ERTECH KELLER JV

NEW PERTH STADIUM PRE-CONSTRUCTION WORKS

CONSTRUCTION METHODOLOGY & APPROACH

NOVEMBER 2014

NEW PERTH STADIUM PRE-CONSTRUCTION WORKS

PROJECT OVERVIEW

ERTECH KELLER JV

NEW PERTH STADIUM PRE-CONSTRUCTION WORKS

KEY ELEMENTS OF PLANNING AND DESIGN

- Client approach
  - Identified that works were required in advance of stadium build
  - Identified that specialist geotechnical skills were critical
  - Carried out critical planning, investigation and initial design in advance of tender period
- Workshops – risk and technical and commercial
  - Comprehensive series of workshops held both during the tender and negotiation stage to identify and address risks prior to commencement
  - For example detailed consideration given to the risk of wick drain refusal.
- Alignment of contractor design approach with client pre-planning and approval process

ERTECH KELLER JV

NEW PERTH STADIUM PRE-CONSTRUCTION WORKS

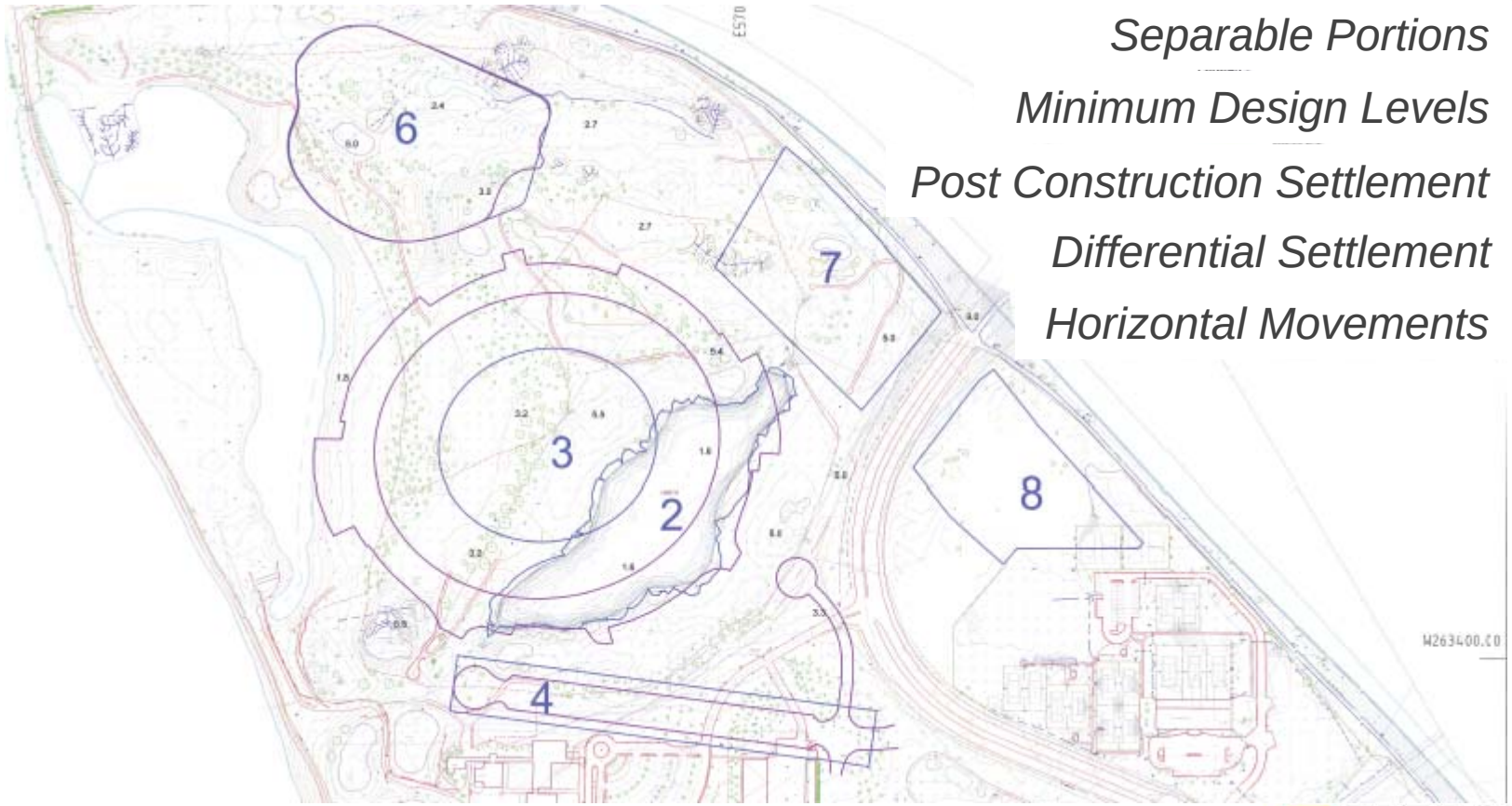
GROUND CONDITIONS

- Area used as tip – up to 10m of uncontrolled fill with no certainty on what we would encounter.
- Underlain by soft alluvial soils – very weak and prone to settlement
- Potential contamination of the soils from the fill eg Asbestos , elevated nutrient levels and chemical contamination such as hydrocarbons.
- Key issue was that the ground was already settling and has done for the duration of the golf course operation ie circa 20 years.

