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Appendix 4a: Independent Estimate to Complete Report – Turner & Townsend

Covering note

This note provides contextual information to assist readers to understand the purpose, scope and findings in the attached document.

1. Purpose

To inform its decision making, Transgrid engaged Turner & Townsend (T&T) in March 2024 to provide an unbiased, independent estimate of the Forecast to Complete (FTC) for a contractor to complete the remaining scope of PEC based on Payment Schedule 47 (dated 22 April 2024). The deliverable was to provide Transgrid with a robust and unbiased external view of the potential FTC for PEC to inform Transgrid's decision-making as it considered the alternative options in response to Contract Failure. T&T's FTC report was completed in July 2024.

Transgrid reviewed T&T's assumptions and prepared a "TG Adjusted T&T FTC" dated 21 August 2024 to incorporate project specific insights, progress assessments and adjustments informed by the team's understanding of PEC's unique complexities and risk profile under the EPC Contract.

In September 2024, Transgrid requested T&T to update its FTC spreadsheet using Payment Schedule 58 but did not request an updated report at that time. In March 2025, Transgrid engaged T&T to update its FTC to:

- Align with percentage of works completed as per Payment Schedule 63 (dated 22 October 2024), which was the last payment statement prior to the new ICCC.
- Address assumptions in earlier reports that were not realistic or did not comply with project requirements (e.g. access to local concrete supply plants).
- Confirm assumptions and seek confirmation of specific issues via an RFI process.
- Reflect updated industry data and benchmarking.

The final FTC report was completed on 8 September 2025.

2. Scope

T&T's report was to advise an FTC at a P50 and P90 confidence level. (T&T have advised that a typical contractor would likely price the works at a [redacted] confidence level).

The FTC was to account for the incomplete works for the following scope:

- Transmission lines L1, L2, L4 and L5.
- Substations S1a, S1b, S2 and S3.
- Special Protection and Communications Works.

The FTC excludes the following:

- Contract Variations other than the Pre-agreed Variations related to the upgrade to a 500kV on L5 and deletion of Substation S4 at Red Cliffs
- Contract Claims
- Owner's Costs

- Costs related to address current health issue of the project
- Items specifically noted as excluded in T&T's report.

To ensure independence, T&T was kept at 'arm's length' from the PEC project team. T&T's estimate was based on their independent industry knowledge and benchmarking practices, ensuring that the FTC was unencumbered by current project thinking and approach.

T&T documented their assumptions in their FTC report and adjusted their FTC when Transgrid identified that updates to assumptions were required.

T&T approached the development of the FTC as follows:

- Using Payment Schedule 63 from the EPC Contract, determine remaining percentage of works to be completed and where possible remaining quantities.
- Prepare a bottom-up estimate for civil components of tracks and substations.
- Prepare a bottom-up estimate for transmission lines and substations.
- Validate the bottom-up estimates against benchmark cost rates and productivity rates.
- Develop an "Indirects" cost estimate (preliminaries, camps, etc) using a combination of bottom-up estimates and benchmarks.
- Prepare Quantitative Schedule and Cost Risk Analysis (QSCRA), based on:
    - Delivery risks identified in the independent risk register
    - Inherent risks associated with the estimate for quantity and rate uncertainty

3. Key Findings

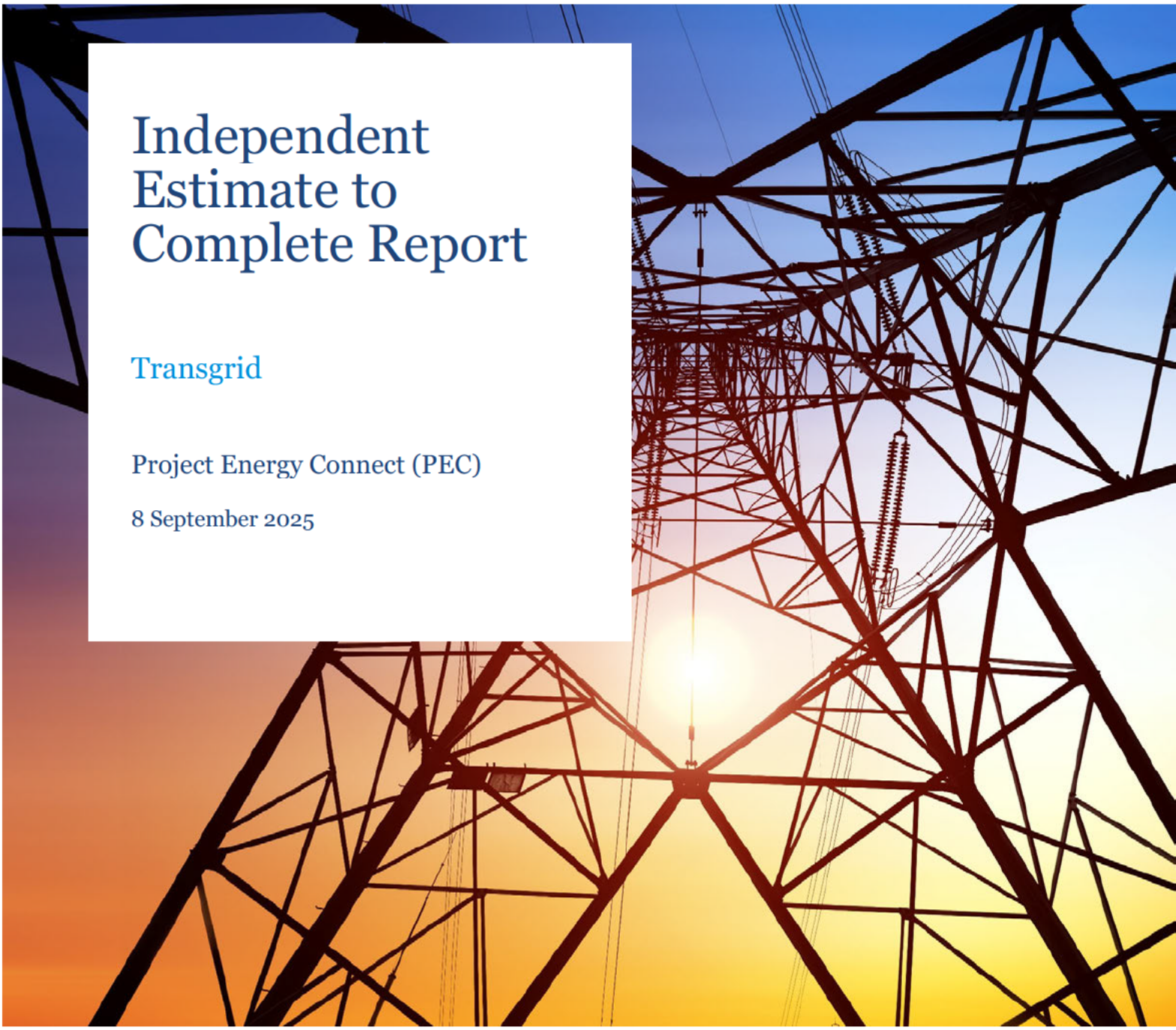
T&T concluded that the forecast cost to complete for PEC would range between $1.86 billion (P50) and [redacted] (P90), including contingency and escalation, but excluding profit (as the ICCC excludes profit). This compares favourably against the ICCC* value of $1.84 billion, indicating that the contracted price is competitive and aligned to the market.

T&T further noted that a typical contractor would likely price the works at a [redacted] confidence level. On this basis, T&T's estimate was [redacted] million higher than the ICC contract cost, reinforcing the view that ICC contract price reflects an efficient cost for energy consumers. As noted in the Application, the ICC contract also secures extensive protections for consumers that further enhances the prudency and efficiency of that contracting option beyond the estimates presented in the T&T report.

$ Million	Elecnor ICCC*	P50	[redacted]
FTC excluding profit	$1,837	$1,856	
Difference to Elecnor's FTC		$19	

*In this cover note the ICCC excludes the costs associated with the Dinawan upgrade/PEC enhancement from 330kV to 500kV as this scope is part of the VNI West project, rather than PEC.

Turner & Townsend



Independent Estimate to Complete Report

Transgrid

Project Energy Connect (PEC)

8 September 2025

We transform together.

Transgrid

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Rev	Status	Originator	Approved	Date
Rev A Oct 2024 PS	Draft	[redacted]		17/04/2025
Rev B Oct 2024 PS	Draft			09/05/2025
Rev C Oct 2024	Final			08/08/2025
Rev D Oct 2024	Final 2			8/09/2025

1. Summary

Purpose of the Report

Turner & Townsend have been engaged by Transgrid to provide a detailed Forecast to Complete (FTC) Estimate for Project Energy Connect (PEC) Stage 2. The purpose of the FTC is to provide the Transgrid Executive with a detailed, robust, and independent view of the likely risk factored, cost and time required to complete the remaining works.

We first undertook an Independent FTC report in April 2024 over a period of ~8 weeks.

However, due to a rapidly changing construction market and industry knowledge gained subsequent to submission of the initial independent FTC report, the independent FTC report has been revisited in 2025.

In addition, the Turner & Townsend team have been able to request and receive information to clarify key assumptions with Transgrid, where gaps existed in the information provided.

In this revised report, we have used the knowledge gained from our initial FTC Report, together with new internal data, and aligned the revised FTC with industry norms available to Turner & Townsend from works on similar transmission projects in delivery and development in the last 12 months. The information used includes constructability reports, productivity data, EBA data and project staff resourcing data.

Cost Outcomes

A summary of our FTC final cost estimate findings can be found in Table 1 below. Note that Turner & Townsend have utilised a range of estimating techniques and have made numerous assumptions and exclusions in the development of these figures. The below table must be read in conjunction with these assumptions and exclusions, found in Section 3.4:

Table 1 - Summary of Cost Estimate

DESCRIPTION	TOTAL ($AUS)
Preliminaries and Overheads (incl accommodation)	[redacted]
Design Allowance	
Construction of Lines including handover to commissioning	
Construction of Substations including handover to commissioning	
Special Protection and Communication and Balance of Works	
FTC - CURRENT TOTAL CONSTRUCTION COST	**1,742,722,688**
Ranges for contingency	**P50 to P90**
Contingency Allowance Range	[redacted]
Escalation Allowance Range	
FTC TOTAL INCL CONTINGENCY AND ESCALATION	**1,981,282,923** [redacted]

The FTC cost estimate has been ranged against P50 and P90 outcomes (note: P50 cost is the Project Cost with sufficient contingency to provide a 50 per cent likelihood that this cost would not be exceeded. P90 cost is the Project Cost with sufficient contingency to provide a 90 per cent likelihood that this cost would not be exceeded).

Possible Contractor Bidding Price

Turner & Townsend's benchmark data suggests that generally contractors will bid around the [redacted] cost percentile, although this is very dependent on their appetite for risk, the market and risk profile of the project.

Turner & Townsend have estimated that a competitive [redacted] bid total could be [redacted].

Transgrid has requested Turner & Townsend to provide a bid total without calculated margin for the purpose of comparison. For this scenario, the [redacted] bid total could be [redacted].

Risk Outcomes

The P50 and P90 cost outcomes are [redacted] of the base cost, respectively. The schedule risk P50 and P90 outcomes show an [redacted] percent delay respectively to the Handover to Commissioning milestone due to risk. The contingency evaluation uses an integrated cost and schedule risk model so risks impact cost and schedule together and delay risk is automatically included in the cost outcome.

Our independent outcome of the key drivers of cost and schedule uncertainty are:

- TG-13 - Tower and Stringing Productivity uncertainty
- TG-57 – Staging and PM Issues
- TG29 & TG-50 Interaction with local community
- TG-04 – Skilled Resource Availability and Retention
- TG-12 - Contractor Insolvency (Subcontractors).

Schedule outcomes

Turner & Townsend used common scheduling methodologies to establish a reasonable and well-informed estimate of the time to complete and thereby develop a realistic schedule. Productivity rates and resourcing were key factors in achieving this goal.

