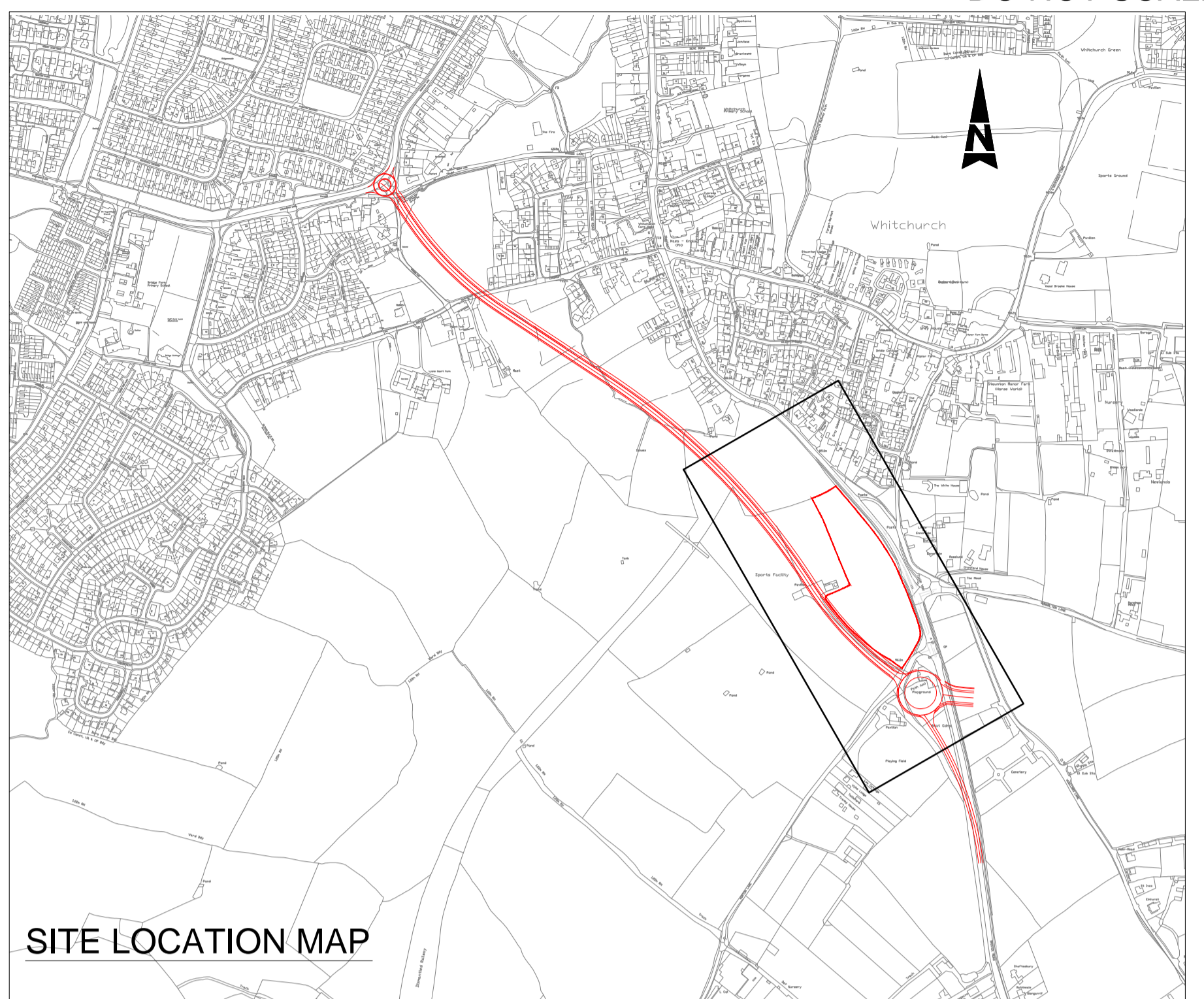
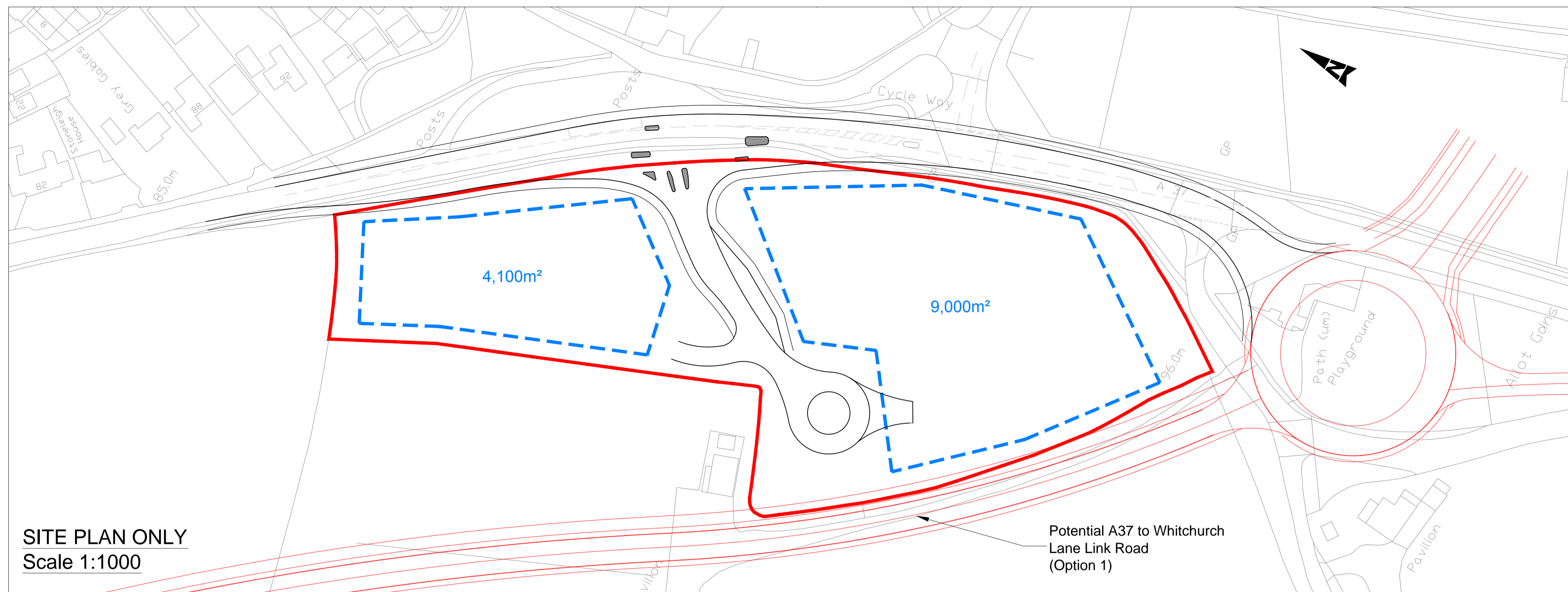
The scheme is considered to have a Highly Significant adverse impact on the water environment (excluding mitigation)

**Qualitative Comments**

Because the scheme has the potential to increase flood risk to residential and commercial properties, and potentially have impacts on water quality, a more detailed assessment would be required, including a WFD and a Flood Risk Assessment, and hydrological and hydraulic modelling. Mitigation measures such as SuDS and potentially flood compensatory storage would be required as part of the scheme - these would need to be tested as part of the Flood Risk Assessment and Drainage Strategy. The extended watercourse crossing needs to ensure that conveyance of flows is maintained and floodplain storage is not reduced.

## Appendix 7.1 Whitchurch P&R concept plans

0 10 100  
millimetres



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Key:

	Full Height Kerbline		Footway
	Hybrid/Light Segregation		Shared Use Path (Unsegregated)
	Mandatory Cycle Lane		Cycle Lane Hatching (Only Shown at Potential Conflict Points)
	Advisory Cycle Lane		Raised Side Road Entry Treatment
	On-Street Parking		Site Boundary
	Bus Lane		Approximate area required for 500 spaces
			Indicative Signal Location