NEW PERTH STADIUM PRE-CONSTRUCTION WORKS

GEOTECHNICAL DESIGN

Performance Criteria



Separable Portions

Minimum Design Levels

Post Construction Settlement

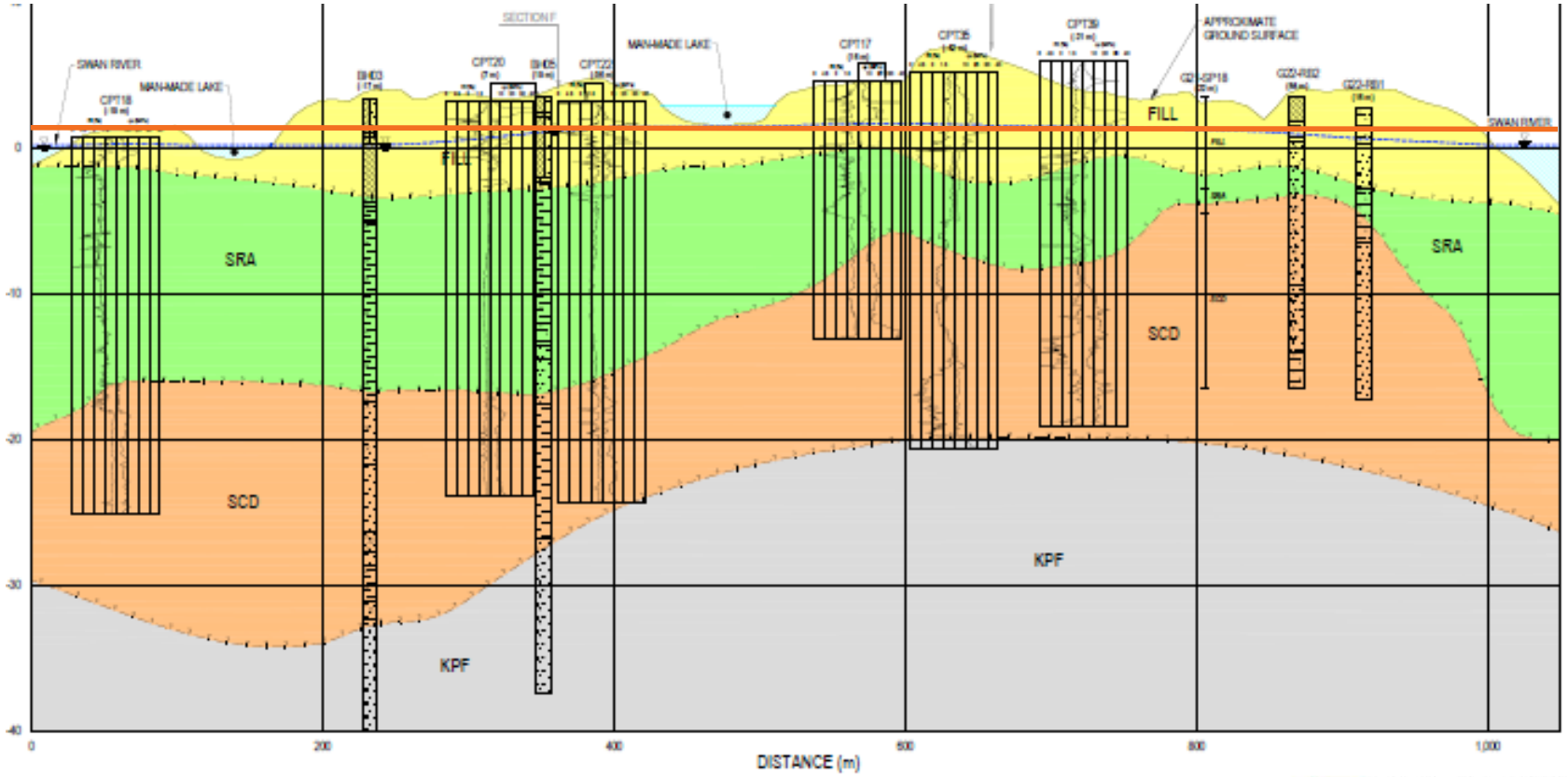
Differential Settlement

Horizontal Movements

NEW PERTH STADIUM PRE-CONSTRUCTION WORKS

GEOTECHNICAL DESIGN

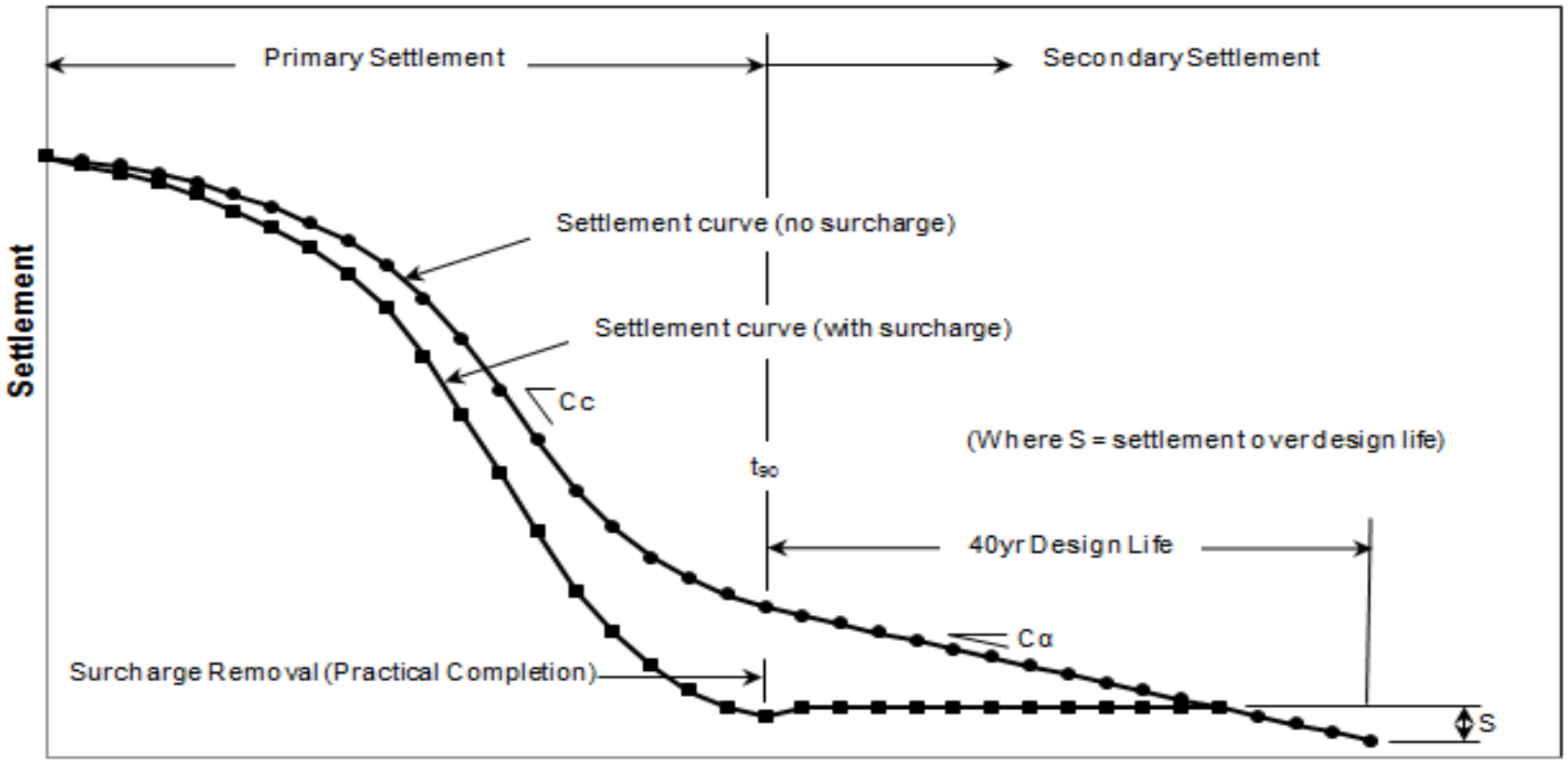
Ground Model Appreciation



NEW PERTH STADIUM PRE-CONSTRUCTION WORKS

GEOTECHNICAL DESIGN

Design Philosophy



NEW PERTH STADIUM PRE-CONSTRUCTION WORKS

ENVIRONMENTAL

- **Environmental risks significant and required detailed consideration as part of successful geotechnical solution:**
  - Minimal disturbance of contaminated materials throughout construction phases
  - Environmental Team with experience in all stages of works, from approvals to construction
  - Risk assessment process throughout project aligned with geotechnical solutions
  - Design focused on minimising disturbance and therefore risk

ERTECH KELLER JV

GEOTECHNICAL OPERATIONS

SELECTED TECHNIQUES

Principal Geotechnical Challenge	Chosen Technique	Benefits	Weakness
Improvement of Uncontrolled Fill	Dynamic Compaction	Proven technique; high energy, minimises disturbance or potentially contaminated fill	Vibration
Penetration past Obstructions	Pre-Punching using adapted Pile Driving Rig	No spoil; proven capability on nearby site; robust	High wear on mandrels.
Improvement of Swan River Alluvial Soil	Wick Drain & Surcharge	Known technology; minimal penetration area thru fill;	Limited ability to penetrate uncontrolled fill