In studying the Project, the team recognises that resource limitations are the main driver for the Schedule. The key result of this estimate is that the remaining works, including Handover to Commissioning, are likely to be completed by end of 2026. The completion dates for the construction works of key work packages are summarised in the table below:

Table 2 – Summary of FTC Schedule Completion Dates

Work Package	Construction Completion Date (without Weather Contingency)	Construction Completion Date (with Weather Contingency)	Handover to Commissioning
Transmission Line L2	[redacted]	[redacted]	3 Dec 2026
Transmission Line L4			13 Feb 2025
Transmission Line L5			22 Dec 2026
Substation S1b			25 Sep 2025
Substation S2			26 Nov 2026
Substation S3			24 Oct 2025

Note: Scheduling has not been undertaken for Transmission L1 or Substation S1a

The table must be read in conjunction with the assumptions and exclusions, found in Section 5.3

2. Purpose of this report

2.1 Introduction

Transgrid have engaged Turner & Townsend (April 2025) to provide a detailed, independent forecast to complete for construction of PEC, based on project work still to be completed.

This FTC report includes an independent analysis of the construction cost to complete, the schedule to complete and a position on risk allowances.

The deliverables provided in this report include:

- A detailed Basis of Estimate including a priced FTC cost estimate in the same format as the Project's Payment Schedule referred to hereinafter as "the FTC"
- A Basis of Schedule Report including a high-level schedule estimate to complete the main project/sub-projects
- An independent Risk Register with narrative and associated integrated cost and schedule QRA outcomes.

Turner & Townsend have carried out the independent FTC assessment to the best of our knowledge, leveraging our experience in similar transmission projects (regionally and globally), using industry standards and relying on the project documentation made available, workshops and requests for information responses provided by Transgrid during our engagement.

Please refer to Section 3.2 – Cost – Methodology and Approach for an explanation of project status at time of report.

2.2 Overview of Project PEC

Project EnergyConnect (the project) is being built between Wagga Wagga in New South Wales and Robertstown in South Australia, with a connection to Red Cliffs in Victoria.

The NSW Western Component involves building around 135km of new 330kV transmission line (Line 1) between the SA border and Buronga substation, replacing about 22km of existing 220kV transmission line (Line 4) between the Buronga substation to Red Cliffs NSW. The NSW Eastern Section involves upgrades to existing substations at Buronga and Wagga Wagga, building the new 330kV Dinawan Substation, building around 375km of new 300kV transmission line (Line 2) between Buronga and Dinawan Substation, building around 157km of 500kV transmission line (Line 5) infrastructure between Dinawan and Wagga Wagga

The scope of this FTC Report covers the completion of the following project elements:

- Transmission line L1 – SA Border to Buronga
- Transmission line L4 - Buronga to Red Cliffs 220KV

- Transmission line L2 – Dinawan to Buronga 330KV
- Transmission line L5 – Dinawan to Wagga Wagga 500KV
- Substation S1a – Buronga - Initial Works
- Substation S1b – Buronga - Balance of Works
- Substation S2 – Dinawan
- Substation S3 – existing Wagga Wagga substation (augmentation)

2.3 Scope of Turner & Townsend Services

We first undertook an Independent FTC report in April 2024 over a period of ~8 weeks.

However, due to a rapidly changing construction market, including prices increases and industry knowledge gained subsequent to submission of the initial independent FTC report, as well as the opportunity to request and receive information to clarify key assumptions, the independent FTC report has been revisited in 2025.

In this revised report, we have used the knowledge gained from our initial FTC Report, together with new internal data, and aligned the revised FTC with industry norms available to Turner & Townsend from works on similar transmission projects in delivery and development in the last 12 months. The information used includes constructability reports, productivity data, EBA data and project staff resourcing data.

We follow the estimating methodology as prescribed by AACE 96R-18 – Cost Est Classification System – as applied to Engineering Procurement and Construction for the Power Transmission Line Infrastructure Industries.

2.4 Cost, Schedule and Risk Methodology

The following sections of the report describe the methodology used in the development of the PEC FTC including the basis of cost, risk and schedule, and summary of findings. Section 3 describes cost; Section 4 describes risk and Section 5 describes schedule.

3. Forecast to Complete – COST Findings

3.1 Final Cost to Complete – Summary (provided in two Cost Estimate formats)

Our FTC final cost estimate findings are provided below, in two different cost estimate formats (as requested by Transgrid). We have included a detailed estimate breakdown in Appendix A.

Table 3 - Forecast Cost to Complete _PEC Payment Schedule Format

DESCRIPTION	TOTAL ($AUS)
Preliminaries and Project Management (incl accommodation)	[redacted]
Design	
L1 – SA Border to Buronga	[redacted]
L2 - Buronga to Dinawan	
L4 - Buronga to Red Cliffs	
L5 - Dinawan to Wagga PAV	
S1a – Buronga Initial Works	[redacted]
S1b- Buronga Balance of Works	
S2 - Dinawan (330kV)	
S3 - Wagga Wagga (330kV)	
Special Protection and Communication and Balance of Works	
Special Protection, Communication, Balance of Works	[redacted]
FTC - CURRENT TOTAL CONSTRUCTION COST	**1,742,722,688**

A – Pro rata value for Line 1 and Substation S1a based on % to complete in Payment Schedule 63 and detailed pricing for other lines and substation
B – Special Protection, Communications and balance of works is as advised by Transgrid, based on the remaining cost from Payment Schedule 63.
C – Please refer to Table 1 - Summary of Cost Estimate for contingency and escalation values

Table 4 - Forecast Cost to Complete - in Top Sheet Format

Description	Direct Costs	Indirect Costs	Camp Costs	Overheads Only (on Directs and Indirects)	Other	Total
	Preliminaries and Project Management					
Preliminaries and Project Management - Shown as Indirect Cost						
Design					[redacted]	
	Construction of Lines including handover to commissioning					
L1 – SA Border to Buronga	[redacted]					
L2 – Buronga to Dinawan						
L4 – Buronga to Red Cliffs						
L5 – Dinawan to Wagga PAV						
	Construction of Sub-Stations including handover to commissioning					
S1a- Buronga initial Works	[redacted]					
S1B- Buronga Balance of						
S2 – Dinawan (330kV)						
S3 – Wagga Wagga (330kV)						
	Special Protection and Communication and Balance of Works					
SPC / BOW Communication and Balance of Works					[redacted]	
FTC - CURRENT TOTAL CONSTRUCTION COST	[redacted]					**1,742,722,688**

Notes:
A – Pro rata value for Line 1 and Substation S1a based on % to complete in Payment Schedule 63 and detailed pricing for other lines and substation
B – Special Protection, Communications and balance of works is as advised by Transgrid, based on the remaining cost from Payment Schedule 63.
C – Please refer to Table 1 - Summary of Cost Estimate for contingency and escalation values

3.2 Cost – Methodology and Approach

Turner & Townsend have used bottom-up estimating for all the cost areas, developed an independent risk register and a schedule of key project scope items. Key issues and assumptions are considered and detailed within this and the following sections.

Rates have been benchmarked against projects similar in scope and size and the estimate has been produced using a construction methodology approach similar to that used in comparable projects.

The scope of remaining works was obtained from Payment Schedule 63 dated 22 October 2024 which was provided by Transgrid. Specifically, Turner & Townsend have used the quantities and the percentage complete in the Payment Schedule to determine the amount of outstanding work. It is important to note that Turner & Townsend's approach did not involve a quantity take-off from the design drawings (i.e. for the number of types of foundations, towers, access tracks, etc) However, the drawings have been used to determine a bottom-up price for each 'type' for the lines in the Payment Schedule and each item for the substations in the Payment Schedule.

The Payment Schedule also forms the basis of the work breakdown structure.

Turner & Townsend utilised our knowledge of the project from the drawings and project information previously provided by the client representative for the April 2024 FTC along with the completed RFI and Query Lists.

Turner & Townsend's approach was to acquire the essential knowledge required for an independent assessment of the work to complete. We aimed to gather sufficient information to confirm high-quality output without compromising our objectivity. To achieve this, we used the following data sources:

- General project documents describing the scope of the project and key components such as excerpts from the EPC contract
- Final Design Drawings and Issued for Construction Drawings
- Management Plans such as Construction Environmental Management Plan (CEMP), Traffic Management Plan, Environmental Impact Statement (EIS) etc. as well as inputs related to scheduled outages, which helped to inform work methodologies and other construction/sustainability-related considerations
- Project data publicly available on Transgrid websites and other online sources, including management plans, such as Construction Environmental Management Plan (CEMP), Traffic Management Plan, Environmental Impact Statement (EIS), etc
- Arial imageries, online maps, and Australian Bureau of Meteorology climate outlook reports
- Limited client input on minor items

Turner & Townsend have used a range of cost estimating techniques, depending on the maturity of the works information that was provided. These techniques include:

- Bottom-up estimate for civil components of track and substations
- Bottom-up estimate for transmission line and substations
- Industry standard cost rates and productivity rates to inform transmission and civil works
- Indirect cost estimate with a combination of bottoms up and benchmarked elements of work

The estimating and scheduling team have worked closely together throughout the development of the FTC report to confirm alignment on the building block assumptions, such as crew sizes, numbers of crews and productivity rates used.

3.3 Cost Elements Definitions

Detailed in table below is the outline definition of each element of cost used in the FTC report:

Table 5 – Outline for each cost aspect within FTC

Element of Cost	
Direct Costs	The direct costs include costs the contractors will incur for labour, plant, materials, and other sub-contract works including temporary works and staging. They represent the contractors' actual cost to undertake the works.
Indirect Costs	The indirect costs include the costs the contractors will incur in preparing and/or executing their design, providing plant and equipment, site and camp facilities, offices and compounds, project management, construction management, site supervision and the like.
Overheads and Margin	Overheads and Margin includes the contractors' corporate overheads and profit (margin). Corporate overheads are non-project specific costs and cover the contractor's contribution to maintaining its local and head offices, directors and companywide costs that are not recovered directly through its contracts. Profit is the margin the contractors would expect to make on each contract package. Our estimate makes provision for seven percent overheads and eight percent margin applied to both the direct and indirect costs.
Design Costs	The FTC includes a recalculated allowance for design costs. This will allow for continued progression of design, design support throughout the remaining period and project close out. The design cost is calculated as a benchmarked percentage of the direct costs, less the design costs paid to date
Owners Costs	At the direction of Transgrid, Owners Costs have been excluded from the FTC report.
Escalation	The FTC has a base date of Q4 2024. Our Turner & Townsend economics team, who are considered authorities in forecasting escalation and market outlooks and who track both the labour market and related commodities, have provided us with the indicative escalation rate used for this FTC. The works were cash flowed with a linear methodology for the remaining duration of the works. Escalation was then applied to the P50 and P90 costs. The escalation figure provided should be read as an indicative allowance given that schedule loaded cashflow was not undertaken.
Contingency	The FTC shows both a P50 and P90 value. P50 is the value at which there is a 50% probability that the actual outcome will be less than or equal to this value. There is an equal chance of the actual result being higher or lower. P90 is the value at which there is a 90% probability that the actual outcome will be less than or equal to this value. There is only a 10% chance the actual result will exceed this value.

3.4 Basis of Cost Estimation (including assumptions and exclusions)

The below section outlines the estimating methodology undertaken for each Work Breakdown Structure (WBS), the assumptions and allowances included which underpins the FTC outcome and any relevant exclusions. The WBS aligns with the nominated PEC Payment Schedule WBS.

3.4.1 General Assumptions and Exclusions

The assumptions noted below apply to all the WBS packages:

- There are no outstanding permits or approvals still required for planning or environmental purposes.