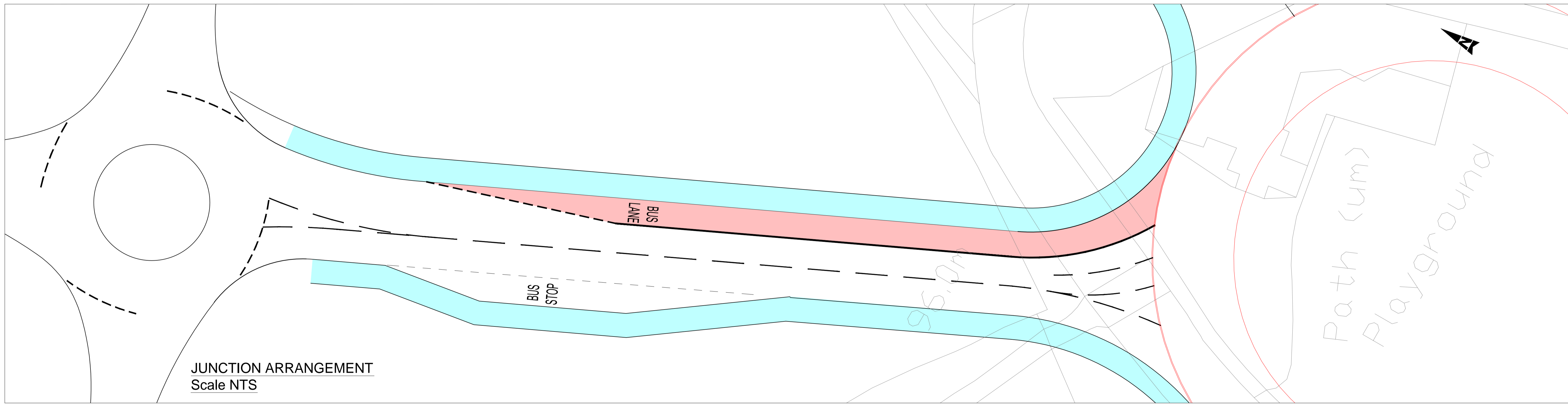
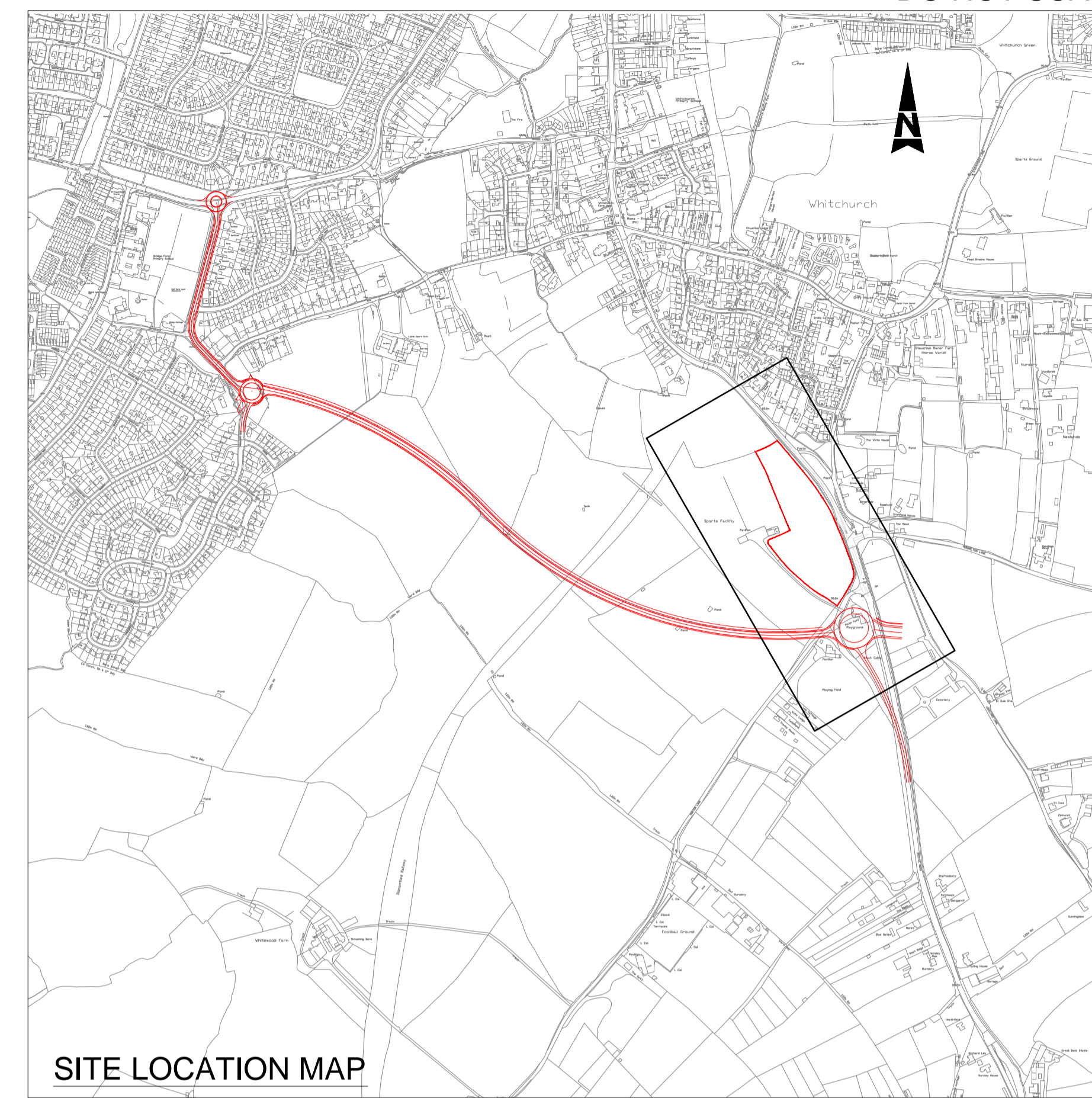
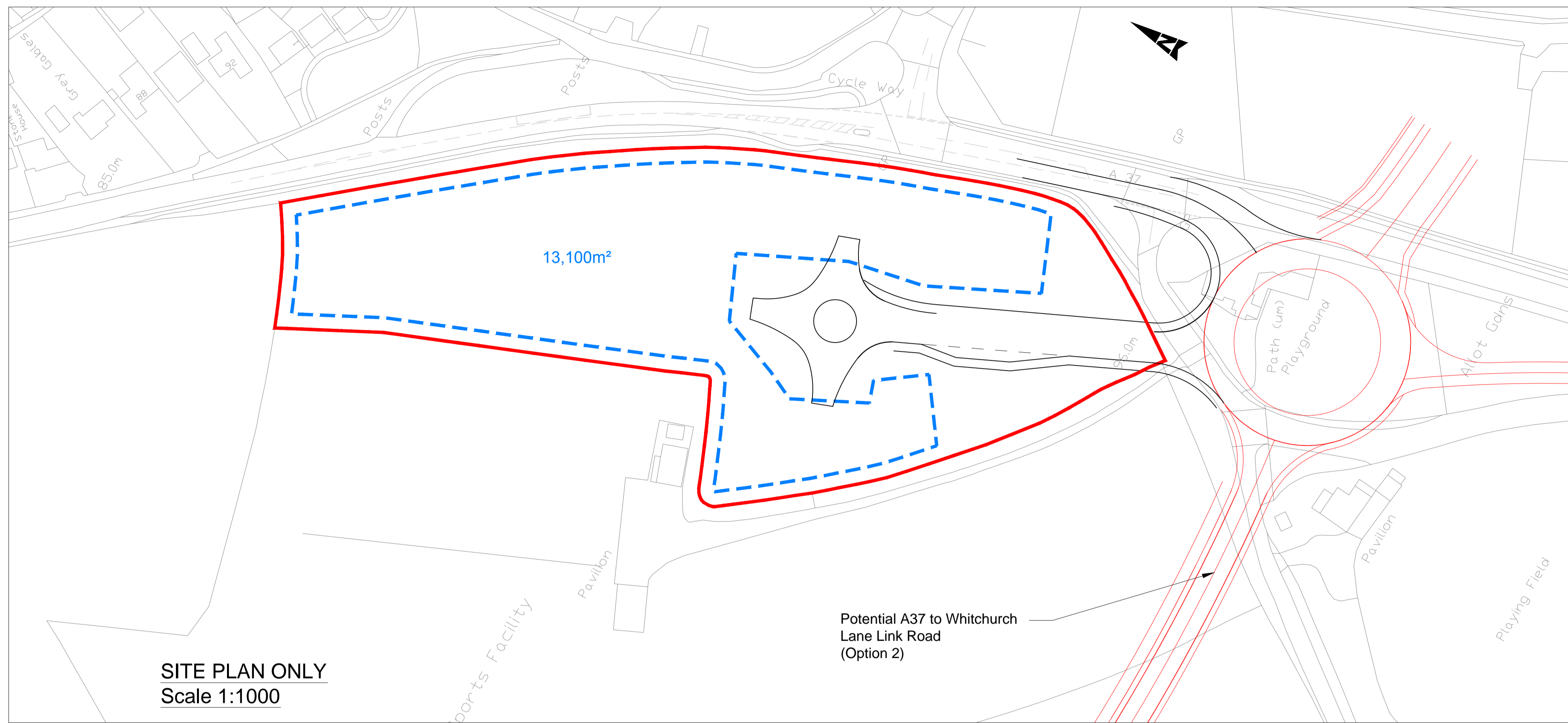
- Notes
- All dimensions shown in millimetres based on OS mapping only.
  - Proposals subject to confirmation of actual available widths from topographical survey and detail design.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION NONE			
MAINTENANCE/CLEANING NONE			
DECOMMISSIONING/DEMOLITION NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			

Rev.	Date	Description	By	CHK'd	App'd
P1.1	07.02.18	DRAWING CREATED		AE	PDE
				CRC	

Drawing Status <b>FOR INFORMATION</b>		Suitability <b>S2</b>		Project Title <b>WEST OF ENGLAND WP1</b>			
		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Drawing Title <b>A37 PROPOSED CONCEPT LAYOUT PARK &amp; RIDE: SITE 4 OPTION 1</b>			
Copyright © Atkins Limited (2014)		Scale 1:1000	Designed PDE Date 16/02/18	Drawn AE Date 16/02/18	Checked PDE Date 16/02/18	Authorised Date	
Client <b>WEST OF ENGLAND</b>		Drawing Number HA PIN <b>Woe</b>	Originator <b>ATK</b>	Volume <b>HGN</b>	Project Ref. No. <b>5161507</b>	Revision <b>WP1 P&amp;R - DR - D - 0004</b> P1.1	

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millimetres



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Key:

	Full Height Kerbline		Footway
	Hybrid/Light Segregation		Shared Use Path (Unsegregated)
	Mandatory Cycle Lane		Cycle Lane Hatching (Only Shown at Potential Conflict Points)
	Advisory Cycle Lane		Raised Side Road Entry Treatment
	On-Street Parking		Site Boundary
	Bus Lane		Approximate area required for 500 spaces
			Indicative Signal Location

- Notes
- All dimensions shown in millimetres based on OS mapping only.
  - Proposals subject to confirmation of actual available widths from topographical survey and detail design.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:			
CONSTRUCTION NONE			
MAINTENANCE/CLEANING NONE			
DECOMMISSIONING/DEMOLITION NONE			
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement			