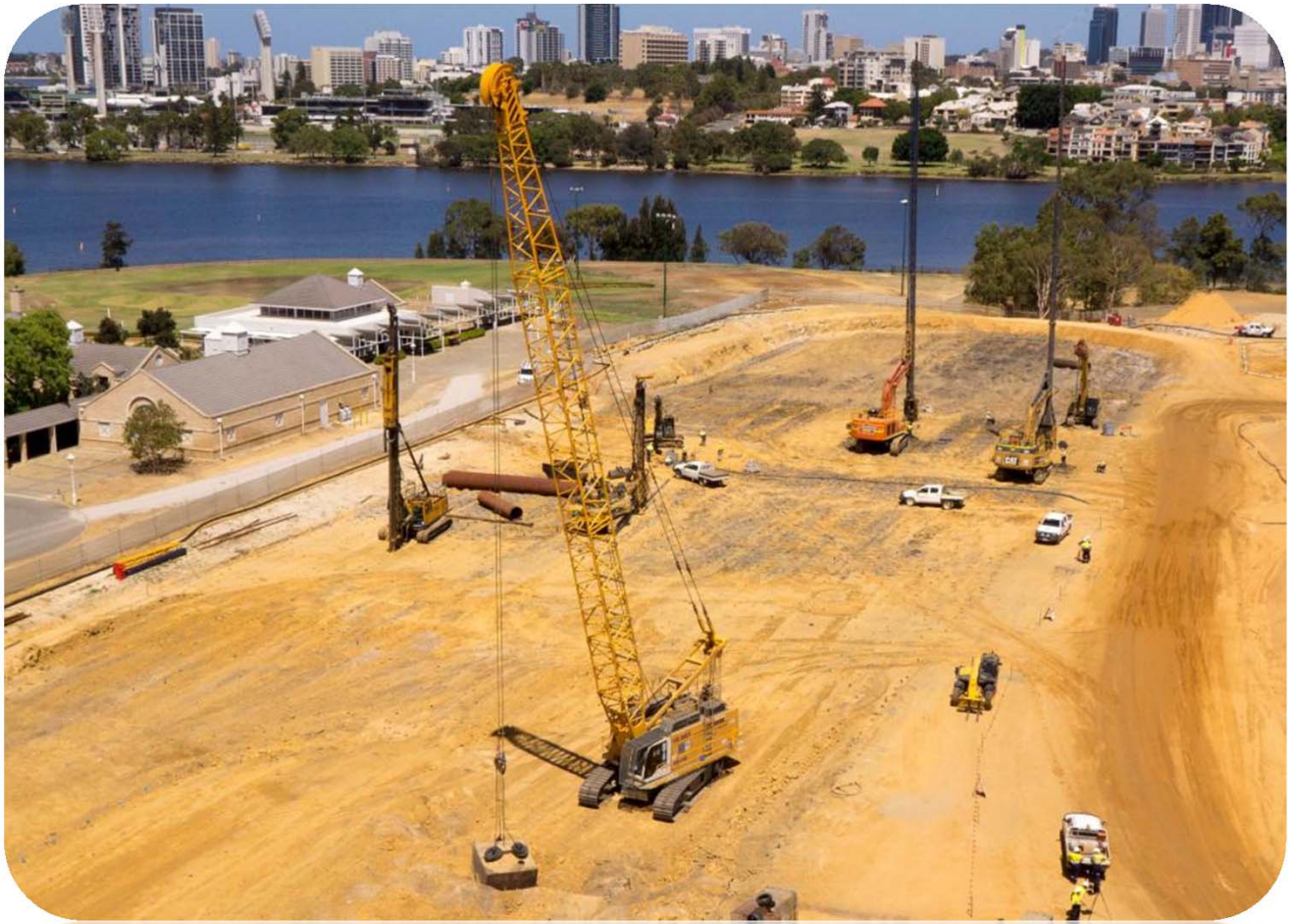
ERTECH KELLER JV

PLANT & EQUIPMENT

- Up to 5 No. WICK DRAIN RIGS
- Two sourced with Vibrators from Hayward Baker in USA
- Up to 5 NO. PRE-PUNCHING RIGS, -ranging from excavator mounted vibrators to full scale driven piling rig
- 2 No. DYNAMIC COMPACTION RIGS – Specifically manufactured modified 120tonne piling cranes.