- Good community and stakeholder relationships exist along the transmission route, i.e., there are limited risks associated with community or stakeholder matters i.e., legal disputes.
- All land acquisitions / easements and property purchases have been completed.
- The Payment Schedule No. 63 dated 22 October 2024 provided the basis for quantities. The team has used the provided quantities and percent complete ("Employer's representative's Assessment Assessed to Date %") to calculate the remaining quantity for each activity.
- Materials are procured and will be on site as required by construction schedule. Materials procured include steel for towers, line materials including conductors and terminators, and major HV equipment as listed in the Payment Schedule (including transformers, synchronous condensers, etc).
- Materials will arrive safely, both at the main laydown and on-site locations, and undamaged with zero defects with the exception of some structural steelwork for the towers. Provision has been made for this additional material handling and logistics for structural steel due to shipping condition.
- All transport routes have been identified, and necessary road works to the public highways network have been completed to deliver large items to both the Deniliquin yard and the individual sites/ laydown areas along the route.
- Labour rates calculated across a number of NSW and interstate EBAs and an average rate of [redacted] for both civils work and electrical work allowed in FTC. The EBAs considered for the labour rate include Renewables Technical Services Pty Ltd 2023 – 2026 (Oct 2023) as well as publicly available EBAs from Acciona Civil, CPB, BMD, John Holland and Downer.
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- Insurances, bonds and payment of Long Service Levy (LSL) have been calculated based on the additional estimated project cost over and above the contract award figure of circa $1.4B for the works. It is assumed that 100% of the original allowance for insurances and LSL was paid prior to Payment Schedule 63.
- In addition, we understand there is a contractual requirement for an Escrow account to the value of [redacted]
- The LSL payable is a nominated % of the construction value. At the time of project award, this was 0.35%. The current NSW legislated LSL payment is 0.25% of the construction value.
- The calculations for the indirect costs assume there is site accommodation/office facilities at each of the accommodation camps. Generally, L2 and L4 share resourcing, L5 has an independent team and there are shared resources for the substations.
- The construction and fitout of all site accommodation and supporting services is completed.
- Flights (economy class seats) allowed for both of the nominated rosters. Bussing allowed for the airport transfer only.

The exclusions noted below apply to all the WBS packages:

- Payment Schedule 63 "Employer's representative's Assessment Assessed to Date %" informed the % complete used for the FTC cost and schedule. The Payment Schedule also the quantity

on which the FTC is based and as such any major scope or shift in quantities has not been captured in the FTC.

- Owners Costs excluded, as directed by Transgrid. There is no allowance for any accommodation or travel costs for Owner's team or Owner's engineering team. Owners team will not utilised camp accommodation.
- The estimate does not include any biodiversity offsets as this is considered to be an Owners Cost.
- FTC based on the drawings and Payment Schedule made available by Transgrid.
- No allowance for excavated materials to be disposed off-site. Imported materials extracted during reinstatement are priced to be disposed of by beneficial reuse within a 5km radius.
- Major rock excavation and disposal excluded.
- Any allowance for industrial actions is excluded.
- FOREX has not been included in the FTC.

As well as the general assumptions and exclusions found above, the following sections outline more detailed assumptions and exclusions, arranged by each WBS element.

3.4.2 Construction of Lines – Access and Clearing

Access and clearing	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates. ▪ We measured detailed quantities for access points/ intersections to price the lump sum item. This was not provided as a line item in the Payment Schedule. ▪ We have allowed for corridor re-instatement. This was not provided as a line item in the Payment Schedule.
Assumptions/Allowances	▪ Clear alignment and terrain assumed to be accessible, with classes of clearing priced as per the payment schedule ▪ Access tracks all 4.5m (for safe large vehicle/crane access) + 1m clearance each side. ▪ Access track type 2, Dwg 45860-DWG-10001-C-5200 Amendment 0 – IFC. All access tracks priced as Type 2 with [redacted] allowance within the rate for Track type 3 including Geogrid and 100mm thick wearing course for L2 and [redacted] allowance within the rate for Track type 3 including Geogrid and 100mm thick wearing course for L5. ▪ Access track type 3, Dwg 45860-DWG-10001-C-5200 Amendment 0 – IFC. This specification is not applicable as noted above other than as nominated allowance. ▪ Access track type 4, Dwg 45860-DWG-10001-C-5200 Amendment 0 – IFC. This specification is not applicable as noted above ▪ Assumed all access tracks are within the alignment corridors. ▪ Productivity is based on working with a grader already within the alignment corridor. ▪ Mobile washdown duration of 2 weeks per tower and relocation every 2 months. ▪ Typically, the local road network regularly crosses the transmission line alignment. This means that once a section of towers has been erected, the corresponding section of access track will not be required, because the next section of access track can be accessed via the local road network. Accordingly, maintenance of access tracks is based on re-grading tracks four times. ▪ Reinstatement of access track allowance based on relevelling to return to existing levels. Hydroseeding included, and Imported topsoil excluded. ▪ Reinstatement of cleared corridor based on hydroseeding only ▪ Imported material based on a delivered rate of [redacted]

	▪ Crane pads all [redacted]. All [redacted] thick and [redacted] thick wearing course. There is no allowance for geotextile under the crane pads.
Exclusions	▪ No cut and fill in excess of 1m level differential across crane pads. ▪ No allowance for handling and disposing contaminated materials. ▪ No allowance for major rock excavation and disposal. ▪ No allowance for materials to be disposed off-site (material mulching allowed). ▪ Crane pad and stringing pad hardfill and running courses allowed to be removed during reinstatement and repurposed locally as road improvement or similar (Tip fees excluded)

3.4.3 Construction of Lines – Foundations:

Foundations	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates. ▪ We measured detailed quantities for access points/ intersections to price the lump sum item. ▪ For foundations, Payment Schedule 63 for Line 2 nominates a similar foundation type (RSF) for both type 1 and type 2 structures and contradicts this with 5 different tower structure steelwork types, (RSF, RSG, RTT, RTU, RTV/RTW). Line 5 splits the tower structure steelwork types VSQ, VTQ/VTS, VTR/VTT. For the FTC, we will utilise the different tower structure steelwork types to inform the split of foundation types. Our rates are based upon detailed quantities from the drawings for each pile type and length to accurately produce rates for the work. ▪ We assumed a number of stringing pads based upon tower grouping on stringing charts but measured detailed quantities for each pad. ▪ We relied upon the number of crane pads in the Payment Schedule but measured detailed quantities for each pad. ▪ Our rates include for the provision of two concrete batching plants to support construction.
Assumptions/Allowance	▪ Stringing pads (every 4km on average) 3500m2 excludes geotextile. ▪ Foundation types priced to align with the tower steel type designations, includes for [redacted] of piles cased (L2) ▪ Based on straight piles with pile casings included where indicated on drawing TL-914404-1 to 5 (L5) ▪ Piles are priced as geological ground model with pile foundation and diameter and depth as nominated on the drawings L 878357.c. NFC ▪ Ground conditions are generally mid to stiff clays. ▪ 100T piling rig required with average productivity rate of 10m/hr ▪ Twenty percent cased piles allowed over and above casing nominated on the drawings L 878357.c. NFC ▪ Pre manufacture of reinforcement cages for piles, with cages delivered directly to each pile location. An allowance for transportation and handling has been included. ▪ Crane pads all [redacted]. All [redacted] thick and [redacted] thick wearing course. There is no allowance for geotextile under the crane pad. Crane pad doubles as the piling mat. ▪ *Note: stringing pad costs are included with stringing totals and not access and clearing.
Exclusions	▪ Cut and fill included to a maximum of 1m level differential across crane pads. No cut and fill or benching allowed for stringing pads. ▪ No allowance for handling and disposing contaminated materials. ▪ No allowance for major rock excavation and disposal

3.4.4 Construction of Lines – Structural Steelwork:

Structural Steelwork	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates. ▪ L2 - total tower tonnage and number & type of towers as per AECOM schedule (ref. 45860-MTO-42000-TL-1000/11 dated 29-09-2023 ▪ L5 - tower tonnage is taken from the drawings 45860—DP-45000-TLS-10001.02.C.FD, 03.B.FD, 04.A.FD,05.A.FD.
Assumptions/Allowances	▪ For remaining quantities of tower steel supply, a steel price of [redacted] has been assumed based on budget quote for similar project. ▪ A nominal provision for additional material handlings and logistics due to shipping condition of steel.
Exclusions	▪ No allowance for independent inspection of tower manufacture.

3.4.5 Construction of Lines – Stringing and Clipping-In

Stringing and Clipping-In	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates. Dual circuits have been built up for 500Kv with quad conductors, and 330Kv with twin conductors.
Assumptions/Allowance	▪ Allowance for spares on the lines of [redacted] as per Contractual Spares Requirement List provided by Transgrid.
Exclusions	▪ No allowance for handling and disposing contaminated materials.

3.4.6 Construction of Line – Crossings

Crossings	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates.
Assumptions/Allowances	▪ Crossing costs from contractor quotes from recent similar projects includes traffic control, hurdles, etc. ▪ Port Handling charges allowance of [redacted] included as advised by Transgrid.
Exclusions	▪ Not applicable.

3.4.7 Construction of Lines – Handover to Commissioning

Handover to Commissioning	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates.
Assumptions/Allowances	▪ Handover to commissioning costs allows for resistance testing, continuity and phase identification testing, insulation resistance testing, fibre optical integrity testing and current injection testing. ▪ Handover to commissioning costs cost from contractor quotes from recent similar projects.

	▪ Cutting into substation has 1 No [redacted] for L2, [redacted] for the L5 and [redacted] for the L4.
Exclusions	▪ Transgrid commissioning. ▪ Testing and commissioning other than noted above. ▪ Non contestable works.

3.4.8 Construction of Lines – Rearrangement Costs

Rearrangement costs relate to work as nominated with the Payment Schedule including cutting and swinging across of existing conductors from existing to new structures (in No. 64) and dismantling and removal of conductors.

New construction relates to work as nominated in the Payment Schedule including the remaining supply and erection of towers, stringing and clipping in, 4 No crossings nominated as type HV Feed: BNG8B1, cutting into the substation and handover to commissioning.

The removal of foundations (to depth of 500mm below ground), demolition of 220KV towers and dismantling of conductors.

Rearrangement Costs L4	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates.
Assumptions/Allowances	▪ No quantities were provided for the removal of foundations, demolition of 220KV towers nor for dismantling of conductors. These are assumed to mirror the quantities for the new foundations, towers and conductors. ▪ Demolition has been included for the existing single circuit line. associated with L4.
Exclusions	▪ No allowance for traffic control required.

Rearrangement Costs L5	
Basis of Estimation	▪ Costs included as provided by Transgrid.