Rev.	Date	Description	By	CHK'd	App'd
P1.1	07.02.18	DRAWING CREATED		AE	PDE

Drawing Status: **FOR INFORMATION**

**ATKINS**

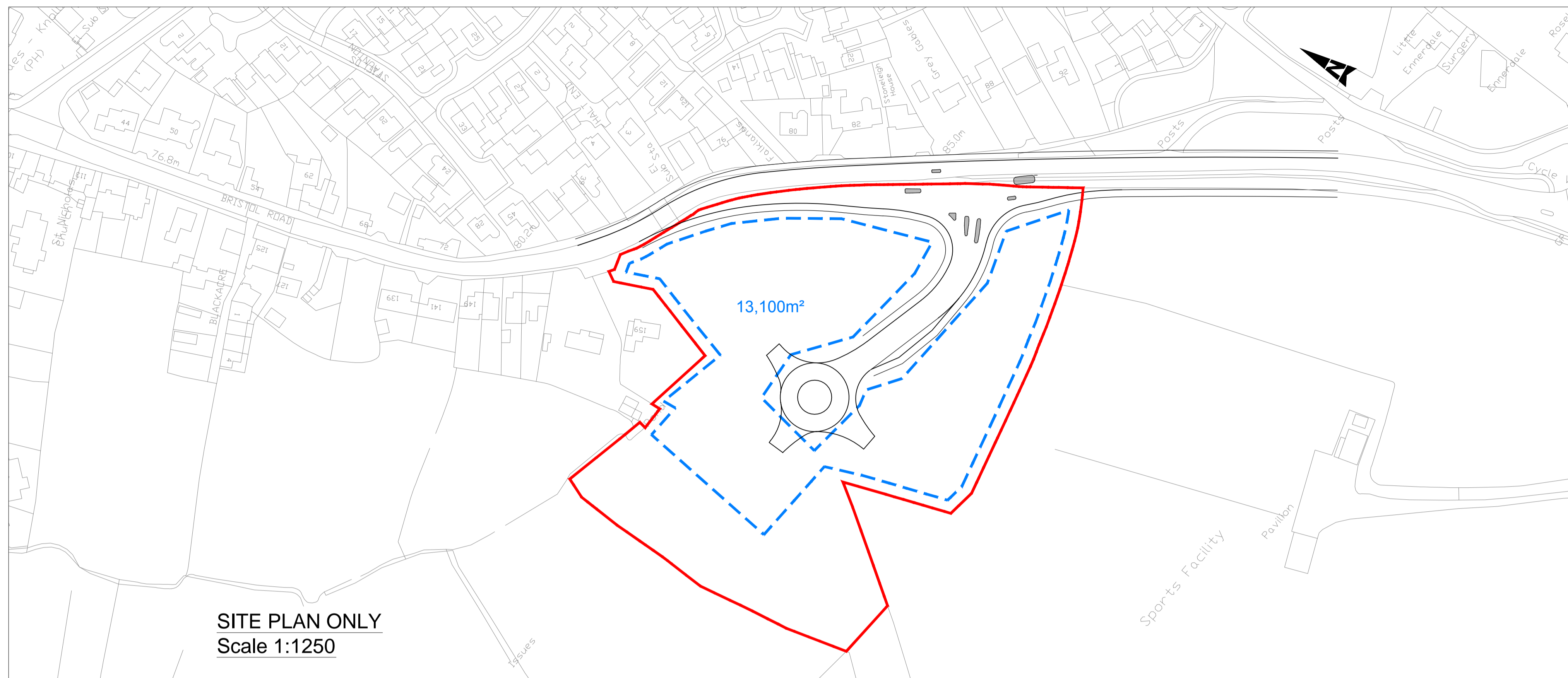
The Hub  
500 Park Avenue  
Aztec West  
Almondsbury  
Bristol  
BS32 4RZ  
Tel: +44 (0)1454 662000  
Fax: +44 (0)1372 663333  
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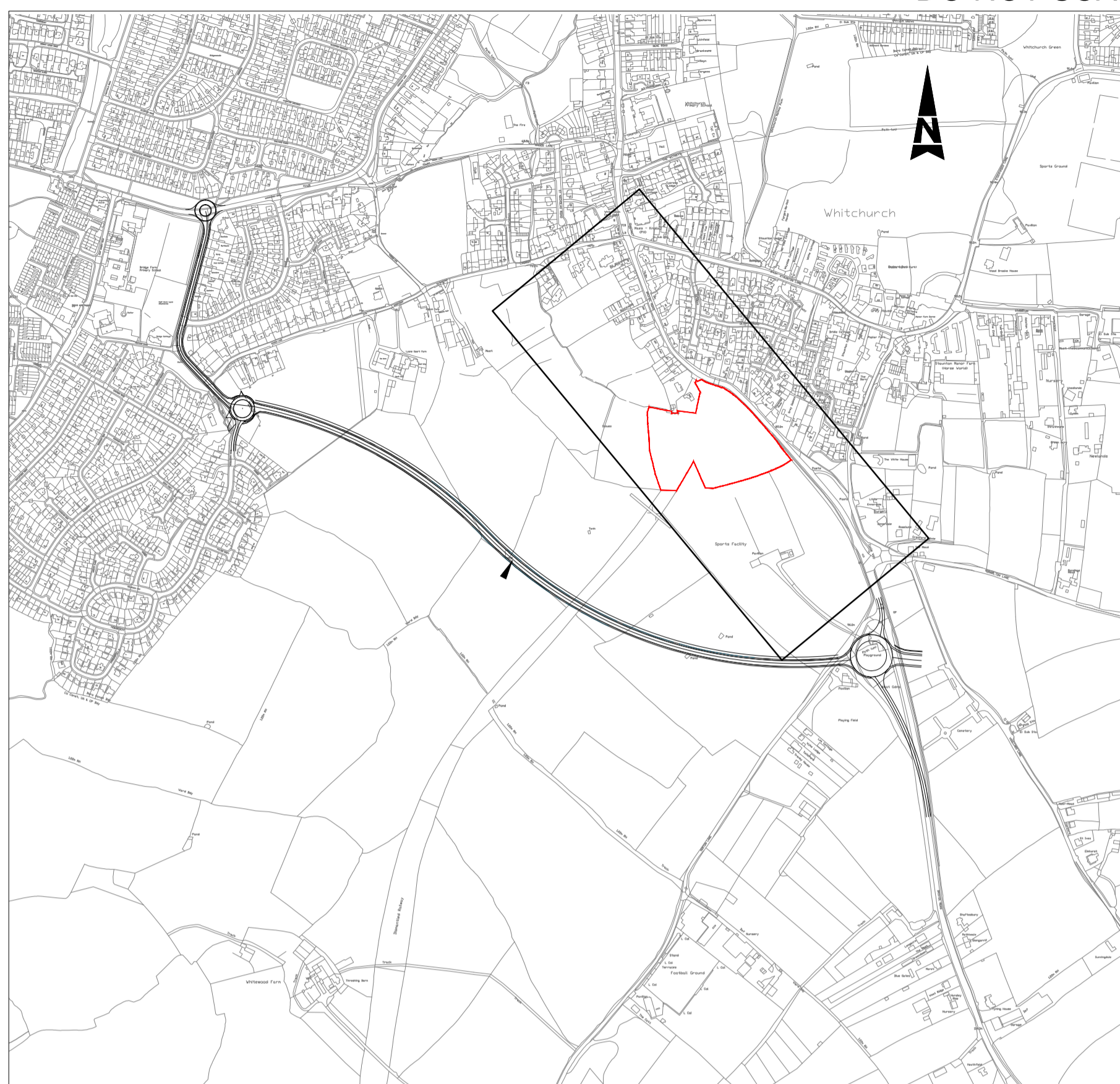
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1:1000	PDE	AE	PDE		
Original Size	Date	Date	Date	Date	
A1	16/02/18	16/02/18	16/02/18		
Drawing Number	Originator	Volume	Project Ref. No.		
HA PIN	Woe	ATK	HGN	5161507	
	WP1 P&R	- DR - D -	0005	Revision	
Location	Type	Role	Number	P1.1	

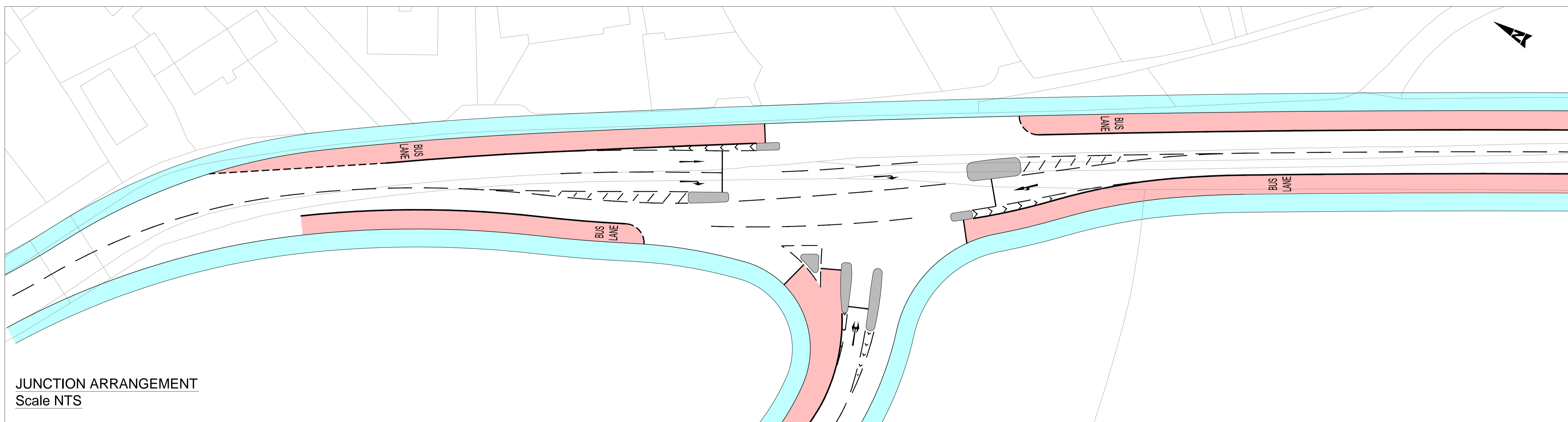
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millimetres



**SITE PLAN ONLY**  
Scale 1:1250



**SITE LOCATION MAP**



**JUNCTION ARRANGEMENT**  
Scale NTS

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Key:	
	Full Height Kerbline
	Hybrid/Light Segregation
	Mandatory Cycle Lane
	Advisory Cycle Lane
	On-Street Parking
	Bus Lane
	Footway
	Shared Use Path (Unsegregated)
	Cycle Lane Hatching (Only Shown at Potential Conflict Points)
	Raised Side Road Entry Treatment
	Site Boundary
	Approximate area required for 500 spaces
	Indicative Signal Location

- Notes
- All dimensions shown in millimetres based on OS mapping only.
  - Proposals subject to confirmation of actual available widths from topographical survey and detail design.

**SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION**

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

**CONSTRUCTION**  
NONE

**MAINTENANCE/CLEANING**  
NONE

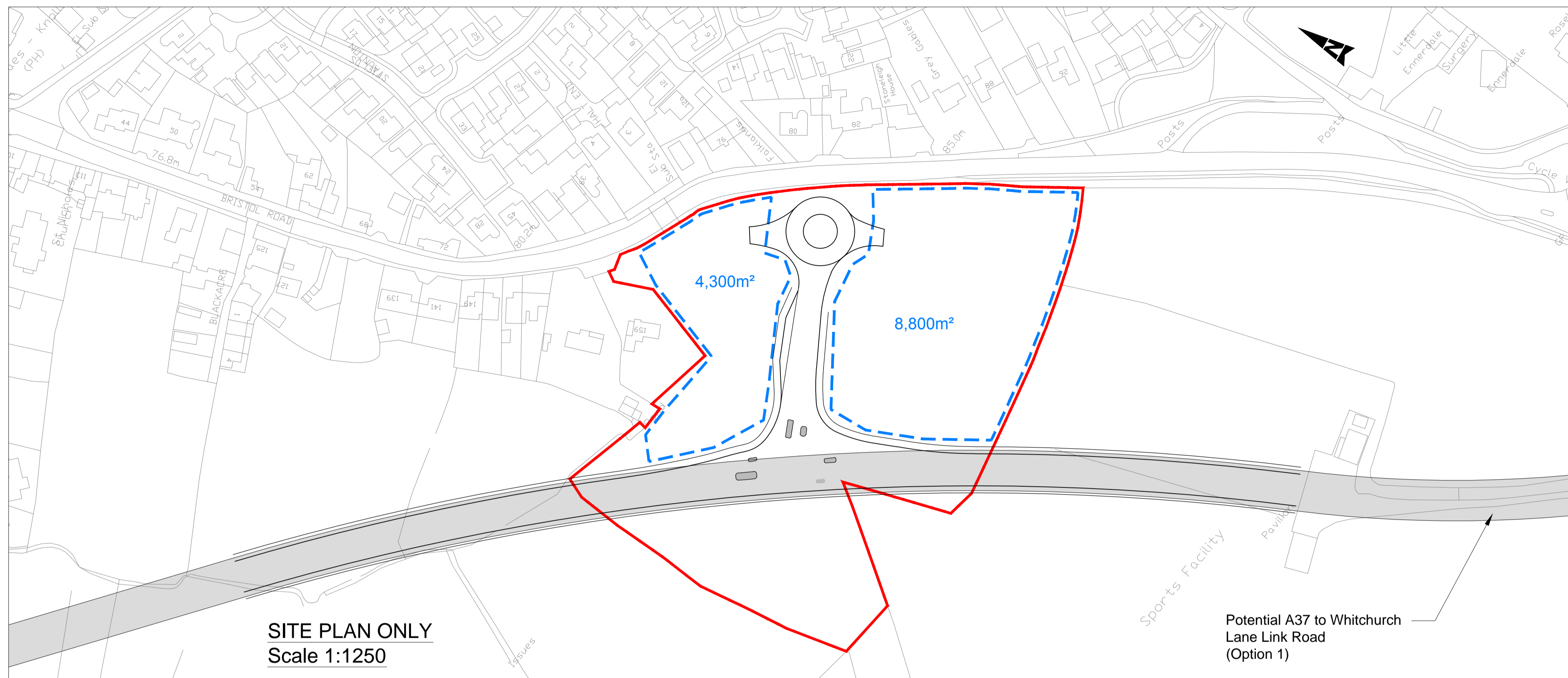
**DECOMMISSIONING/DEMOLITION**  
NONE

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

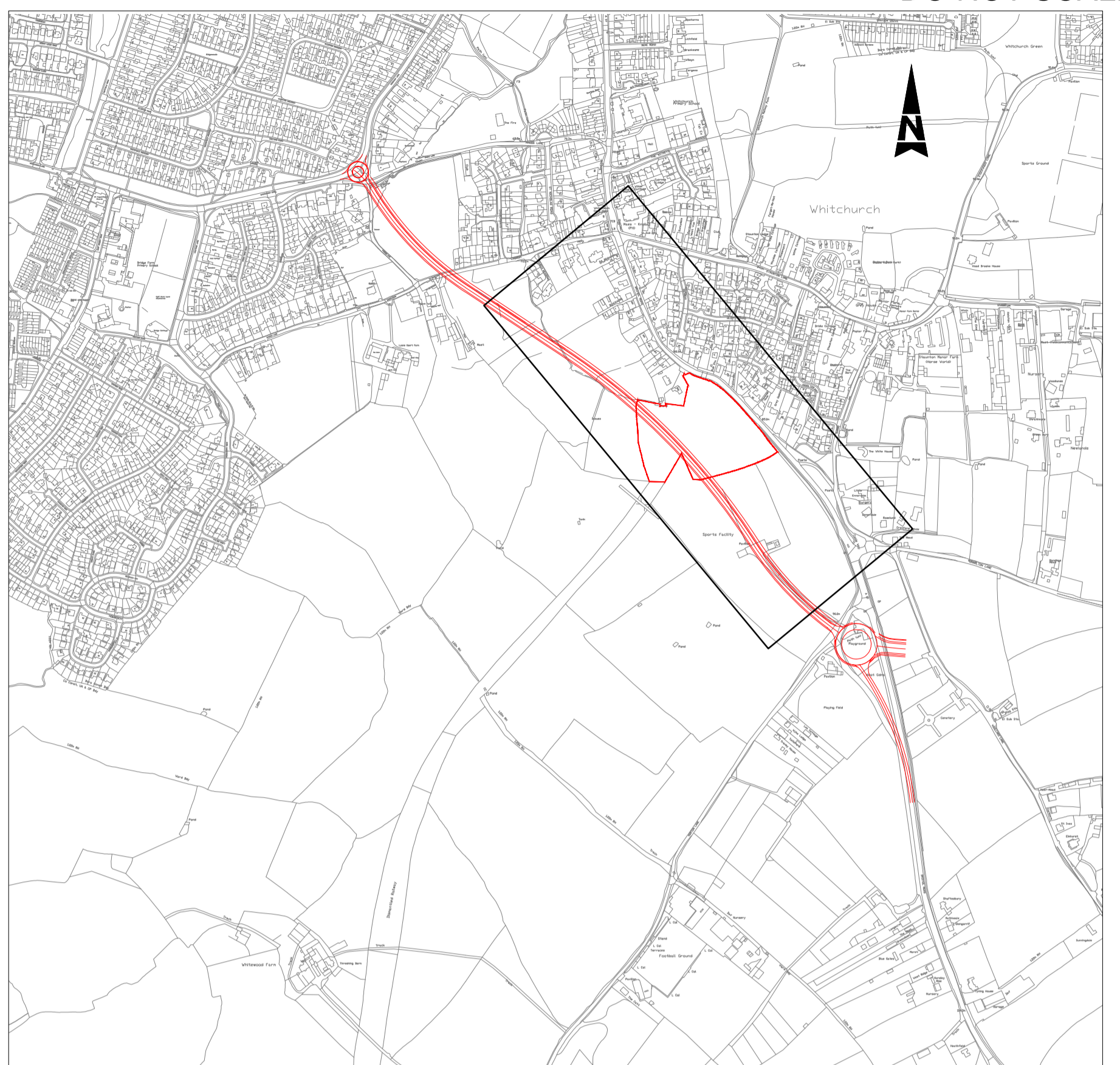
Rev.	Date	Description	By	CHK'd	App'd	
P1.1	07.02.18	DRAWING CREATED		AE	PDE	CRC

Drawing Status <b>FOR INFORMATION</b>		Suitability <b>S2</b>		Project Title <b>WEST OF ENGLAND WP1</b>	
		The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com		Drawing Title <b>A37 PROPOSED CONCEPT LAYOUT PARK &amp; RIDE: SITE 5 OPTION 1</b>	
Copyright © Atkins Limited (2014)		Scale 1:1000	Designed PDE Date 16/02/18	Drawn AE Date 16/02/18	Checked PDE Date 16/02/18
Client <b>WEST OF ENGLAND</b>		Original Size A1	Date 16/02/18	Date 16/02/18	Date 16/02/18
Drawing Number HA PIN <b>WoE - ATK - HGN - WP1 P&amp;R - DR - D - 0006</b>		Originator Date 16/02/18	Volume Date 16/02/18	Project Ref. No. 5161507	Revision P1.1

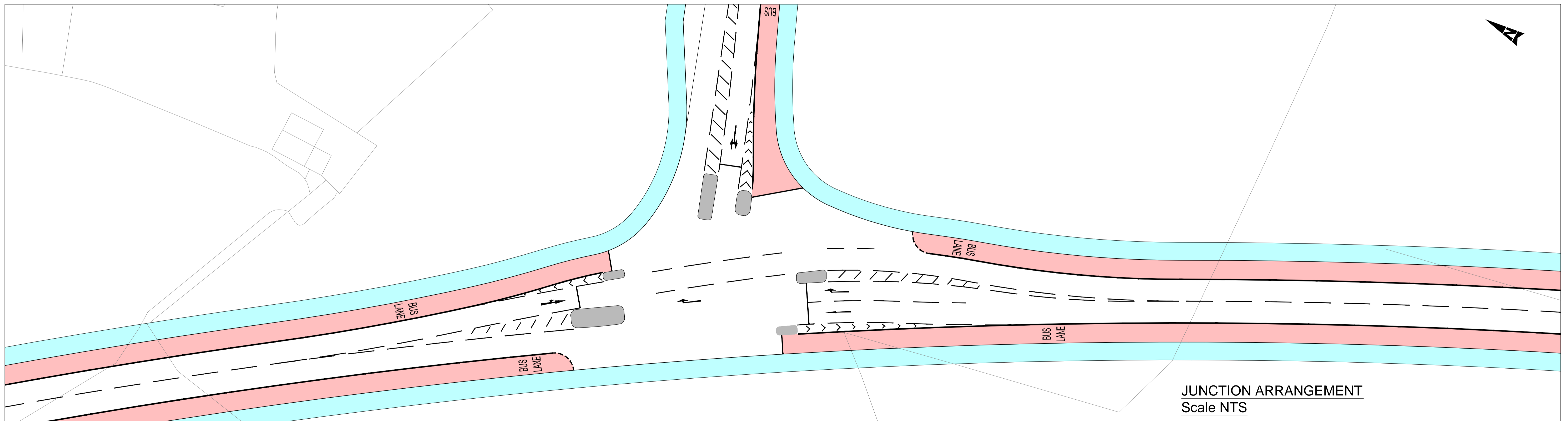
0 10 100  
mm



SITE PLAN ONLY  
Scale 1:1250



SITE LOCATION MAP



JUNCTION ARRANGEMENT  
Scale NTS

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Key:	
	Full Height Kerbline
	Hybrid/Light Segregation
	Mandatory Cycle Lane
	Advisory Cycle Lane
	On-Street Parking
	Bus Lane
	Footway
	Shared Use Path (Unsegregated)
	Cycle Lane Hatching (Only Shown at Potential Conflict Points)
	Raised Side Road Entry Treatment
	Site Boundary
	Approximate area required for 500 spaces
	Indicative Signal Location

- Notes
- All dimensions shown in millimetres based on OS mapping only.
  - Proposals subject to confirmation of actual available widths from topographical survey and detail design.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION				
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:				
CONSTRUCTION NONE				
MAINTENANCE/CLEANING NONE				
DECOMMISSIONING/DEMOLITION NONE				
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement				

Rev.	Date	Description	By	CHK'd	App'd
P1.1	07.02.18	DRAWING CREATED			

Drawing Status <b>FOR INFORMATION</b> 	Suitability <b>S2</b>	Project Title <b>WEST OF ENGLAND WP1</b>			
		Drawing Title <b>A37 PROPOSED CONCEPT LAYOUT PARK &amp; RIDE: SITE 5 OPTION 2</b>			
The Hub 500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ Tel: +44 (0)1454 662000 Fax: +44 (0)1372 663333 www.atkinsglobal.com	Scale 1:1000	Designed PDE Date 16/02/18	Drawn AE Date 16/02/18	Checked PDE Date 16/02/18	Authorised Date
	Client <b>WEST OF ENGLAND</b>		Drawing Number HA PIN <b>WoE - ATK - HGN - WP1 P&amp;R - DR - D - 0007</b>	Project Ref. No. <b>5161507</b>	Revision <b>P1.1</b>



## **Appendix 7.2 Environmental Assessment worksheets: A37 schemes**

**Contents**

This workbook provides WebTAG worksheets, and proformas consistent with WebTAG principles for the following scheme options:

Enhanced bus service on the A37	Option J. No assessments undertaken as scheme involves no infrastructure change.
Whitchurch P&R	Site 4 (Option K1)
Whitchurch P&R	Site 5 (Option K2)

Scheme option worksheets are grouped by environmental impact:

Section 1	Noise (NO)
Section 2	Air Quality (AQ)
Section 3	Landscape (LA)
Section 4	Townscape (TO)
Section 5	Historic Environment (HE)
Section 6	Biodiversity (BI)
Section 7	Water Environment (WE)

**NOISE ASSESSMENT - Option K1&2 - Whitchurch P&R**

Option	<ul style="list-style-type: none"> <li>• How many households will be affected by the scheme?</li> <li>• Could the scheme lead to a change in traffic flow &gt;25% or change in average speeds &gt;10kph?</li> </ul>	Assessment
Option K1 (Site 4)	<p>There are no noise important areas within 200m of the proposed park and ride, although there are 10 noise important areas located on roads anticipated to experience a decrease in road traffic flow volume due to modal shifts induced by the scheme.</p> <p>There ~76 noise sensitive receptors within 200m of the proposed site, and could be exposed to an increase in noise directly from the scheme. Additionally, noise from the park and ride itself would likely be sufficiently different in nature to be notable at the very nearest NSRs.</p> <p>There are just over 23800 noise sensitive receptors located within 200m of roads that may be expected to experience a decrease in road traffic volume due to modal shifts induced by the scheme, including just over 1250 which are located within designated noise important areas, although it is anticipated that these changes in road traffic volume are likely to result in a negligible change in road traffic noise experienced at the majority of these noise sensitive receptors.</p>	Likely Neutral
Option K2 (Site 5)	<p>There is 1 noise important area within 200m of the proposed park and ride, and a further 9 noise important areas are located on roads anticipated to experience a decrease in road traffic flow volume due to modal shifts induced by the scheme.</p> <p>There are ~186 noise sensitive receptors within 200m of the proposed site, and could be exposed to an increase in noise directly from the scheme, including 15 which are located within designated noise important areas. Additionally, noise from the park and ride itself would likely be sufficiently different in nature to be notable at the very nearest NSRs.</p> <p>There are just over 23800 noise sensitive receptors located within 200m of roads that may be expected to experience a decrease in road traffic volume due to modal shifts induced by the scheme, including just over 1250 which are located within designated noise important areas, although it is anticipated that these changes in road traffic volume are likely to result in a negligible change in road traffic noise experienced at the majority of these noise sensitive receptors.</p>	Likely Neutral