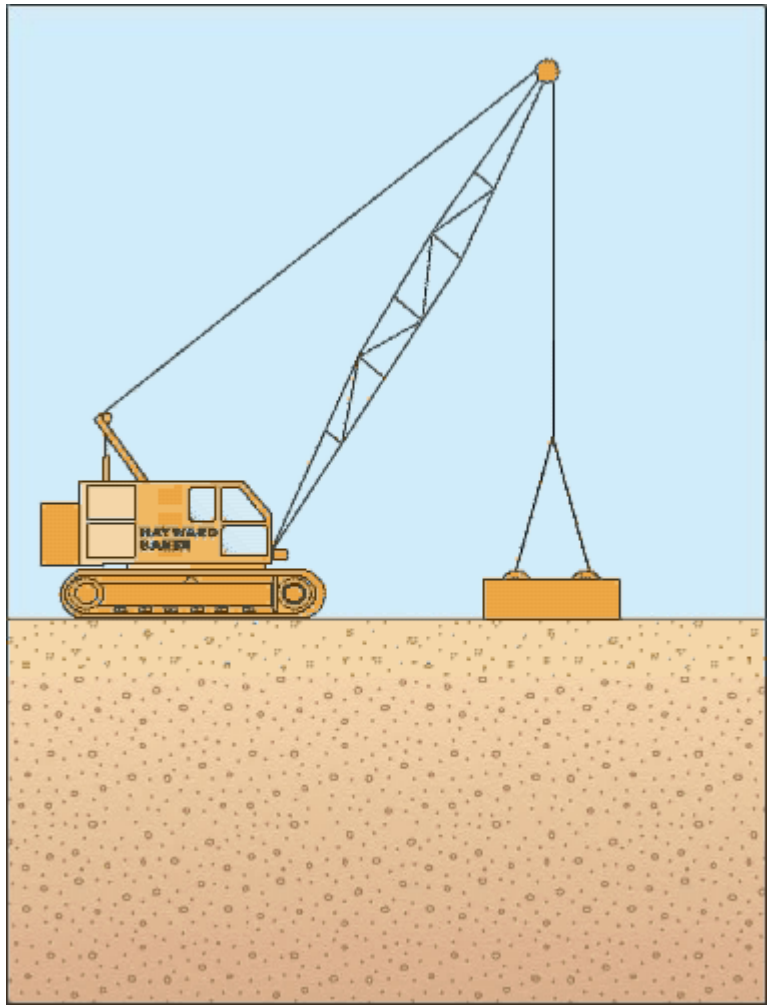
ERTECH KELLER JV

PLANT AND EQUIPMENT SPREAD