3.4.9 Substation Works – Civil, Fencing and Site Improvement

Civil, Fencing and Site Improvement	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates. ▪ We measured quantities for earthworks, cable trenching, cable conducting, footings and foundations, various compounds, roads and pavements, drainage, oil containment, fences and gates and landscaping. Recent tender rates were applied to these measured quantities
Assumptions/Allowance	▪ All concrete, gravel and other road materials to be locally sourced / by local suppliers. ▪ Allowance for watering of the re-vegetated areas based on two months for Buronga and one month for each of Dinawan and Wagga ▪ Dust suppression is allowed to each of the substation sites (1x 25000l truck + water) for construction period. ▪ Soil is stockpiled within site boundaries and spread in local area. ▪ [redacted]

	▪ No allowance for remote substations works outside the three substations (including but not limited to Bundey substation, Darlington Point, Red Cliff Substations) ▪ The S1a and S1b scope boundary is the temporary fence as shown in drawing BRG312006/2 Version 00
Exclusions	▪ No allowance for handling and disposing contaminated materials. ▪ No allowance for major rock excavation and disposal

3.4.10 Substation Works – Steel Structures

Steel Structures	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates. ▪ Steel tonnage for equipment supports at substations based on the tonnage provided in the drawings with recent tender rates applied to these measured quantities
Assumptions/Allowances	▪ Total tonnage calculated for Buronga substation is [redacted], Dinawan substation is [redacted], and Wagga Wagga is [redacted] including all accessories such as bolts & nuts, etc. ▪ [redacted] ▪ For Dinawan substation, assumed twenty columns at 27m overall height [redacted] ▪ The gantry support steel fabrication and supply come in bulk thus the rate is lower than the equipment support rate which is for smaller quantities.
Exclusions	▪ No modification required for the existing gantries at Wagga Wagga substation

3.4.11 Substation Works – Electrical Equipment Supply & Install and Secondary Systems

Electrical Equipment Supply & Install and Secondary Systems	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates.
Assumptions/Allowance	▪ Substation works will finish at the same time as the line segment work finish. No remobilisation of lines crew or substation crew to install landing span from the last towers to the substation gantries and/or during energisation has been allowed for. ▪ No secondary panel test beds or dummies have been allowed for. ▪ Supply of Synchronous Condensers (Syncon)includes items such as: Main transformers, Aux transformers, Isolated Phase Bus, Generator CB, Synchronised Condenser, outdoor cooling system, associated protection and control panels, etc

	▪ Syncon supplier will install the Syncon on its footing and also perform commissioning and testing. The rest of the plant will be installed by the contractor. The Syncon supplier will also assembly, installation and pre commissioning of the Syncon transformers.
	▪ Transformers, reactors, phase-shifting transformer supply cost includes supply, delivery, installation and pre commissioning by supplier.
	▪ Allowances for CCTV, access control and control building
	▪ Telecom allowances of approx. [redacted] for S1b, S2 and S3
	▪ Dinawan:
	  ▪ The protection panels will be installed in the control building manufacturer, where they are installed in the control room, FAT'ed and then deliver to site
	  ▪ No allowance to installed power supply from distribution pole
	▪ Buronga:
	  ▪ The protection and control panels associated to the operation of stage S1a has been installed, including: DNW Line 6F and Reactor #4, PS Transformer #5, 330/220kV Transformer #8, Syncon transformer #4 & #5, Busbar protection A, B, C and D, Conditional Monitoring Cubicle, QoS, Misc. Alarm Cubicle, TWFL/Disturbance Recorder cubicle, SA RAS, Electranet TWFL, Line 6C& 6F metering cubicle). Allowance to modify the panels to cater the augmentation has been allowed for.
	  ▪ The DC system and batteries installed in stage S1a is enough to supply all protection, control and telecommunication panels for both stage S1a and S1b. No allowance has been made to increase the capacity of the batteries
	  ▪ All Main AC distribution boards has been installed. Additional LVAC boards has only been allowed in the S1b yard.
	  ▪ New protection panels will be assembled in the manufacturing facilities, FAT'ed and then deliver to BRG to install in the existing control rooms and then SAT'ed. Assumed that all control buildings are part of S1a.
	  ▪ The syncon building, 1x Syncon, 2x control buildings, 220kV switchyard, 2x capacitor banks, 1x 330/220kV transformer has already been installed as part of S1a.
	  ▪ No earthing has been installed at S1b bench.
	▪ Wagga Wagga:
	  ▪ As no detail information available on the secondary requirement, the following secondary panels has been allowed for: 4x Line protection and control panels, metering panels, and TWFL. Augmentation on the SCADA and telecommunication system has been allowed for.
	  ▪ The existing busbar protection scheme can cover the busbar extension. No allowance for new busbar protection panels.
	  ▪ Existing DC system are still adequate to cater for the augmentation. No allowance has been made for DC system augmentation.
	  ▪ Additional bays can be supplied from the existing AC system. No additional Main AC board has been allowed for. Only outdoor LV kiosks have been allowed for.
	  ▪ Allowance for spares on the substation of [redacted] as per Contractual Spares Requirement List provided by Transgrid.

Exclusions	▪ Installation of Capacitor Bank is excluded from S3, as it is part of different project. ▪ No allowance for switching works on the remote substations. ▪ No allowance to installed power supply from distribution pole. ▪ No allowance for optic and radio repeater stations. ▪ No allowance has been made for FOREX other than as noted. ▪ No remobilisation of energisation crews has been included

3.4.12 Substation Works – Buildings and Site Services

Buildings and Site Services	
Basis of Estimation	▪ The FTC elements of works have been quantified and benchmark rates applied to the measurement
Assumptions/Allowance	▪ It is assumed that these buildings, other than the Syncon building, are all typical construction to be found on similar projects and as such, benchmark rates have been utilised. ▪ While the Payment Schedule provides percentage complete for the synchronous condenser buildings at substations, the composition of the incomplete scope is not known, therefore reasonable assumption was made around completion scope, including quantity of secondary services installed. It is also noted that at Buronga the same building houses the synchronous condenser for S1a and S1b and the completion percentage has been applied as per Payment schedule 63 to both of these.
Exclusions	▪ On site training

3.4.13 Substation Works – Handover to Commissioning

Handover to Commissioning	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates and productivity rates
Assumptions/Allowance	▪ Planned outages will align to the requirements of the construction schedule. ▪ Commissioning allowance has been made for new protection and control panels and primary plants. ▪ Factory Acceptance Test (FAT) allowance [redacted] person hours for Dinawan, [redacted] person hours for Buronga S1b and [redacted] person hours for Wagga Wagga. ▪ Site Acceptance Test (SAT) allowance [redacted] person hours for Dinawan, [redacted] person hours for Buronga S1b and [redacted] person hours for Wagga Wagga. ▪ HV testing allowance [redacted] person hours for Dinawan, [redacted] person hours for Buronga S1B and [redacted] person hours hrs for Wagga Wagga
Exclusions	▪ Transgrid commissioning

3.4.14 Bonds, Insurance and Long Service Levy

Bonds, Insurances, and Long Service Levy	
Assumptions/Allowance	▪ Insurances, bonds and payment of Long Service Levy (LSL) have been calculated based on the additional estimated project cost over and above the contract award figure of circa $1.4B for the works. ▪ Insurances, LSL and bond payment is as per Payment Schedule 63 ▪ Escrow Account of [redacted] as advised by Transgrid. [redacted] This cost is included in the preliminary costs – line item Insurances.
Exclusions	▪ Any payment or adjustment prior to Payment Schedule 63.

3.4.15 Special Protection and Communication and Balance of Works

Special Protection	
Assumptions/Allowance	▪ Special Protection, Communications and balance of works is as advised by Transgrid, based on the remaining cost from Payment Schedule 63 ▪ An allowance of [redacted] has been made within the FTC for this work as advised by Transgrid.

3.4.16 Indirect Costs

The Indirect Cost for the FTC includes the costs that the contractors will incur in preparing and/or executing their design, providing plant and equipment, site and camp facilities, offices and compounds, project management, construction management, site supervision and the like.

Generally, the indirect costs have been built up as a bottom-up estimate with recent benchmark cost rates applied to the relevant time, value or fixed elements of work. The table below provides a summary of indirect FTC costs ($ AUS), while details of each of the indirect cost WBS items is provided in the sections below.

Table 6 - Indirect Cost Breakdown

WBS	Description	L2	L4	L5	S1B	S2	S3
2.1	Site Establishment and Mobilisation						
2.1.1	Establish Site Office						
2.1.2	Mobilise to Site						
2.2	Site Management Costs						
2.2.1	Project Management	[redacted]					
2.2.2	Camp Accommodation						
2.2.3	LAFHA Uplift						
2.2.4	Travel Allowances inc. Site Transport						
2.2.5	Contingency – Contractor's Risk	Included as P50 and P90 risk allowances					
2.3	Site Running Costs	[redacted]					
2.4	Demobilisation Costs						
	Insurances, Bonds, LSL, etc						
		[redacted]					
	TOTAL						

Pro rata allowance for L1 and S1a are [redacted] and [redacted] giving a total of [redacted] for preliminaries, project management, insurances and accommodation

3.4.17 Site Establishment and Mobilisation

WBS Item 2.1 - Site Establishment and Mobilisation	
Basis of Estimation	▪ Generally, the FTC has been built up as a bottom-up estimate with recent benchmark cost rates applied to the relevant time, value or fixed elements of work
Assumptions/Allowances	▪ All camps have been constructed.

	▪ The cost of the construction of all site offices is completed WBS Item 2.1.1 – Site establishment and mobilisation. ▪ The cost of the construction of the camp accommodation is completed WBS item 2.2.2 – Camp Accommodation
Exclusions	▪ Not applicable

3.4.18 Site Management Costs – Project Management

WBS Item 2.2.1 - Site Management Costs - Project Management	
Basis of Estimation	▪ The FTC makes allowance for the project management team, including supervisors, for the project duration, until completion of handover to commissioning for each work package ▪ Team of [redacted] commissioning support staff during the Transgrid commissioning period (assumed as 6 months) ▪ Recent benchmarking cost for project staff have been used to undertake the calculations
Assumptions/Allowances	▪ The calculations for the indirect costs have been built on the premise that there is a site accommodation/office at each of the five accommodation camps. ▪ Generally, L2 and L4 share resourcing, L5 has an independent team and there are shared resources for the three substation projects.
	[redacted]
	Turner & Townsend has estimated the project management resources based on benchmarking and industry standards; however, we note that resourcing requirements can vary significantly from project to project based on the construction methodology, contracting strategy, contractual arrangements, other factors for a particular project.
	A social legacy levy of [redacted] has been included within the project management cost. This value was supplied by Transgrid.

The benchmark crew to supervision ratios used to calculate the supervision and engineering support are outlined in the table below -:

Table 7 - Crew to Supervision Ratio

	Supervision and support per crew			
Activity	**Foreman**	**Supervisor**	**Project Engineer**	**Senior Project Engineer**
Clearing / access tracks, crane and stringing pads and re-instatement	[redacted]			
Tower assembly and erection				
Stringing Operations Crew				

3.4.19 Site Management Costs – Site and Camp Accommodation

WBS Item 2.2.2 - Site Management Costs – Site and Camp Accommodation	
Basis of Estimation	▪ Benchmark costs from recent projects for running costs.
Assumptions/Allowances	▪ All site and camp accommodation is built and operational with all supporting facilities completed. ▪ Camp running costs for all camps of [redacted] with Approx. [redacted] bed nights which included the nominated surge capacity [redacted] allowance. ▪ We have not undertaken a manning histogram or a resourcing leveling exercise. It is assumed that if the camps do not have capacity, local accommodation is available. Our estimate, however, does not provide any uplift for this situation. ▪ Demobilisation allowance of [redacted] bed has been allowed for camps. This has been benchmarked from a recent demobilisation project in remote Western Australia. ▪ A camp capacity of [redacted] bed has been adopted as advised by Transgrid
Exclusions	▪ Any site accommodation costs for Owners Team and Owners engineering team.

3.4.20 Site Management Costs – Living Away from Home Allowance (LAFHA)

WBS Item 2.2.3 - Site Management Costs – LAFHA	
Basis of Estimation	▪ The base estimate labour rates include the necessary LAFHA allowance on the understanding that all accommodation is within camps paid for the contractor. ▪ The base estimate staff and supervision rates include a LAFHA allowance on the understanding that all accommodation is within camps paid for the contractor. The LAFHA allowance is assumed at [redacted]/night payable only for nights in camps/alternate accommodation. ▪ All meals are included in the accommodation strategy.
Assumptions/Allowances	▪ [redacted] FIFO for staff and labour.
Exclusions	▪ Outcomes of any current discussion of new EBAs.