**AIR QUALITY ASSESSMENT - Option K1&2 - Whitchurch P&R**

Option	Summary of Key Impacts	Assessment (see key)
Option K1 (Site 4)	There are no AQMAs or designated ecological sites within 200 m of the option. There are approximately 75 sensitive properties within 200 m of the site which could be affected by a deterioration in air quality arising from additional traffic emissions. The anticipated reduction of traffic on the roads within 1km of the A37 bus route which would serve the P&R could positively affect up to 23,800 sensitive properties. Overall, there may be neutral impact on NO2 and PM10 depending on the magnitude of changes in traffic flow.	5
Option K2 (Site 5)	No AQMAs or designated ecological sites within 200 m of the option. There are approximately 185 sensitive properties within 200 m which could be affected which could be affected by a deterioration in air quality arising from additional traffic emissions. The anticipated reduction of traffic induced on the roads within 1km of the A37 bus route which would serve the P&R could positively affect up to 23,800 sensitive properties. Overall, there may be neutral impact on NO2 and PM10 depending on the magnitude of changes in traffic flow.	4

1	PCM links and/or AQMA/designated sites with increases and overall likely negative outcome
2	PCM links and/or AQMA/designated sites with increases and overall likely neutral outcome OR overall likely negative outcome
3	PCM links and/or AQMA/designated sites or > 100 properties with deterioration but overall likely neutral/ positive outcome
4	No PCM, AQMA or designated sites with increases, >100 properties with deterioration but overall likely neutral/beneficial outcome
5	No PCM, AQMA or designated sites or <100 properties with increases, and overall likely neutral/beneficial outcome

**TAG Landscape Impacts Worksheet - Option K1 - Whitchurch P&R (Site 4)**

Features	Step 2		Step 3			Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	A rolling open landscape with medium scale irregular shaped pastoral fields, bounded by hedgerows & trees. Low ridge to the S & E forms the backbone to the landscape with slopes down to the Avon Valley and Stockwood Vale.	Local - features are valued at the local level.	Pattern of landscape common at a local level.	Medium at the local level - the pattern of the landscape is commonplace but also a key component of the character of this landscape type.	Opportunity for substitution, with consideration of design & allowance of mitigation for any loss of features and disturbance of pattern.	The proposed P&R scheme, W of A37 & S of Whitchurch, would involve utilisation of pastoral land adjacent to the Bristol Barbarians Rugby Club to the S. The scheme would slightly alter the local pattern of the landscape and landform within the adjacent vicinity. Judged on the scale of the impacts through minor modification of field pattern, the impacts would be considered to be neutral-slight adverse.
Tranquillity	Due to the proximity to urban settlements and the presence of the A37 bisecting through Whitchurch & Stockwood, the tranquillity is relatively low within this landscape. Away from these settlements, the wider rural landscape is more tranquil, despite being near urban centres. Users of recreational routes (PROWs, Three Peaks Walk Trail & National Cycle Route 3) experience limited tranquillity in the vicinity of these transport corridors and urban areas, however the sense of tranquillity & isolation increases away from these areas further S.	Local - tranquillity is valued at the local level.	Rare at a local level due to busy transport corridors & urban centres.	High at the local level - valued due to the diminishing rural landscape away from urban centres & busy transport corridors.	Limited opportunity for substitution, but consideration of design & mitigation features could aid perception of greater tranquillity.	The proposed scheme is located in an area which has mixed levels of tranquillity. Low levels of tranquillity would be evident mainly to road users & features on the edge of large settlements such as Stockwood & Whitchurch, including the Rugby Club, Cricket Club. Users of the PROWs & Trails which pass close to the urban areas & A37. PROWs & isolated properties within the rural context experience higher levels of tranquillity therefore would experience increased adverse impacts as a result of the scheme. The impact on tranquillity is judged to be slight adverse.
Cultural	The main settlements of Stockwood & Whitchurch to the N & W respectively, dominate the area, with more isolated farms & clusters of dwellings interspersed between them. HorseWorld is within the study area on the edge of Whitchurch/Stockwood. There are designated historical features within 1km, including 1 SM (Maes Knoll Camp) located 1km SW of the scheme. Local, regional & national recreational routes are also in the area, with 3 PROWs passing within 500m of the scheme & National Cycle Route 3 passing adjacent to the E of the scheme along the A37 then Sleep Lane & Three Peaks Walk 1km SW. Other recreational facilities such as Whitchurch Cricket Club & Whitehall Garden Centre are within 500m & Bristol Barbarians Rugby Club adjoining the southern edge of the scheme.	Settlements & transport corridors valued at regional level. SM valued at national level. Recreational routes valued at regional & local level.	Modern settlements & transport corridors not rare at all levels. SM rare at local & national level. Regional recreational routes not rare at local or regional level. PROWs common at all levels.	Medium importance of settlements & designated features at all levels. Medium importance of recreational routes.	SM not substitutable. Limited opportunity for substitution of features associated with modern settlements & recreational routes.	Due to the relatively localised extent of the scheme, impacts on cultural features will be limited. Main settlements, isolated properties, farmsteads and associated recreational facilities are within 1km of the scheme, some of which directly adjacent, particularly the Rugby Club in which the scheme adjoins & properties along A37 will experience visual impact. Recreational routes within 500m may experience some minor degradation in visual quality. There is some visual connectivity with other cultural features such as Maes Knoll Camp SM & impacts on its setting are likely to be minor due to the proximity to the scheme. The impact on cultural features is judged to be neutral-slight adverse.
Landcover	Outside the urban areas, landcover comprises medium scale, irregular shaped fields of mainly pastoral farmland. Fields are bounded by clipped or overgrown hedgerows. The LCA is largely unwooded with some tree belts to field boundaries.	Local - landcover is valued at the local level.	Pastoral fields, hedgerows, woodland & linear tree belts common at all levels.	Features & elements such as fields, trees & hedgerows, of medium - high importance within the local landscape.	Opportunity for substitution with incorporation of mitigation planting.	The proposed scheme would result in a loss of pastoral agricultural land, including loss of trees & hedgerows. When judged on the scale of the scheme and quantity of features affected, the impact on landcover is judged to be slight adverse.
Summary of character	Landscape in this area is designated as Greenbelt by Bristol City Council, BANES Council & South Gloucestershire Council. A medium scale landscape influenced by busy transport corridors, adjacent urban areas & outlying farms & small settlements. The rural character is of medium scale, with mainly pastoral fields bounded by hedgerows and trees of varying quality. Trees & hedges provide screening to settlements & transport routes which help to contain the urban edge influence, allowing tranquil pockets to remain in the rural areas separating the settlements.	Some features valued at national level. Landscape elements valued at mainly local level.	Some features, e.g. designated sites, are rare at national, regional & local level. Many landscape features are commonplace at all levels.	Designated sites are of high importance at national, regional & local level. Many landscape elements are of medium importance at the local level.	Designated sites are not substitutable at any level. Some opportunity for substitution of features associated with modern settlements & recreational routes. Some opportunity for substitution of landscape elements, e.g. trees, linear woodland & grassland, & re-creation of appropriate landforms.	The proposals are medium in scale with minor alteration to pattern of landscape & loss of landscape elements (hedgerows, trees). No impacts are anticipated on any designated sites. Minor impacts anticipated on regionally designated Greenbelt. Initial mitigation would consist of careful design of landscape elements, e.g. trees, & siting of new features. Mitigation planting for screening & recreating severed or lost linear elements, would not have appreciable benefits for up to 15 years. Overall, anticipated impacts would be limited, however the scheme would be seen in context with the existing road network & other urban influences in close proximity to the scheme. The impacts of the scheme on completion are judged to be slight adverse. With mitigation planting after 15 years impacts judged to be neutral-slight adverse.

**Reference Sources**

BANES Landscape Character Assessment  
 South Gloucestershire Landscape Character Assessment (2014)  
 Natural England  
 Ordnance Survey Mapping  
 Aerial Mapping  
 Magic - Geographical mapping  
[Satellite](#)

**Step 5 - Summary Assessment Score**

Slight adverse on completion  
 Neutral-slight adverse 15 years after completion.

**Qualitative Comments**

A 2km offset from the scheme boundary has been prescribed for the study area within this local character area of which baseline assessment only has been conducted due to the early stages of this design & optioneering stage. It is considered that significant effects are unlikely beyond this. The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the landscape.