3.4.21 Site Management Costs – Travel Allowances

WBS Item 2.2.4 Site Management Costs – Travel Allowances	
Basis of Estimation	▪ [redacted]
Assumptions/Allowances	▪ Bussing – only for the airport transport, not to work fronts or between camps and site offices. ▪ All flights allowed as per roster stated in Section 3.4.1. ▪ International economy flights for tower assembly and erection and stringing crews allowed ▪ Additional allowance over and above the flight costs of [redacted] for emergency accommodation, flight delays, etc. This is approximately [redacted] ▪ Site vehicles for labour and staff – one vehicle per four crew for travel to work sites and one for each staff member. ▪ [redacted]
Exclusions	▪ Any allowances over and above those described above

3.4.22 Site Management Costs All – Site Running Costs

WBS Item 2.3 – Site Running Costs	
Basis of Estimation	▪ Site running costs include recurring site establishment costs and IT/office expenses, site services and communication, small tool allowance and survey crews
Assumptions/Allowances	▪ Allowance has been made for office accommodation of [redacted] people in Sydney and [redacted] people in Wagga Wagga for the remainder of the construction period. ▪ Recuring site establishment costs include site maintenance, office cleaning and rubbish removal, statutory testing of office equipment and common plant ▪ Recurring IT/site office expenses include IT licensing and software and any CCTV licences ▪ Nonrecurring site services include cost of international visas, cost of inductions, medicals and training (with a thirty percent staff churn allowance) ▪ Recuring site services include HR support services, minimal security guarding, PPE, power and water consumption and site communication charges ▪ Traffic management allowance for works to access points on main highways – no allowance made for access points to minor roads and gravel tracks ▪ Survey crews included to support the construction services
Exclusions	▪ Allowances over and above those described above

3.4.23 Mobilisation and Demobilisation Costs

Mobilisation and Demobilisation Costs	
Assumptions/Allowances	Allowance includes: ▪ Mobilisation and demobilisation cost for training crews ([redacted]) ▪ Rehabilitation allowance of [redacted] overall for camp and site accommodation facilities

3.4.24 Emergency response team

Emergency response team	
Assumptions/Allowances	[redacted]

3.4.25 Handover to Commissioning

Contractor Commissioning	
Assumptions/Allowances	▪ Generally as noted within section 3.4.7 and 3.4.13 ▪ Handover to commissioning includes pre energization and hand over to the Transgrid commissioning team. This consists of testing of fibre (OPGW) to the last transmission tower, and the line to the point of departure. ▪ No allowance for final commissioning of stations or lines via the fibre (OPGW) on the transmission lines (this is considered part of the Transgrid commissioning works). ▪ Team of [redacted] commissioning support staff during the Transgrid commissioning period (assumed as [redacted])

3.4.26 Escalation

Escalation	
Assumptions/Allowances	Escalation indices have been prepared by Turner & Townsend Construction Economists as part of an independent study commissioned by Transgrid on past and future cost escalation on energy transmission projects in New South Wales. The escalation indices cover the key cost categories for inputs into energy projects and include: Construction labour, Structural steel, Concrete, Copper, Electrical Equipment, Aluminium, Civil works, Buildings, Construction equipment, Road freight, Shipping (International), Sub-contractors, Consultants, and CPI. The study examines the movement and drivers of cost increases during three key phases of the project, which span the following timeframes: ▪ Phase 1: Final pricing (Oct 2020) to contract Award (Jun 2021) ▪ Phase 2: Contract award (Jun 2021) to construction start (Oct 2023) ▪ Phase 3: Construction start (Oct 2023) to construction scheduled end (Sep 2026) **Key findings** **Phase 1:** The COVID-19 pandemic was still heavily impacting global markets, including Australia, where states continued to be place in and out of lockdowns. At this time, global supply chain disruptions were increasing, which would kick-start a series of supply chain constraints that heavily impacted construction costs. Commodity prices were the first to prices spikes [redacted], aluminium [redacted], and copper recording significant growth over this period. Shipping costs also surged [redacted] added to these pressures, which pushed up the cost of imported goods into Australia. These factors set the scene for significant price inflation for many key inputs into construction in the following years. **Phase 2:** A perfect storm of factors came together during this time, generating some of the strongest price growth on record for construction goods and services in Australia. Global supply chain disruptions continued to escalate throughout Phase 2, reaching their peak in the second half of 2022.

	Most of the inputs in energy transmission projects experienced record growth between 2020 and the end of 2022, particularly those that were imported from other markets. This included steel [redacted], copper [redacted] electrical equipment [redacted], aluminium [redacted], and construction equipment [redacted]. Transportation costs also surged during this time, with shipping costs surging by more than 290 percent through to their peak, while road freight costs also shot up by 18 percent due to the rebound in oil prices. Adding to these intense cost pressures, was a growing shortage in construction workers across Australia, which were accentuated following the prolonged closure of international borders. The combination of these factors drove a sharp spike in construction costs across the country, which is evident in the indexes for building and civil works, recording growth of 18 percent and 16 percent, respectively, during this period. **Phase 3:** Building material costs eased during this period, however, higher labour costs due to skills shortages, and increased margins and risk continue to add premiums to construction projects in New South Wales. There is the potential for further easing in input costs as a result of the trade tensions between China and the US, and as other global markets look to divert their exports away from the volatile US market. Costs for inputs related to commodity prices, such as steel, copper, aluminium, and equipment are likely to experience the benefits of this. However, heightened volatility and increased uncertainty in the global landscape are making the outlook highly uncertain and are increasing risks for construction costs in the outlook. [redacted] [redacted]

4. Forecast to Complete – RISK Findings

4.1 Risk – Methodology and Approach

Turner & Townsend have updated the independent Project Risk Register initially developed for the July 2024 risk evaluation. The risks were ranked using the Transgrid risk matrix. The following Extreme risks are assessed to be Extreme:

- TG-04-1 Skilled person power availability and retention - Contractor
- TG-57 Staging and PM Issues
- 13 Productivity - Stringing and Towers

A further 10 High risks, 12 Medium and 4 Low risks were also identified and ranked.

The contingency was evaluated utilising an integrated Quantitative Schedule and Cost Risk Analysis (QSCRA) process utilising the risks in the Project Risk Register to inform the risk.

4.2 Basis of Risk Analysis

The following sources were considered in the risk process:

- Project Risk Register developed by Turner & Townsend for the FTC report in 2024 and reviewed and updated for Rev C
- Project Summary Schedule.
- FTC Cost Estimate updated for Rev C

The cost estimate, schedule and risk register were imported into the Safran Risk™ tool to form the basis of an integrated cost/schedule/risk QRA model. This enabled costs to be mapped directly to the schedule and risks mapped simultaneously to cost and schedule. This provides enhanced integrated analysis of the risk impact on the project.

4.3 Risk Workshops

The following risk workshops and meetings were conducted to update the risk register and the inputs to the quantitative cost and schedule risk analysis and review results. The workshops were limited to Turner & Townsend attendees:

1. Risk identification workshop – 9 April 25
2. Cost risk quantification workshop – 23 Apr 25
3. Cost risk quantification workshop – 30 Apr 25
4. Schedule risk quantification workshop – 2 May 25
5. Client risk review – 23 Jun 25
6. Turner and Townsend Risk update review – 26 June 25.

4.3.1 Quantitative Schedule and Cost Risk Analysis (QSCRA)

The risk quantification workshops developed the input to the risk evaluation for cost and schedule, respectively. Inputs from the 2024 cost risk analysis were used where the cost estimate inputs had not changed. There was no QSRA in the previous assessment. The following was assessed against each scope item, cost and schedule:

- Inherent risk ranging of the cost estimate for quantity and rate uncertainty.
- Inherent risk range for the schedule activities
- Contingent risk quantification (cost and schedule) of the risks in the project risk registers.

4.3.2 Correlation

The cost and schedule risk ranges with common drivers (e.g., procurement rates within the same assumed contract or contact rates awarded in the same market) were correlated to represent those common risk factors in the risk model.

Table 8 - QRA Correlation Matrices

Type of Activity	Level of Correlation
Quantity ranges	[redacted]
Rate ranges	[redacted]
Schedule	[redacted]

The integrated cost and schedule risk model was developed in Safran Risk™. The risk model was run for 10,000 iterations using Latin Hypercube Monte Carlo simulation.

4.3.3 Risk Exclusions

The following areas of risks were excluded from the QRA as they are considered corporate risks and should not be covered by project CAPEX contingency or are outside the scope of the analysis. Contingency for these risks should be evaluated and held outside the project:

- Major scope change
- Commissioning activities and planned outages
- Client costs and risks to Client cost
- Government change/policy redirection
- Funding delay
- Force majeure events – Acts of God
- Accidents and safety events including road traffic accident
- Risks to operations and business case process
- Lost revenue
- Forex uncertainty
- Climate change impacts on policy
- Sunk costs.

The following specific risks from the register were excluded from the QRA:

- TG-04-2 & TG-17 Skilled resources availability and retention – Client – Client costs are outside of scope therefore this risk has been excluded.
- TG-07 Procurement / Supply chain issues – This risk has been closed and the analysis assumes all equipment is on site.
- TG-16 TransGrid and contractor interface ownership complications - Client costs are outside of scope therefore this risk has been excluded.
- TG-19 & TG-20 Wagga and Buronga substation planned & unplanned outages – This risk is not a construction risk and has thus been excluded from the analysis.
- TG-25 Energisation delayed due to regulatory environment (AEMO) – Regulatory factors are considered a business risk not a project risk and thus this risk has been excluded from the analysis.
- TG-26 New power line does not integrate into Transgrid network and systems – Transgrid has provided instruction that this would not be considered a project risk and has thus been excluded.
- TG-32 & TG-33 Wagga and Buronga substation: Damage to existing infrastructure - Construction does not require access to tie-in line. Not entering substation thus this risk has been excluded.

- TG-37 Site Safety – This risk is normally excluded as a business risk and thus has not been factored in the analysis.
- TG-46 Construction techniques/methodologies – This risk has been closed because contractor has been assessed for delivery capability and contract awarded.
- TG-53 Political – This is a business risk not a project risk thus is excluded from the analysis.
- TG-54 Stakeholder Engagement Milestones - Very low risk thus excluded from the analysis.
- TG-55 Stakeholder Engagement – Very low risk thus excluded from the analysis.
- TG-56 Logistics - The analysis assumes major equipment is on site.

4.3.4 QRA Assumptions

The assumptions which underpin both the FTC cost estimate, and the schedule were considered when evaluating the risk in the QRA process to ensure that the risk quantification was appropriate in the context of the underlying estimate and schedule assumptions.

4.4 Risk Evaluation Outcomes

4.4.1 Schedule and Cost Risk Outcome Drivers

The sensitivity analysis tornado graph below shows the impact of the top risks on the P90 cost ($) and schedule (days). The integrated analysis enables simultaneous evaluation of the impact of cost and schedule on the outcomes to the project. The top risks impacts show how much the risk exposure is and provides support in justifying spending on mitigations to control the risks.

Figure 1 Sensitivity Analysis - Cost & Schedule

The probabilistic critical paths are listed below with the criticality.

Path#1 – L5 Construction - [redacted] criticality

Path#2&3 – L2 Construction – [redacted] criticality

Path#4 – Substation S2 Construction – [redacted] criticality

The figure below shows the critical path activities from the summary schedule.

[redacted]

Table 9 - Contingency Evaluation – Cost Risk

Transgrid (Rev C)	Estimate	P10	P50	P90
	$ million	$ million	$ million	$ million
		[redacted]		
Total Cost (Estimate & Contingency)				
Risk Contribution ($)				
Variation from base estimate (%)				

The analysis shows that the estimate has a [redacted] level of confidence. A further [redacted] is required to provide a P90 level of confidence. [redacted]

Note: P50 cost is the Project Cost with sufficient contingency to provide a 50 per cent likelihood that this cost would not be exceeded. P90 cost is the Project Cost with sufficient contingency to provide a 90 per cent likelihood that this cost would not be exceeded.

The total cost outcome graph is shown below. The s-curve is read off the X-axis ($ cost) and viewers right Y-axis for cumulative probability (P10, P50, P90 etc...). The bar chart is read off the X-axis and viewers left Y-axis for likelihood of occurrence (most likely or mode outcome).

Figure 3 Total Cost Risk Distribution

The graph shows a significant tail from P90 to P100 of circa $300M. This exposure would not be covered by the P90 level of contingency envisaged for the project. (Footnote 1)

4.4.3 Schedule Risk Outcomes

The schedule contingency evaluation results are shown below:

Table 10 Contingency Evaluation - Schedule Risk

Transgrid	Schedule	P10	P50	P90
	22 Dec 26			
Handover to Commissioning Milestone				
Risk Contribution (days)				
Variation from base schedule (%)				

The final Handover to Commissioning milestone falls deterministically and with risk over the summer (November to March inclusive) when planned outages (not included in the scope of the analysis) are understood to be not permitted. This suggests early engagement to ensure planned outages can happen over the summer or the construction schedule is re-planned to complete late in the summer.

The schedule outcomes graph is shown below. The s-curve is read off the X-axis (date) and viewers right Y-axis for cumulative probability (P10, P50, P90 etc…). The bar chart is read off the X-axis and viewers left Y-axis for likelihood of occurrence (most likely or mode outcome).

Foot note: *There is a slight anomaly between Figure 3 and Table 9 because the risk analysis was completed prior to minor value refinements of the estimate. These late estimate refinements did not change the risk and accordingly, did not warrant re-running the risk model.*

Figure 4 Schedule Outcomes - Handover to Commissioning

5. Forecast to Complete – SCHEDULE Findings

5.1 Schedule – Methodology

The outcome of the independent assessment of the 'time to complete' (schedule) component is provided in the form of:

a) Master schedule outlining the work to complete, referred to hereinafter as "the Schedule," with activities representing key remaining works (please refer to Appendix D)

b) This section, which communicates the planning principles and development assumptions incorporated in the process of developing the Schedule. This section is to be read in conjunction with the Schedule.

This section of the report provides clear and concise information to help stakeholders understand the various components of the Schedule such as the WBS, key milestones, critical path, and the concepts behind logic, duration estimates, calendars, etc. It also communicates key schedule assumptions, schedule findings, risks, and opportunities.

5.2 Schedule – Approach

Turner & Townsend 's approach was to acquire the essential knowledge required for an independent assessment of the work to complete. We aimed to gather sufficient information to ensure high-quality output without compromising our objectivity. To achieve this, we used the following data sources.

- General project documents describing the scope of the project.
- Payment Schedule No. 63 dated 22 October 2024 which provided clarifications regarding the WBS and quantities of completed and remaining works.
- Project data publicly available on TransGrid websites and other online sources such as, Construction Environmental Management Plan (CEMP), Traffic Management Plan, Environmental Impact Statement (EIS) etc., which helped to inform work methodologies and other construction/sustainability-related considerations.
- Arial imageries, online maps, and Australian Bureau of Meteorology climate outlook reports

Turner & Townsend used common scheduling methodologies to establish a reasonable and well-informed estimate of the time to complete and thereby develop a realistic schedule. The Schedule has been developed using Primavera P6 which is designed based on the Critical Path Method (CPM) providing estimate of the longest duration of the project through the implementation of forward planning, and the identification of critical tasks that directly impact the project completion date through backward planning.

The Schedule is presented in Gantt chart which provides visual presentation of tasks, dates, durations, and dependencies on a timeline format that is easy to understand and track.

5.3 Key Schedule Assumptions

In the absence of certain information, the team has made key assumptions to develop the Schedule. These assumptions are considered reasonable for a high-level assessment and are designed to be flexible allowing for adjustments and rescheduling as needed. The key assumptions are as follows:

- Schedule Progress information is based on the Payment Schedule No. 63, dated 22 October 2024.
- The start of the task assumes that all land acquisitions are complete, and site accesses are granted. No time allowed for land acquisitions/accesses in the Schedule.
- The start of the task also assumes that all the remaining designs, issued for construction drawings, and remaining procurement tasks are complete. The Schedule shows milestone dates when remaining design and procurement tasks should be complete before they could impact the construction.
- The Schedule assumes that all project approvals, permits, and other regulatory requirements are in place and that no time allowance is made for any pending approvals.

- The Schedule also assumes that all camps are complete and will not affect mobilising resources. It further assumes resources are fully mobilised including all specialised trades, engineers, supervisors, safety person, plants, equipment etc.
- There are two calendars considered for office and construction works, details of calendars are provided in section 5.7.3 below. Inclement weather allowance has been added to the Schedule accounting for wet weather, hot weather, and wind. The activities representing the inclement weather allowance have been highlighted separately in the Schedule for ease of monitoring and drawdown management.

5.4 Key Drivers and Considerations

The team identified that transmission lines are the main activities driving the schedule. Activities for stringing, particularly, are impacting the critical path of the project.

The schedule was developed and resource-loaded with the assumption that bed capacity would not be an issue. It also assumes that some activities will occur concurrently with the agreed productivity

The camp capacities are considered for direct labours. The team has then assumed camps to service the nearest transmission line sections and substation.

The table below provides the key drivers identified by the team and the considerations made in the schedule. The team followed the key drivers in the following priority:

Priority	Key Driver	Consideration
1	Durations for Stringing Activities	The team included in the schedule details for the stringing activities to the smallest components to better analyse the sequence of work and movement of different trades within the stringing crew, resulting in a more accurate estimate of time and effort.
2	Estimation of Overall Workforce	After estimating the stringing workforce based on [redacted] stringing crews, the team estimated the overall workforce requirements, including for other activities such as tower foundation, tower assembly and erection, etc. The estimation of crews required for these other activities has in the first instance aimed to ensure adequate work fronts are provided to support the stringing operation. The resulting estimation have been sense checked to ensure the number of crews required for the other activities are likely to be available in the market. Substations person power have also been considered.
5	Labor Force Resource Levelling	The team undertook resource levelling to ensure availability of labor force. This resource levelling resulted in further updates to the critical path and project duration.
6	Equipment Loading	Equipment will be on site in good working when required by the crews to undertake work. No reduction in productivity allowance in base estimate for the equipment delay.

5.5 Key Productivities and Resources

Productivity rates and resourcing are key factors for effective planning and scheduling. In studying the Project, the team recognises that transmission lines construction productivity is the main driver for the Schedule. The team has estimated the number of crews required for each line to establish reasonable durations and production rates, while also considering capacity of the market to provide crews. Below are some of the key productivities and crew numbers for critical activities considered in the Schedule:

Table 11 - Summary of Key Productivities and Resources

FOUNDATION PRODUCTION	No. of towers remaining (based on % complete)	Hrs/ tower	12 person Crew days per tower	Crew days to complete	Working days to completion	Based on 8 crews	
L2							
Type 1 Structure - Light Suspension structure (RSF)							Towers/ week
Type 2 Structure - Guyed Suspension structure (RSG)							Towers/ week
Type 3 Structure - Light Angled Strain Tower (RTT)							Towers/ week
Type 4 Structure - Medium Strain Tower (RTU)							Towers/ week
Type 5 Structure - Heavy Strain tower (RTV/RTW)							Towers/ week
L2 Total crew days to complete							
FOUNDATION PRODUCTION	**No. of towers remaining (based on % complete)**	**Hrs/ tower**	**12 person Crew days per tower**	**Crew days to complete**	**Working days to completion**	**Based on 8 crews**	
L5							
Type 1 Structure - VSQ							Towers/ week
Type 2 Structure - VTQ/VTS							Towers/ week
Type 3 Structure - VTR/VTT							Towers/ week
L5 Total crew days to complete							

TOWER ASSEMBLY & ERECTION PRODUCTION	No. of towers remaining (based on % complete)	Hrs/tower - Assembly & Erection	9 person Crew days per tower	Crew days to complete	Working days to completion	Based on 9 crews	
L2							
Type 1 Structure - Light Suspension structure (RSF)							Towers/ week
Type 2 Structure - Guyed Suspension structure (RSG)							Towers/ week
Type 3 Structure - Light Angled Strain Tower (RTT)							Towers/ week
Type 4 Structure - Medium Strain Tower (RTU)							Towers/ week
Type 5 Structure - Heavy Strain tower (RTV/RTW)							Towers/ week
L2 Total crew days to complete							

TOWER ASSEMBLY & ERECTION_PRODUCTION	No. of towers remaining (based on % complete)	Hrs/tower - Assembly & Erection	9 person Crew_ days per tower	Crew days to complete	Working days to completion	Based on 9 crews	
L5							
Type 1 Structure - VSQ	[redacted]						Towers/ week
Type 2 Structure - VTQ/VTS	[redacted]						Towers/ week
Type 3 Structure - VTR/VTT	[redacted]						Towers/ week
L5 Total crew days to complete				[redacted]			

STRINGING PRODUCTION	Remaining Stringing KM (based on % complete)	No of 5Km section	Days for completing one 5Km stringing	Days for completing entire 358Km length	Crew person size	No of crews required	Stringing Km completed in a week using 3 crews	UOM
L2								
Formula							[redacted]	
Winch Setup/Draw Wire Pulling includes installation of running blocks and draw wire. Conductor stringing, sagging, termination, clamping, spacers, marker ball and bird protector-Includes OPGW and Earth wire.	[redacted]							*Km/ Week*
L2 Total crew days to complete							[redacted]	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	completed in a week using 3 crews	UOM
L5								
Formula							[redacted]	
Winch Setup/Draw Wire Pulling includes installation of running blocks and draw wire. Conductor stringing, sagging, termination, clamping, spacers, marker ball and bird protector-Includes OPGW and Earth wire.	[redacted]							*Km/ Week*
L5 Total crew days to complete							[redacted]	Km/ Week

5.6 Key Schedule Outputs

The team developed the schedule by following the steps identified in section 5.4 above adhering to the order of priority referenced in the table therein

The key completion dates for the remaining work packages after schedule adjustments are summarised in the table below:

Table 12 - Work Package Completion Dates

Work Package	Construction Finish Date (without Weather Contingency)
Transmission Line L2	[redacted]
Transmission Line L4	
Transmission Line L5	
Substation S1b	
Substation S2	
Substation S3	

5.7 Key Schedule Components

5.7.1 Work Breakdown Structure

The study of the provided documents informed the establishment of the Work Breakdown Structure. The team has considered a four-level WBS for the development of the Schedule as follows:

WBS level 0: Project

WBS Level 1: Phase, such as (Management/General – Engineering – Procurement – Construction – Commissioning)

WBS level 2: Sub phases/Areas, such as (Stage 1 – NSW Western Section – NSW Eastern Section – Pre-Commissioning, etc.)

WBS level 3: Project Deliverables, such as (Transmission Lines – Substations)

WBS level 4: Work packages, such as (Sections – Civil Works – Electrical Works, etc.)

5.7.2 Key dates / Milestones

In the absence of complete historical project information, the team was unable to establish an as-built section of the schedule reflecting completed work. Therefore, the team has focused solely on scheduling remaining work. The start date of the remaining work is the cut-off date of the provided Payment Schedule. Therefore, the Schedule data date is 21 October 2024, and is therefore the Schedule start date.

The Schedule includes separate deliverables for each line and substation, making it easy to obtain a finish date per deliverable and an overall project completion date. Additionally, The Schedule divides the work within each deliverable by job type such as civil, electrical, mechanical, handover to commissioning etc. This provides the Project stakeholders the ability to monitor work packages based on job type per deliverable as shown in the table below:

Table 13 - Job Type Completion Dates per Deliverable

Work Package	Job Type	Completion Date
Engineering Design Completion		[redacted]
Procurement		
Construction		
Construction		
Handover to Commissioning		
L4 – Buronga to Red Cliff		
	Civil Works	
	Tower Assembly & Erection	
	Stringing	
	Construction with Weather Contingency	
	Handover to commissioning	
S1b – Substation - Buronga		
	Civil Works	
	Mechanical Works	
	Electrical Works	
	Construction with Weather Contingency	
	Handover to commissioning	
L2 – Dinawan to Buronga		
	Civil Works	
	Tower Assembly & Erection	
	Stringing	
	Construction with Weather Contingency	
	Handover to commissioning	
L5 – Dinawan to Wagga Wagga		
	Civil Works	
	Tower Assembly & Erection	

Work Package	Job Type	Completion Date
	Stringing	[redacted]
	Construction with Weather Contingency	
	Handover to commissioning	
S2 – Substation - Dinawan		
	Civil Works	
	Mechanical Works	
	Electrical Works	
	Construction with Weather Contingency	
	Handover to commissioning	
S3 – Substation – Wagga Wagga		
	Civil Works	
	Mechanical Works	
	Electrical Works	
	Construction with Weather Contingency	
	Handover to commissioning	
Project Completion		
Reinstatement – L4		
Reinstatement – L2		
Reinstatement – L5		

5.7.3 Calendars for working and non-working periods

There are two types of calendars considered in the Schedule, one is used for design and engineering activities, and the other one is for construction and handover to commissioning activities. The detail of each type is as below:

Table 14 – Calendar Names and Explanations

Calendar Name	Description
Design and Engineering Calendar	Office Working Calendar ▪ Five days per week ▪ Eight hours per day as normal working time ▪ All NSW public holidays considered, also two weeks shut down been considered for Christmas break

Calendar Name	Description
	This calendar has been applied to Project management, engineering, and procurement activities.
Construction Calendar	

The site working calendar considers eight productive hours per day. (The eleven labour hours per day includes averaged travel time from camp to work front and meal breaks). Resources including workers, trade person, materials and equipment required for performing the scheduled tasks are assumed to be within a close vicinity of the construction sites at the beginning of the eight productive hours per day.