**TAG Landscape Impacts Worksheet - Option K2 - Whitchurch P&R (Site 5)**

Features	Step 2	Step 3			Step 4	
	Description	Scale it matters	Rarity	Importance	Substitutability	
Pattern	A rolling open landscape with medium scale irregular shaped pastoral fields, bounded by hedgerows & trees. Low ridge to the S & E forms the backbone to the landscape with slopes down to the Avon Valley and Stockwood Vale.	Local - features are valued at the local level.	Pattern of landscape common at a local level.	Medium at the local level - the pattern of the landscape is commonplace but also a key component of the character of this landscape type.	Opportunity for substitution, with consideration of design & allowance of mitigation for any loss of features and disturbance of pattern.	The proposed P&R scheme, W of A37 & S of Whitchurch, would involve utilisation of pastoral land and adjoins residential housing at the southern edge of Whitchurch. The scheme would slightly alter the local pattern of the landscape and landform within the adjacent vicinity. Judged on the scale of the impacts through minor modification of field pattern, the impacts would be considered to be neutral - slight adverse.
Tranquillity	Due to the proximity to urban settlements and the presence of the A37 bisecting through Whitchurch & Stockwood, the tranquillity is relatively low within this landscape. Away from these settlements, the wider rural landscape is more tranquil, despite being near urban centres. Users of recreational routes (PRoWs, Three Peaks Walk Trail & National Cycle Route 3) experience limited tranquillity in the vicinity of these transport corridors and urban areas, however the sense of tranquillity & isolation increases away from these areas further S.	Local - tranquillity is valued at the local level.	Rare at a local level due to busy transport corridors & urban centres.	High at the local level - valued due to the diminishing rural landscape away from urban centres & busy transport corridors.	Limited opportunity for substitution, but consideration of design & mitigation features could aid perception of greater tranquillity.	The proposed scheme is located in an area which has mixed levels of tranquillity. Low levels of tranquillity would be evident mainly to road users & features on the edge of large settlements such as Stockwood & Whitchurch, including the Rugby Club, Cricket Club. Users of the PRoWs & Trails which pass close to the urban areas & A37 - PRoWs & isolated properties within the rural context experience higher levels of tranquillity therefore would experience increased adverse impacts as a result of the scheme. The impact on tranquillity is judged to be slight adverse.
Cultural	The main settlements of Stockwood & Whitchurch to the N & W respectively, dominate the area, with more isolated farms & clusters of dwellings interspersed between them. Properties to the southern edge of Whitchurch adjoin the site to the N. HorseWorld is within the study area on the edge of Whitchurch/Stockwood. There are designated historical features within 1km, including 1 SM (Maes Knoll Camp) located 1km SW of the scheme. Local, regional & national recreational routes are also in the area, with 3 PRoW's passing within 500m of the scheme & National Cycle Route 3 passing close to the SE of the scheme along the A37 then Sleep Lane & Three Peaks Walk 1km SW. Other recreational facilities such as Whitchurch Cricket Club, Bristol Barbarians Rugby Club & Whitehall Garden Centre are within 500m of the scheme.	Settlements & transport corridors valued at regional level. SM valued at national level. Recreational routes valued at regional & local level.	Modern settlements & transport corridors not rare at all levels. SM rare at local & national level. Regional recreational routes not rare at local or regional level. PRoW's common at all levels.	Medium importance of settlements & designated features at all levels. Medium importance of recreational routes.	SM not substitutable. Limited opportunity for substitution of features associated with modern settlements & recreational routes.	Due to the relatively localised extent of the scheme, impacts on cultural features will be limited. Main settlements, isolated properties, farmsteads and associated recreational facilities are within 1km of the scheme, some of which directly adjacent, particularly properties to the southern edge of Whitchurch in which the scheme adjoins & properties along A37 will experience visual impact. Recreational routes within 500m may experience some minor degradation in visual quality. There is some visual connectivity with other cultural features such as Maes Knoll Camp SM & impacts on its setting are likely to be minor due to the proximity to the scheme. The impact on cultural features is judged to be neutral-slight adverse.
Landcover	Outside the urban areas, landcover comprises medium scale, irregular shaped fields of mainly pastoral farmland. Fields are bounded by clipped or overgrown hedgerows. The LCA is largely unwooded with some tree belts to field boundaries.	Local - landcover is valued at the local level.	Pastoral fields, hedgerows, woodland & linear tree belts common at all levels.	Features & elements such as fields, trees & hedgerows, of medium - high importance within the local landscape.	Opportunity for substitution with incorporation of mitigation planting.	The proposed scheme would result in a loss of pastoral agricultural land, including loss of trees & hedgerows. When judged on the scale of the scheme and quantity of features effected, the impact on landcover is judged to be slight adverse.
Summary of character	Landscape in this area is designated as Greenbelt by Bristol City Council, B&NES Council & South Gloucestershire Council. A medium scale landscape influenced by busy transport corridors, adjacent urban areas & outlying farms & small settlements. The rural character is of medium scale, with mainly pastoral fields bounded by hedgerows and trees of varying quality. Tree & hedges provide screening to settlements & transport routes which help to contain the urban edge influence, allowing tranquil pockets to remain in the rural areas separating the settlements.	Some features valued at national level. Landscape elements valued at mainly local level.	Some features, eg designated sites, are rare at national, regional & local level. Many landscape features are commonplace at all levels.	Designated sites are of high importance at national, regional & local level. Many landscape elements are of medium importance at the local level.	Designated sites are not substitutable at any level. Some opportunity for substitution of features associated with modern settlements & recreational routes. Some opportunity for substitution of landscape elements, eg trees, linear woodland & grassland, & recreation of appropriate landforms.	The proposals are medium in scale with alteration to pattern of landscape & loss of landscape elements (hedgerows, trees) & no impacts are anticipated on any designated sites. Minor impacts anticipated on regionally designated Greenbelt. Initial mitigation would consist of careful design & siting of new features. Mitigation planting for screening & for recreating severed or lost linear elements, would not have appreciable benefits for up to 15 years. Overall, anticipated impacts would be limited, however the scheme would be seen in context with the existing road network & other urban influences in close proximity to the scheme. The impacts of the scheme on completion are judged to be slight adverse. With mitigation planting after 15 years impacts judged to be neutral-slight adverse.

**Reference Sources**

- B&NES Landscape Character Assessment
- South Gloucestershire Landscape Character Assessment (2014)
- Natural England
- Ordnance Survey Mapping
- Aerial Mapping
- Magic - Geographical mapping
- Sustrans

**Step 5 - Summary Assessment Score**

Slight adverse on completion  
Neutral-slight adverse 15 years after completion.

**Qualitative Comments**

A 2km offset from the scheme boundary has been prescribed for the study area within this local character area of which baseline assessment only has been conducted due to the early stages of this design & optioneering stage. It is considered that significant effects are unlikely beyond this. The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the landscape.

**TAG Townscape Impacts Worksheet - Option K1 - Whitchurch P&R (Site 4)**

Features	Step 2		Step 3				Step 4
	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Impact
Layout	The townscape within the study area is characterised as being suburban located on edge of Bristol city bordering the rural context. The area is influenced by the busy A37 corridor with minor roads connecting surrounding settlements. The area is dominated by residential use with some retail, industry & commercial areas towards Hengrove. Settlements include Stockwood & Whitchurch to the N & W respectively interspersed with isolated properties & farmsteads.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to layout, e.g. introduction of new housing developments & other urban elements such as retail/industrial units.	It is not anticipated that there would be any notable impacts on the layout as a result of the scheme due to its proximity from townscape features, therefore the affect is judged to be neutral.
Density and mix	Density is of low - medium scale within a suburban & rural edge context comprising mainly residential housing linked with road networks intermixed with some retail, industry and commercial use.	Local	Common at the local level	Medium at the local level	Some opportunity for substitution	Medium potential for change e.g. in areas of regeneration, brownfield sites & urban fringe areas & alteration to mix of urban elements.	Density & mix will increase slightly with the introduction of a new visually intrusive urban element to the edge of Whitchurch.  It is anticipated that there would be visual disturbance on properties SE of Whitchurch, therefore the affect is judged to be slight adverse.
Scale	Built elements are mainly of a domestic scale, generally 1-3 storey including residential properties with some areas retail & industry use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the scale as a result of the scheme due to its proximity from townscape features, therefore the affect is judged to be neutral.
Appearance	The housing is a mixture of ages with modern, private, commercial offices & retail buildings. Some features/buildings retain historical associations which add to the local distinctiveness of the area.	Local	Common at the local level	Medium at a local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the appearance of the townscape as a result of the scheme due to its proximity from townscape features, therefore the affect is judged to be neutral.
Human interaction	The primary human interaction is focused around domestic use such as schools, shops, pubs, churches, community facilities etc. with some retail & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change as a result of land use, density & mix & layout.	It is not anticipated that there would be any notable impacts on human interaction as a result of the scheme due to its proximity from townscape features, therefore the affect is judged to be neutral.
Cultural	There is a mix of council housing & post war development with some more modern features interspersed with areas of historical interest including Listed Buildings & traditional houses within Whitchurch village N of the scheme. HorseWorld is within the study area on the edge of Whitchurch/Stockwood. There are designated historical features within 1km, including 1 SM (Maes Knoll Camp) located 1km SW of the scheme. Other recreational facilities such as Whitchurch Cricket Club & Whitehall Garden Centre are within 500m & Bristol Barbarians Rugby Club adjoining the southern edge of the scheme.	Settlements & transport corridors valued at regional level.  SM's & Listed Buildings valued at national level.	Rare at local level	Medium at local level  Medium at Regional & National level	Limited opportunity for substitution	Low potential for change due to limited opportunity for substitution.	It is anticipated that there would be visual disturbance on the setting of some cultural features to the edge of Whitchurch as a result of the introduction of a new visually intrusive urban element SE of Whitchurch, therefore the affect is judged to be neutral - slight adverse.
Land use	Land use is primarily domestic including residential & recreational with some retail, industry & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to land use.	It is not anticipated that there would be any notable impacts on land use as a result of the scheme due to its proximity from townscape features, therefore the affect is judged to be neutral.
Summary of character	The study area is characterised as a suburban townscape on the edge of Bristol transitioning to rural landscape with primarily residential settlements with some historic & cultural associations. These are connected with the busy A37 corridor & network of rural lanes linking smaller settlements & farmsteads.	Some features valued at national level.  Many townscape elements valued at local level.	Some features, e.g. designated cultural sites, are rare at national, regional & local level.  Many townscape features are commonplace at all levels.	Low to medium at local, regional & national level.	Some opportunity for substitution	Low-medium potential for change as a result of other influences.	Mitigation for this scheme would consist of careful design of layout & implementation of planting to screen the site from nearby urban elements.  It is not anticipated that there would be any notable impacts on this townscape as a result of the scheme due to its distance from urban areas. However, there may be adverse impacts on density & mix & on the settings of cultural features close to the scheme.  Impacts are judged to be neutral - slight adverse.

**Reference Sources**

B&NES Landscape Character Assessment  
 South Gloucestershire Landscape Character Assessment (2014)  
 Ordnance Survey Mapping  
 Aerial Mapping  
 Magic - Geographical mapping  
 Bristol City Council

**Step 5 - Summary Assessment Score**

Neutral - slight adverse

**Qualitative Comments**

A 1km offset from the scheme boundary has been prescribed for the study area within this townscape area of which baseline assessment only has been conducted due to the early stages of this design & optioneering stage. It is considered that significant effects are unlikely beyond this.  
 The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the townscape.

**TAG Townscape Impacts Worksheet - Option K2 - Whitchurch P&R (Site 5)**

Features	Step 2	Step 3				Step 4	
	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Impact
Layout	The townscape within the study area is characterised as being suburban located on edge of Bristol city bordering the rural context. The area is influenced by the busy A37 corridor with minor roads connecting surrounding settlements. The area is dominated by residential use with some retail, industry & commercial areas towards Hengrove. Settlements include Stockwood & Whitchurch to the N & W respectively interspersed with isolated properties & farmsteads.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to layout, e.g. introduction of new housing developments & other urban elements such as retail/industrial units.	It is not anticipated that there would be any notable impacts on the layout as a result of the scheme due to its distance from townscape features, therefore the impact is judged to be neutral.
Density and mix	Density is of low - medium scale within a suburban & rural edge context comprising mainly residential housing linked with road networks intermixed with some retail, industry and commercial use.	Local	Common at the local level	Medium at the local level	Some opportunity for substitution	Medium potential for change e.g. in areas of regeneration, brownfield sites & urban fringe areas & alteration to mix of urban elements.	Density & mix will increase slightly with the introduction of a new visually intrusive urban element to the edge of Whitchurch. It is anticipated that there would be visual disturbance on properties SE of Whitchurch, therefore the impact is judged to be slight adverse.
Scale	Built elements are mainly of a domestic scale, generally 1-3 storey including residential properties with some areas retail & industry use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the scale as a result of the scheme due to its distance from townscape features, therefore the impact is judged to be neutral.
Appearance	The housing is a mixture of ages with modern, private, commercial offices & retail buildings. Some features/buildings retain historical associations which add to the local distinctiveness of the area.	Local	Common at the local level	Medium at a local level	Some opportunity for substitution	Medium potential for change to built environment.	It is not anticipated that there would be any notable impacts on the appearance of the townscape as a result of the scheme due to its distance from townscape features, therefore the impact is judged to be neutral.
Human interaction	The primary human interaction is focused around domestic use such as schools, shops, pubs, churches, community facilities etc. with some retail & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change as a result of land use, density & mix & layout.	It is not anticipated that there would be any notable impacts on human interaction as a result of the scheme due to its distance from townscape features, therefore the impact is judged to be neutral.
Cultural	There is a mix of council housing & post war development with some more modern features interspersed with areas of historical interest including Listed Buildings & traditional houses within Whitchurch village N of the scheme. HorseWorld is within the study area on the edge of Whitchurch/Stockwood. There are designated historical features within 1km, including 1 SM (Maes Knoll Camp) located 1km SW of the scheme. Other recreational facilities such as Whitchurch Cricket Club, Bristol Barbarians Rugby Club & Whitehall Garden Centre are within 500m of the scheme.	Settlements & transport corridors valued at regional level. SM's & Listed Buildings valued at national level.	Rare at local level	Medium at local level Medium at Regional & National level	Limited opportunity for substitution	Low potential for change due to limited opportunity for substitution.	It is anticipated that there would be visual disturbance on the setting of some cultural features to the edge of Whitchurch as a result of the introduction of a new visually intrusive urban element SE of Whitchurch, therefore the impact is judged to be neutral - slight adverse.
Land use	Land use is primarily domestic including residential & recreational with some retail, industry & commercial use.	Local	Common at the local level	Low at the local level	Some opportunity for substitution	Medium potential for change to land use.	It is not anticipated that there would be any notable impacts on land use as a result of the scheme due to its distance from townscape features, therefore the impact is judged to be neutral.
Summary of character	The study area is characterised as a suburban townscape on the edge of Bristol transitioning to rural landscape with primarily residential settlements with some historic & cultural associations. These are connected with the busy A37 corridor & network of rural lanes linking smaller settlements & farmsteads.	Some features valued at national level. Many townscape elements valued at local level.	Some features, e.g. designated cultural sites, are rare at national, regional & local level. Many townscape features are commonplace at all levels.	Low to medium at local, regional & national level.	Some opportunity for substitution	Low-medium potential for change as a result of other influences.	Mitigation for this scheme would consist of careful design of layout & implementation of planting to screen the site from nearby urban elements. It is not anticipated that there would be many notable impacts on this townscape as a result of the scheme due to its distance from urban areas. However, there may be adverse impacts on density & mix & on the settings of cultural features close to the scheme. Impacts are judged to be neutral - slight adverse.

**Reference Sources**

B&NES Landscape Character Assessment  
 South Gloucestershire Landscape Character Assessment (2014)  
 Ordnance Survey Mapping  
 Aerial Mapping  
 Magic - Geographical mapping  
 Bristol City Council

**Step 5 - Summary Assessment Score**

Neutral - slight adverse

**Qualitative Comments**

A 1km offset from the scheme boundary has been prescribed for the study area within this townscape area of which baseline assessment only has been conducted due to the early stages of this design & optioneering stage. It is considered that significant effects are unlikely beyond this.  
 The assessment considers the scheme design and alignment and considers the impacts as at year one of opening. This approach has been undertaken due to the absence of a formal mitigation strategy and to enable the comparison of the impacts of the scheme as a result of its physical presence in the townscape.



TAG Biodiversity Impacts Worksheet - Option K1 - *Whitchurch P&R (Site 4)*

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Sturminster Road SNCI (approximately 110m north)	Woodland, scrub, tall ruderal vegetation, grassland & stream, with associated marginal vegetation	Regional	Medium- site designated at local level for nature conservation	N/A	Medium- site designated at local level for nature conservation	Neutral	Neutral
Stockwood Open Space LNR SNCI (approximately 200m north)	Mature grassland and unploughed meadows on lime-rich clay soils.	Regional	Medium- site designated at local level for nature conservation	N/A	Medium- site designated at local level for nature conservation	Neutral	Neutral
Charlton Bottom and Queen Charlton watercourse SNCI (approximately 400m north west)	Running water (streams), with associated marginal habitats, semi-natural broadleaved woodland and scrub.	Regional	Medium- site designated at local level for nature conservation	N/A	Medium- site designated at local level for nature conservation	Neutral	Neutral
Mells Valley SAC (approximately 9.8km south east).	Sites known for Greater horseshoe bat populations, cave networks.	International	Very high-internationally designated site	N/A	Very high-internationally designated site	Neutral	Neutral
Bath and Bradford on Avon Bats SAC (approximately 14km east).	Sites known for Greater horseshoe, Lesser horseshoe and Bechstein's bat roost populations	International	Very high-internationally designated site	N/A	Very high-internationally designated site	Neutral	Neutral
Wye Valley and forest of Dean Bat Sites SAC (29km south east).	Sites known for lesser horseshoe and greater horseshoe bat populations	International	Very high-internationally designated site	N/A	Very high-internationally designated site	Neutral	Neutral
North Somerset and Mendip Bats SAC (approximately 11km south west)	Sites known for Lesser horseshoe and greater horseshoe bat populations	International	Very high-internationally designated site	N/A	Very high-internationally designated site	Neutral	Neutral

**Habitats present that could be lost include arable farmland, hedgerow, grassland, scrub habitats and ponds could result in loss of areas potentially suitable for associated protected species.**

## Reference Sources

Magic Maps - <http://www.magic.gov.uk/MagicMap.aspx>,  
<http://map.n-somerset.gov.uk/southglos.html>  
<https://isharemaps.bathnes.gov.uk/atmycouncil.aspx>

## Summary Assessment Score

Neutral

## Qualitative Comments

As a result of this assessment, a neutral assessment score was given to this Scheme as all features assessed were found to have neutral assessment scores.

**TAG Biodiversity Impacts Worksheet - Option K2 - Whitchurch P&R (Site 5)**

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
Sturminster Road SNCI (approximately 120m north)	Woodland, scrub, tall ruderal vegetation, grassland & stream, with associated marginal vegetation	Regional	Medium- site designated at local level for nature conservation	N/A	Medium- site designated at local level for nature conservation	Neutral	Neutral
Stockwood Open Space LNR SNCI (approximately 210m north)	Old grassland and unploughed meadows on lime-rich clay soils.	Regional	Medium- site designated at local level for nature conservation	N/A	Medium- site designated at local level for nature conservation	Neutral	Neutral
Charlton Bottom and Queen Charlton Watercourse SNCI (approximately)	Running water (streams), with associated marginal habitats, semi-natural broadleaved woodland and scrub.	Regional	Medium- site designated at local level for nature conservation	N/A	Medium- site designated at local level for nature conservation	Neutral	Neutral
Mells Valley SAC (approximately 9.8km south east)	Sites known for Greater horseshoe bat populations, cave networks.	International	Very high-internationally designated site	N/A	Very high-internationally designated site	Neutral	Neutral
Bath and Bradford on Avon Bats SAC (approximately 14km east)	Sites known for Greater horseshoe, Lesser horseshoe and Bechstein's bat roost populations	International	Very high-internationally designated site	N/A	Very high-internationally designated site	Neutral	Neutral
Wye Valley and Forest of Dean Bat Sites SAC (approximately 29km south east)	Sites known for Lesser horseshoe and Greater horseshoe bat populations	International	Very high-internationally designated site	N/A	Very high-internationally designated site	Neutral	Neutral
North Somerset and Mendip Bats SAC (approximately 11km south west)	Sites known for Lesser horseshoe and Greater horseshoe bat populations	International	Very high-internationally designated site	N/A	Very high-internationally designated site	Neutral	Neutral
<b>Habitats present that could be lost include arable farmland, hedgerow, grassland, scrub habitats and ponds could result in loss of areas potentially suitable for associated protected species.</b>							

**Reference Sources**

Magic Maps - <http://www.magic.gov.uk/MagicMap.aspx>,  
<http://map.n-somerset.gov.uk/southglos.html>  
<https://isharemaps.bathnes.gov.uk/atmycouncil.aspx>

**Summary Assessment Score**

Neutral

**Qualitative Comments**

As a result of this assessment, a neutral assessment score was given to this Scheme as all features assessed were found to have neutral assessment scores.

**TAG Historic Environment Impacts Worksheet - Option K1 - Whitchurch P&R (Site 4)**

Feature	Step 2		Step 3		Step 4
	Description	Scale it matters	Significance	Rarity	Impact
Form	<p>There are 6 listed buildings within an approximate 500m study area surrounding the proposed scheme (1 Grade II* and 5 Grade II) [1365675, 1129498, 1129499, 1136454, 1136442, 1365674]. The Grade II* building [Church of St Nicholas 1136442] is located just within the northern extent of the study area at the junction of Bristol Road and Church Road.</p> <p>With the exception of a listed milestone which is located to the east of the scheme on Queen Charlotte Lane, the remaining buildings are located to the north of the scheme within Whitchurch.</p> <p>The buildings consist of various forms including a 17th century and an 18th century manor farmhouse, unidentified monuments within a churchyard, an 18th century house with gatepiers, a church of possible early-medieval origin and a milestone.</p>	The Grade II* listed buildings are of high importance, while the Grade II buildings are of medium importance.	There are 5 Grade II listed buildings of medium value, and one Grade II* listed building of high value within the study area.	The form of the listed buildings is not rare locally or regionally, however, the Grade II* church is a good example of a potential early-medieval (12th century) church and is not common in both a local and regional context.	<p><b>Negligible</b> - there will be no change to the form of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Survival	The level of survival of the listed buildings is generally good. Aside from some alterations, additions and repairs (internally and externally) which represent multiple phases of development and use, the buildings have mainly retained their characteristic elements.	The survival of the listed buildings is a matter of regional to national interest.	The survival of the listed buildings is important in understanding the historic development of the study area.	The survival of the listed buildings is not rare, while good survival of post-Norman conquest churches is not common.	<p><b>Negligible</b> - there will be no change to the survival of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Condition	The listed buildings are generally in a good condition. The majority of buildings are in residential use (aside from the church, churchyard monuments and milestone).	The condition of the listed buildings is a matter of regional to national interest.	The condition of the listed buildings is important due to their association with the development of their area.	The condition of the listed buildings is not rare.	<p><b>Negligible</b> - there will be no change to the condition of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Complexity	The listed buildings are generally of low to moderate complexity, with the church and the manor farmhouses presenting moderate complexity levels due to their alterations which either span across multiple centuries or having now been subdivided.	The complexity of the listed buildings is a matter of regional to national interest.	The complexity of the listed buildings represents some variety in form and function of medieval and post-medieval buildings.	The complexity of the listed buildings is not uncommon, however, the church is a good example of an early-medieval church, which has been subject to change over the centuries, representing moderate complexity.	<p><b>Negligible</b> - there will be no change to the complexity of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Context	<p>The landscape surrounding the scheme is largely rural to the east, south and west. At its northern point, the scheme connects to a residential development at Whitchurch.</p> <p>The context of the majority of the listed buildings presents a mixture between a sub-urban to semi-rural environment which has been subject to development pressures to the north of the scheme.</p>	<p>The context of the listed buildings is largely valued at a local level.</p> <p>The setting of such assets is also a material consideration under national policy.</p>	The context of the listed buildings within the study area reflects the local and wider regional changes in settlement pattern and development.	The context of the listed buildings within the study area is not rare. Even the context of the Grade II* listed church is not uncommon on a national level.	<p><b>Minor Adverse</b> - there is potential for adverse impacts on the setting of designated heritage assets. The assets are likely to have visibility to and from the proposed scheme.</p>
Period	With the exception of the medieval church, the remaining listed buildings are of post-medieval date.	The post-medieval period is typical within the area and of regional and national interest. The medieval period (represented by the church) is of regional and national interest.	The medieval and post-medieval periods are well represented within the wider study area.	The medieval and post-medieval periods are not rare.	<p><b>Negligible</b> - there will be no significant change to the periods represented by assets within the scheme study area.</p>

**Reference Sources**

Historic England's *The National Heritage List for England* (NHLE) database

**Step 5 - Summary Assessment Score**

This option is likely to have an overall Slight Adverse Effect on Cultural Heritage.