5.7.4 Constraints and Interfaces

In developing the Schedule, the team utilised constraints like "As Late As Possible" to establish a logical relationship between the remaining design and procurement activities and the construction works. These constraints allow the Schedule to reflect the latest possible completion dates for the initial tasks before they begin to impact the subsequent construction work (Backward Planning). This logic aligns with the key assumption that the interface of the remaining design/material procurement tasks with construction works should not cause any delays to the Schedule.

5.8 Basis of Schedule Estimate

This section of the report details the process of developing activity durations for inputs into the Schedule.

In estimating the project duration, the team used the Most-Likely estimate as the basis for the activity durations. These estimates consider all the known factors that could impact the duration of each activity. The most-likely duration estimate is derived from the estimated labour hours and crew sizes obtained from the estimation team. Various methods were employed to calculate these estimates, including bottom-up estimates, market research, expert judgment, and benchmarking.

The scheduling team has broken down the estimated labour hours by sections which together with number of crews available to work simultaneously and resource constraints, helped calculating the activity durations.

5.9 Inclement Weather Allowance

The Schedule contains inclement weather allowances accounting for wet weather, hot weather, and wind. The allowances were calculated based on historical data obtained from the Australian Bureau of Meteorology (BOM) online sources. The team identified three separate climate zones at Buronga, Dinawan, and Wagga Wagga.

The results obtained from these three locations were used for each relevant substation. As for transmission lines, the team has calculated the allowances by obtaining the average days from the two ends of each line. The table below provides the results of the weather allowances considered in the Schedule for each project deliverable:

Table 15 – Inclement Weather Allowances

Project Zone	Wet Weather	Hot Weather	Total Allowance	Allowance /Duration %
Line 2- Dinawan to Buronga	[redacted]			
Line 4 – Buronga to Red Cliffs				
Line 5 – Dinawan to Wagga Wagga				
Wagga Wagga - S3				
Buronga - S1b				
Dinawan - S2				

The weather allowance is represented as a free-standing activity at the end of each critical path of the relevant deliverable in the Schedule for visibility and better control.

Notes:
1 – The schedule contains the wind days nominated above. However, the estimate productivity allows for an additional 5% loss during stringing and erection activities to account for time during which 42km/h (or over) gusts stop works.

5.10 Basis of Schedule Logic

This section of the report explains the considerations made in the Schedule to define the relationships between activities and the dependencies between the different project sections.

5.10.1 Transmission lines:

The transmission line construction is divided into two work packages: Civil works and Tower assembly. The tower civil works are scheduled to start after vegetation clearing and site establishment. Once civil work is complete, the tower assembly and erection will commence followed by earthing, stringing, and clipping. The stringing section is detailed for more accurate estimate of time and effort.

[redacted]

Transmission Line L2 schedule considers separate crews for tower foundations and assembly, with [redacted] foundation crews and [redacted] tower assembly and erection crews working simultaneously. The stringing schedule is developed considering [redacted] separate crews for Line L2. Site Reinstatement works will follow once stringing is complete in a certain section.

Transmission Line L5 follows the same assumption as [redacted] crews for tower foundation, [redacted] tower assembly and erection crews. The stringing works has [redacted] separate crews for L5 and Site Reinstatement works will follow once stringing is complete in a certain section.

Transmission Line L4 foundations are complete, and a small number of towers are left to be installed. Therefore, the team considered only one section, and the schedule is simply based on one tower crew and one stringing crew.

In all the above lines, the logic and resource limitation of the stringing activities drives the schedule where the estimation of crews required for other activities has in the first instance aimed to provide adequate work fronts are provided to support the stringing operation.

The transmission lines commissioning work is split into pre-commissioning, and final commissioning. The pre-commissioning to be done by the contractor before handover to Transgrid. Transgrid will then undertake the final commissioning allowing for energisation of the line and connection to the main grid.

5.10.2 Substations:

Substations will follow the conventional construction logic for civil, mechanical, electrical, and commissioning works. Earthworks and access roads will be established to prepare the site for concrete works to establish foundations, trenches, and plinths for equipment. Mechanical, electrical conduits, and steel works will be undertaken to provide provisions for subsequent cable laying, wiring and equipment installation. Once equipment is delivered on site (delivery is assumed not to impact the construction works), the installation works will proceed followed by testing and commissioning. Civil, landscape, and reinstatement works can proceed meanwhile. Please refer to the schedule screenshot below for conventional substation activities.

Specific details related to each substation is provided below:

Substation S1b – Buronga is an expansion of the existing 220 kV Buronga substation and the works for S1a scope is largely complete. There are major construction and equipment to be installed. The team has studied the provided drawings and estimated the durations and logic based on benchmarking with other projects and after consultation with SMEs.

The testing and pre-commissioning of the substation S1b is considered to be executed by the contractor and then handed over to Transgrid to complete the final commissioning to connect to the main grid. Planned outages to connect the existing substation with the expansion are provided in the schedule.

Substation S2 – Dinawan is a completely new substation. There are major construction and equipment to be installed. The activities are based on reference drawings and benchmarking with similar projects.

The testing and pre-commissioning of the substation S2 is considered to be completed by the contractor and connected to the transmission lines by the contractor as this is a substation connected to the transmission lines under construction.

Substation S3 – Wagga Wagga is an augmentation of the existing substation, some equipment to remove and replace, and the connection with the existing substation requires planned outages, like the case in S1.

The testing and pre-commissioning of the Wagga Wagga substation is considered to be largely completed by the contractor and handed over to Transgrid for the final commissioning to connect to the existing substation.

5.10.3 Contractor Commissioning

The schedule makes allowance for pre energization and hand over to the Transgrid commissioning team. This consists of testing of fibre (OPGW) to the last transmission tower and the line to the point of departure.

Sub stations will be pre commissioned and there is no allowance for final commissioning of stations or lines via the fibre (OPGW) on the transmission lines (this is considered part of the Transgrid commissioning works)

We have allowed for a team of commissioning support staff during the Transgrid commissioning period. We have assumed a [redacted] period is required for this support post the completion of contractor pre -energisation commissioning works.

5.11 Schedule Findings

5.11.1 Constraints, interfaces, and dependencies

For the tower lines the main constraints are land access, road crossing where traffic plans need to be applied and restricted times observed.

The substations have constraints mostly for the planned outages. Scheduled outage dates must be observed and locked-in or the contractor can negotiate a non-planned outage to proceed with the handover to commissioning.

We understand that there have, to date, been no delays associated with the contractor not gaining a planned outages to suit the scheduled dates.

5.11.2 Critical Path commentary

The critical path flows through the L5-Dinawan to Wagga Wagga transmission lines. It will begin with the continuation of the clearing and access tracks works, followed by excavation works and foundation works. Tower erection will commence once the curing of the first foundation is complete, followed by stringing works, which will be completed a month after the foundation works. Upon completion of construction, pre-energization of the line will take place, and it will be connected to the main grid during planned outages. Finally, the TransGrid final commissioning will involve connecting all substations and lines to the main grid. Site reinstatement works will be the last to complete but will not affect the commissioning works; hence, they are not part of the critical path.

The near-critical path would be the S2 Substation – Dinawan, starting from the remaining civil works, moving to the HV/LV equipment installation, including cable pulling and termination, followed by equipment testing before connecting to the main grid. Finally, the TransGrid final commissioning will involve connecting all substations and lines to the main grid.

[redacted]

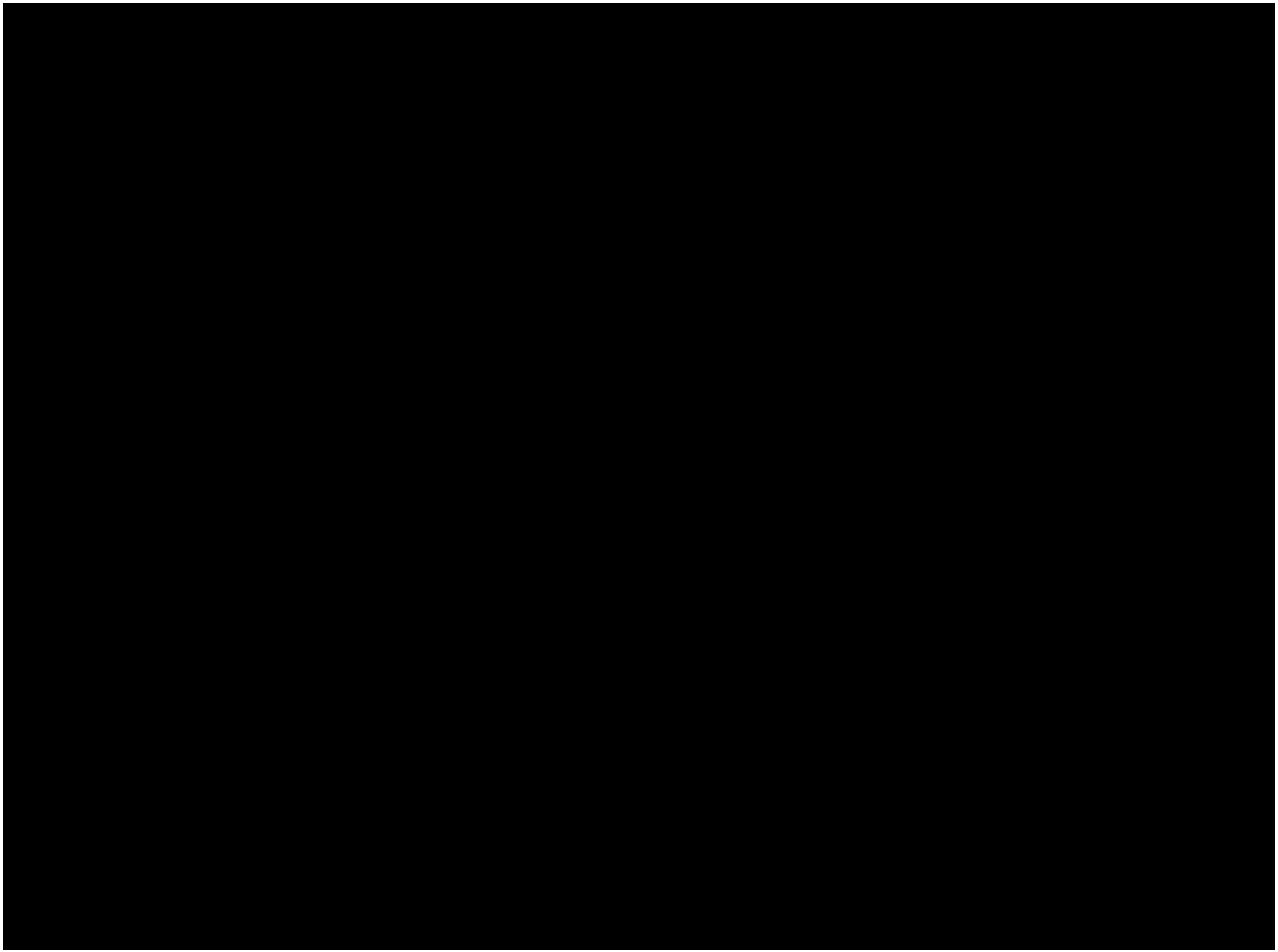
[redacted]