**Qualitative Comments**

The main adverse effects relate to potential temporary setting impacts during the construction of the scheme. Sensitive design and appropriate mitigation such as screening could reduce the overall effect of the scheme to Neutral.

**TAG Historic Environment Impacts Worksheet - Option K2 - Whitchurch P&R (Site 5)**

Step 2		Step 3			Step 4
Feature	Description	Scale it matters	Significance	Rarity	Impact
Form	<p>There are 6 listed buildings within an approximate 500m study area surrounding the proposed scheme (1 Grade II* and 5 Grade II) [1365675, 1129498, 1129499, 1136454, 1136442, 1365674]. The Grade II* building [Church of St Nicholas 1136442] is located just within the northern extent of the study area at the junction of Bristol Road and Church Road.</p> <p>With the exception of a listed milestone which is located to the east of the scheme on Queen Charlotte Lane, the remaining buildings are located to the north of the scheme within Whitchurch.</p> <p>The buildings consist of various forms including a 17th century and an 18th century manor farmhouse, unidentified monuments within a churchyard, an 18th century house with gatepiers, a church of possible early-medieval origin and a milestone.</p>	The Grade II* listed building is of high importance, while the Grade II listed buildings are of medium importance.	There are 5 Grade II listed buildings of medium value, and a Grade II* listed building of high value within the study area.	The form of the listed buildings is not rare regionally, however, the Grade II* church is a good example of a potential early-medieval (12th century) church and is not common in both a local and regional context.	<p><b>Negligible</b> - there will be no change to the form of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Survival	The level of survival of the listed buildings is generally good. Aside from some alterations, additions and repairs (internally and externally) which represent multiple phases of development and use, the buildings have mainly retained their characteristic elements.	The survival of the listed buildings is a matter of regional to national interest.	The survival of the listed buildings is important in understanding the historic development of the study area.	The survival of the listed buildings is not rare, while good survival of post-Norman conquest churches is not common.	<p><b>Negligible</b> - there will be no change to the survival of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Condition	The listed buildings are generally in a good condition. The majority of buildings are in residential use (aside from the church, churchyard monuments and milestone).	The condition of the listed buildings is a matter of regional to national interest.	The condition of the listed buildings is important due to their association with the development of their area.	The condition of the listed buildings is not rare.	<p><b>Negligible</b> - there will be no change to the condition of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Complexity	The listed buildings are generally of low to moderate complexity, with the church and the manor farmhouses presenting moderate complexity levels due to their alterations which either span across multiple centuries or having now been subdivided.	The complexity of the listed buildings is a matter of regional to national interest.	The complexity of the listed buildings represents some variety in form and function of medieval and post-medieval buildings.	The complexity of the listed buildings is not uncommon, however, the church is a good example of an early-medieval church, which has been subject to change over the centuries, representing moderate complexity.	<p><b>Negligible</b> - there will be no change to the complexity of any of the identified designated heritage assets.</p> <p>No physical impacts or significant adverse setting impacts on designated heritage assets are anticipated.</p>
Context	<p>The landscape surrounding the scheme is largely rural to the east, south and west. At its northern point, the scheme connects to a residential development at Whitchurch.</p> <p>The context of the majority of the listed buildings presents a mixture between a sub-urban to semi-rural environment which has been subject to development pressures to the north of the scheme.</p>	<p>The context of the listed buildings is largely valued at a local level.</p> <p>The setting of such assets is also a material consideration under national policy.</p>	The context of the listed buildings within the study area reflects the local and wider regional changes in settlement pattern and development.	The context of the listed buildings within the study area is not rare. Even the context of the Grade II* listed church is not uncommon on a national level.	<b>Minor Adverse</b> - there is potential for adverse impacts on the setting of designated heritage assets. The assets are likely to have visibility to and from the proposed scheme.
Period	With the exception of the medieval church, the remaining listed buildings are of post-medieval date.	The post-medieval period is typical within the area and of regional and national interest. The medieval church is of regional to national interest.	The medieval and post-medieval periods are well represented within the wider study area.	The medieval and post-medieval periods are not rare.	<b>Negligible</b> - there will be no significant change to the periods represented by assets within the scheme study area.

**Reference Sources**

Historic England's *The National Heritage List for England* (NHLE) database

**Step 5 - Summary Assessment Score**

This option is likely to have an overall Slight Adverse Effect on Cultural Heritage.

**Qualitative Comments**

The main adverse effects relate to potential temporary setting impacts during the construction of the scheme. Sensitive design and appropriate mitigation such as screening could reduce the overall effect of the scheme to Neutral.

**TAG Water Environment Impacts Worksheet - Option K1 - Whitchurch P&R (Site 4)**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance				
Study area: Whitchurch Park and Ride Site 4													
Potential Impacts:													
The site is in Flood Zone 1. The RoFSW flood maps indicate there are no overland flow routes across the site, but there are floodplains shown approximately 300m north of the site. Mapping indicates there are no watercourses/ditches crossed by the site. However, the design proposals are limited to a dot on a plan so exact boundaries are not available. Other major nearby watercourses include the River Avon (4km North East) and the River Chew (approximately 3.5km South).	Brislington Brook watercourse (tributary of the River Avon) and floodplain	Conveyance of flood flows and floodplain storage	The Proposed scheme is in Flood Zone 1 and is not within any Surface Water floodplain.	Local	At a local level the floodplain provided by the site is important in helping to reduce flooding to commercial properties. For the reasons stated above the site is considered to have a high rarity.	At this stage of design assumed to not be possible for this site	High	Minor Adverse	Low Significance				
There do not appear to be any watercourses/ditches within the site boundary therefore new culverts or watercourse diversions are not considered necessary as part of the Scheme. If required these would need to ensure conveyance of flows is maintained and floodplain storage is not reduced.		Conveyance of flood flows and floodplain storage	The Proposed scheme is in Flood Zone 1 and is not within any Surface Water floodplain.							At this stage of design assumed to not be possible for this site	High	Minor Adverse	Low Significance
Increased runoff resulting from increase in impermeable area from Park and Ride. Mitigation will be required to ensure runoff rates are not increased as a result of the scheme, SuDS should be used where appropriate. A Drainage Strategy would be required if this site is taken forward.		Surface water runoff	The River Avon is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.							At this stage of design assumed to not be possible for this site	Medium	Major Adverse	Significant
Discharge of pollutants from road / parking runoff; potential impacts on water quality of the watercourse, with potential implications on Water Framework Directive status. SuDS should be used to ensure pollutants are managed on site, both during construction and operation. A Drainage Strategy would be required if this site is taken forward.		Water quality / WFD	The River Avon is used for recreational fish and boat navigation. The River Avon is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.							At this stage of design assumed to not be possible for this site	Medium	Moderate Adverse	Low Significance

**Reference Sources**

<https://flood-map-for-planning.service.gov.uk/>  
<http://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/9>  
 Bing Maps  
 Google Maps

**Summary Assessment Score**

The scheme is considered to have a Significant adverse impact on the water environment (excluding mitigation)

**Qualitative Comments**

Because the scheme has the potential to increase flood risk to residential and commercial properties, and potentially have impacts on water quality, a more detailed assessment would be required, including a Flood Risk Assessment and potentially hydrological and hydraulic modelling. Mitigation measures such as SuDS would be required as part of the scheme - these would need to be tested as part of the Flood Risk Assessment and Drainage Strategy.

**TAG Water Environment Impacts Worksheet - Option K2 - Whitchurch P&R (Site 5)**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Study area: Whitchurch Park and Ride Site 5									
Potential Impacts:									
The site is in Flood Zone 1. The RoFSW flood maps and OS mapping indicate the scheme crosses a small watercourse/ditch, which has floodplains associated with it. However, the design proposals are limited to a dot on a plan so exact boundaries are not available. Dependent on the proposals within these floodplain areas there is a potential for a loss of floodplain storage. Mitigation (such as compensatory floodplain storage areas) measures may be required to ensure that flood risk upstream and downstream is not increased; such mitigation would need to take into account the impacts of climate change. Other major nearby watercourses include the River Avon (4km North East) and the River Chew (approximately 3.5km South).	Brislington Brook watercourse (tributary of the River Avon) and floodplain	Conveyance of flood flows and floodplain storage	The Proposed scheme is in Flood Zone 1 but crosses Surface Water floodplains and could potentially reduce conveyance and storage	Local	At a local level the floodplain provided by the site is important in helping to reduce flooding to commercial properties. For the reasons stated above the site is considered to have a high rarity.	At this stage of design assumed to not be possible for this site	High	Major Adverse	Highly Significant
It appears that new culverts or watercourse diversions are likely to be necessary as part of the Scheme. If required these would need to ensure conveyance of flows is maintained and floodplain storage is not reduced.		Conveyance of flood flows and floodplain storage	The Proposed scheme is in Flood Zone 1 but crosses Surface Water floodplains and could potentially reduce conveyance and storage		At this stage of design assumed to not be possible for this site	High	Moderate Adverse	Significant	
Increased runoff resulting from increase in impermeable area from Park and Ride. Mitigation will be required to ensure runoff rates are not increased as a result of the scheme, SuDS should be used where appropriate. A Drainage Strategy would be required if this site is taken forward.		Surface water runoff	The River Avon is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.		At this stage of design assumed to not be possible for this site	Medium	Major Adverse	Significant	
Discharge of pollutants from road / parking runoff; potential impacts on water quality of the watercourse, with potential implications on Water Framework Directive status. As new culverts or watercourse diversions may be necessary a WFD assessment may be required to ensure no detriment to waterbodies. SuDS should be used to ensure pollutants are managed on site, both during construction and operation. A Drainage Strategy would be required if this site is taken forward.		Water quality / WFD	The River Avon is used for recreational fish and boat navigation. The River Avon is currently classified by the EA as 'Moderate' for ecological and 'Good' for chemical water quality ratings.		At this stage of design assumed to not be possible for this site	Medium	Moderate Adverse	Low Significance	

**Reference Sources**

<https://flood-map-for-planning.service.gov.uk/>  
<http://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/9>  
 Bing Maps  
 Google Maps

**Summary Assessment Score**

The scheme is considered to have a Highly Significant adverse impact on the water environment (excluding mitigation)

**Qualitative Comments**

Because the scheme has the potential to increase flood risk to residential and commercial properties, and potentially have impacts on water quality, a more detailed assessment would be required, including a Flood Risk Assessment and potentially hydrological and hydraulic modelling. A WFD assessment may be required if culverting or watercourse diversions are required. Mitigation measures such as SuDS and potentially flood compensatory storage would be required as part of the scheme - these would need to be tested as part of the Flood Risk Assessment and Drainage Strategy.