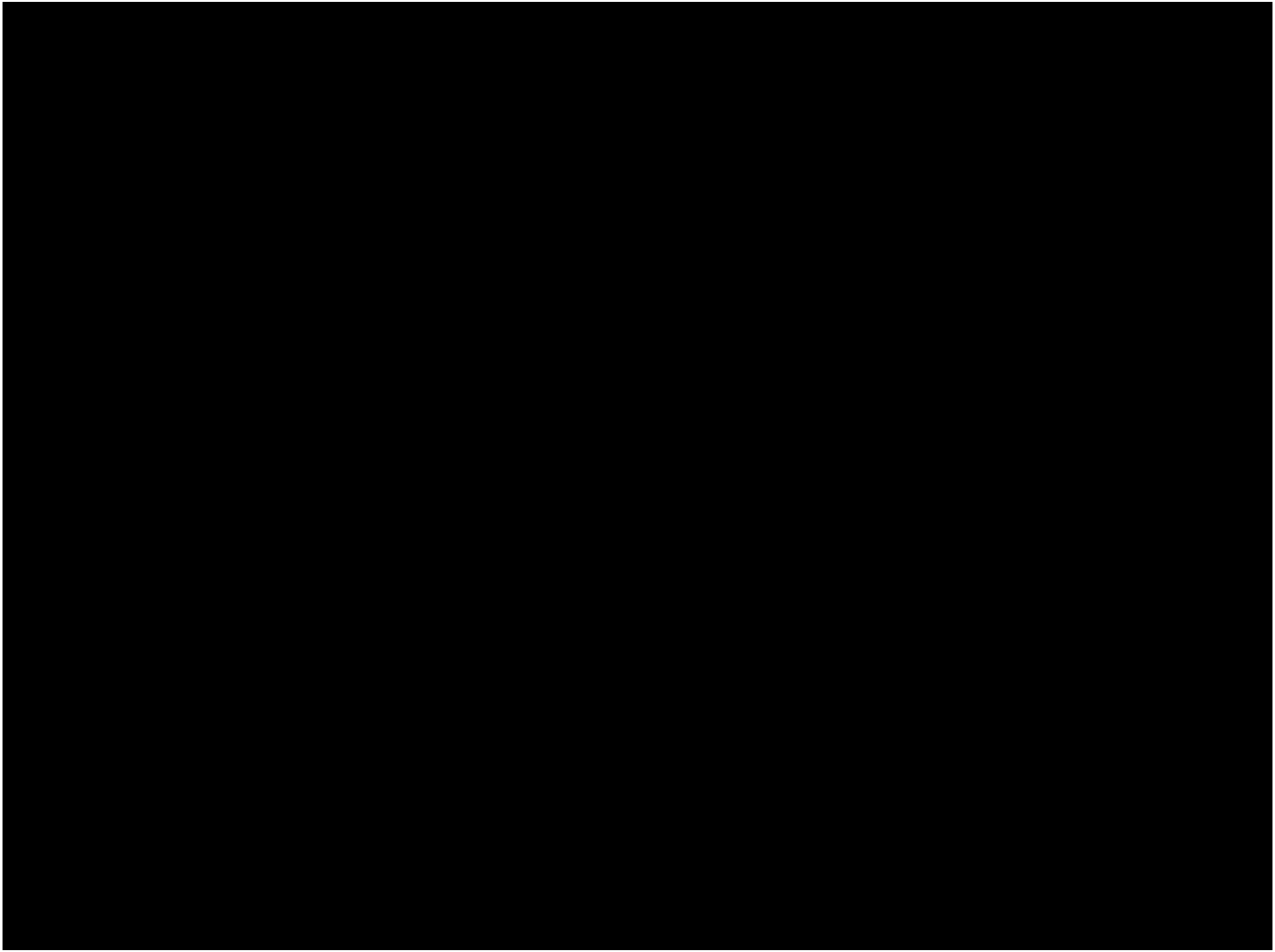
[redacted]

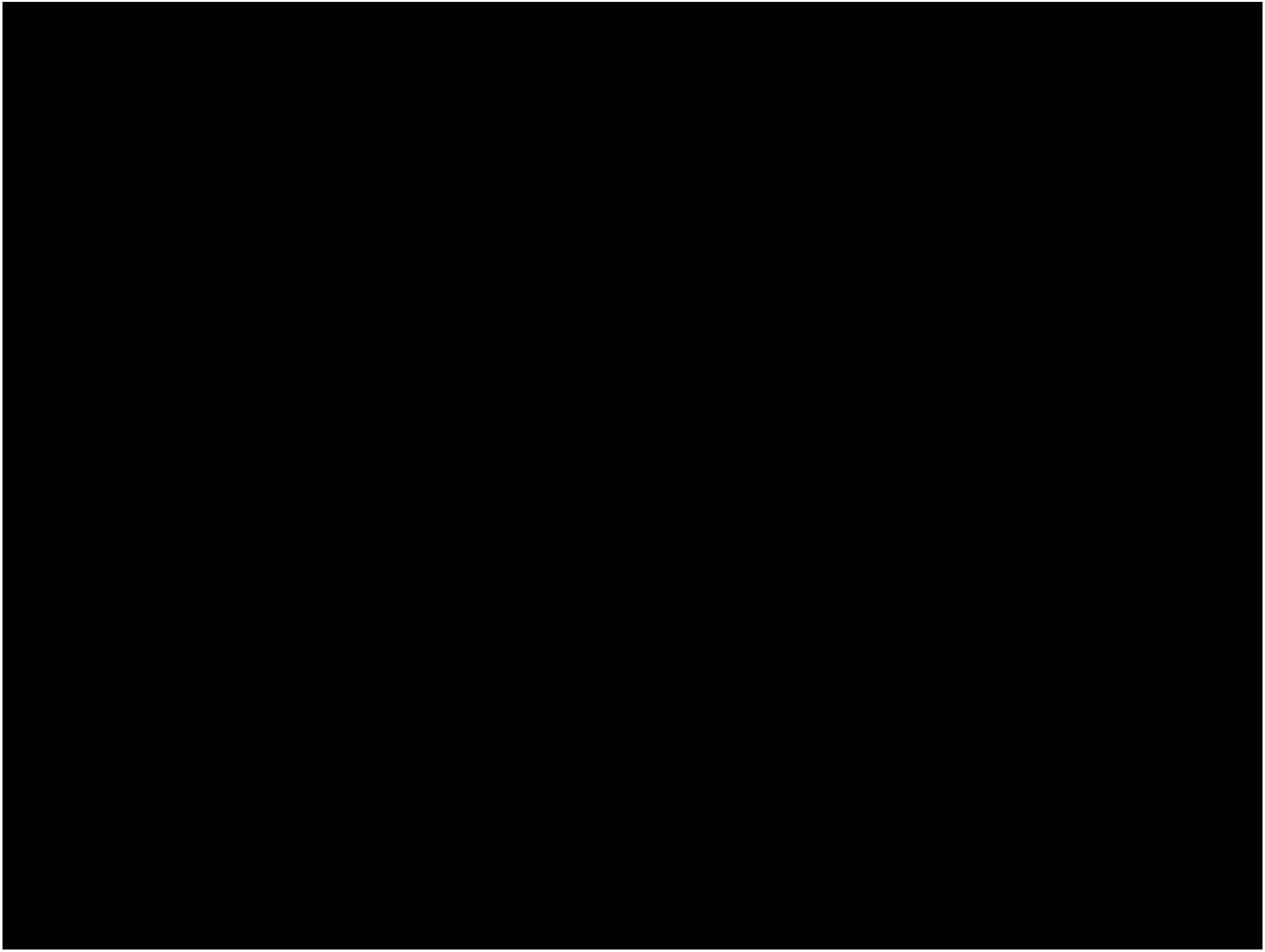
[redacted]

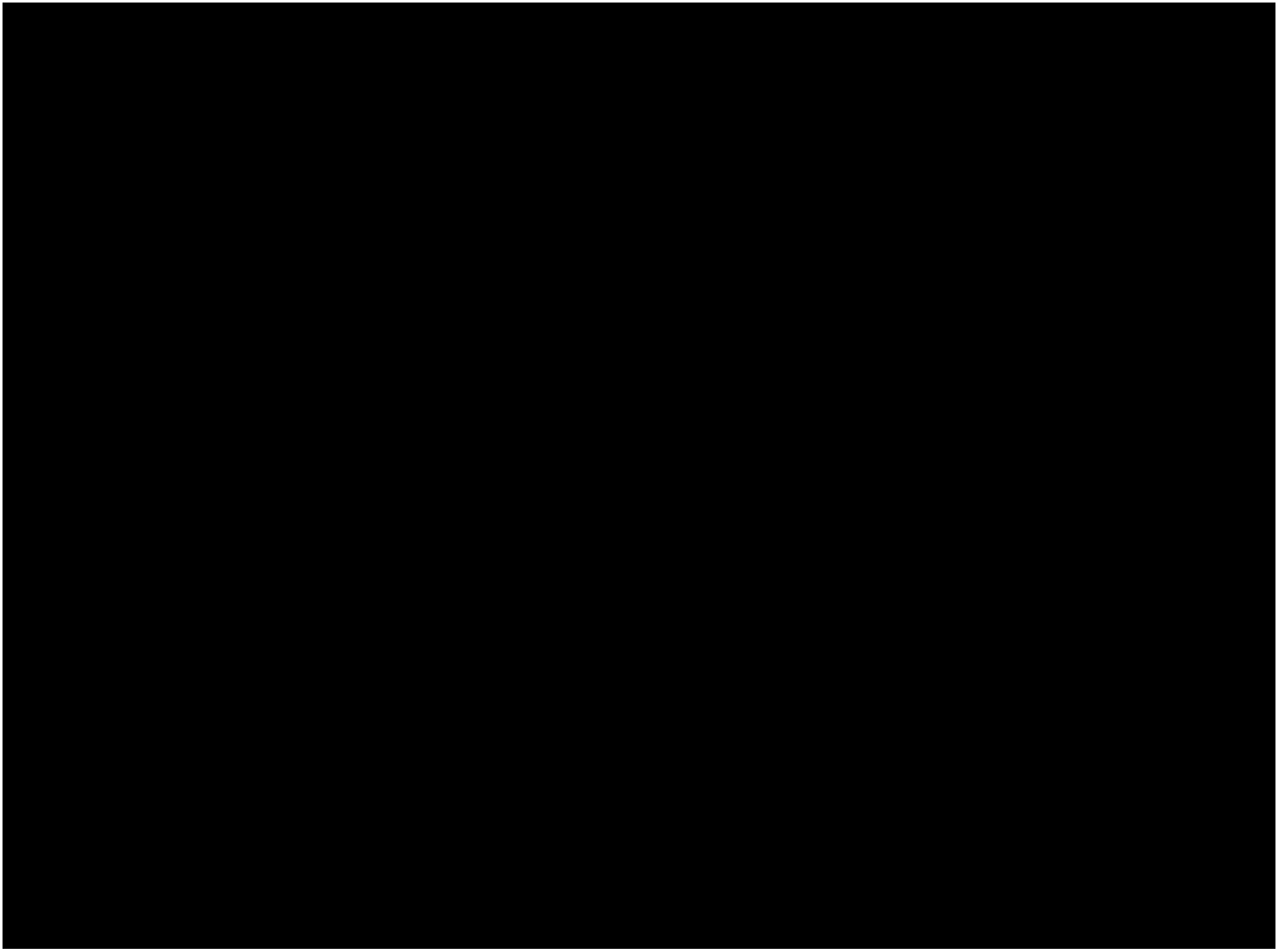
[redacted]

[redacted]









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