ERTECH KELLER JV

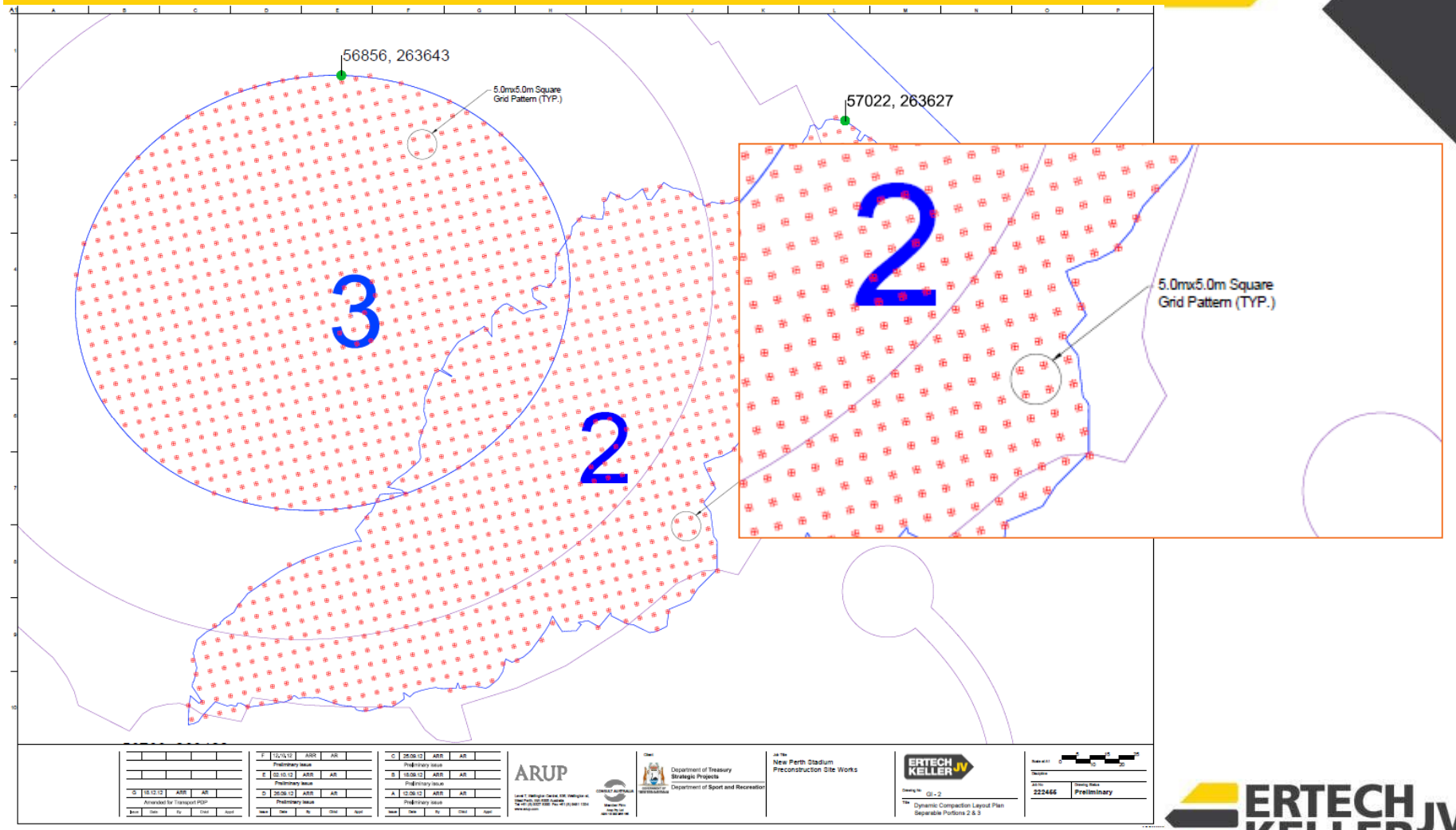
DYNAMIC COMPACTION



ERTECH KELLER JV

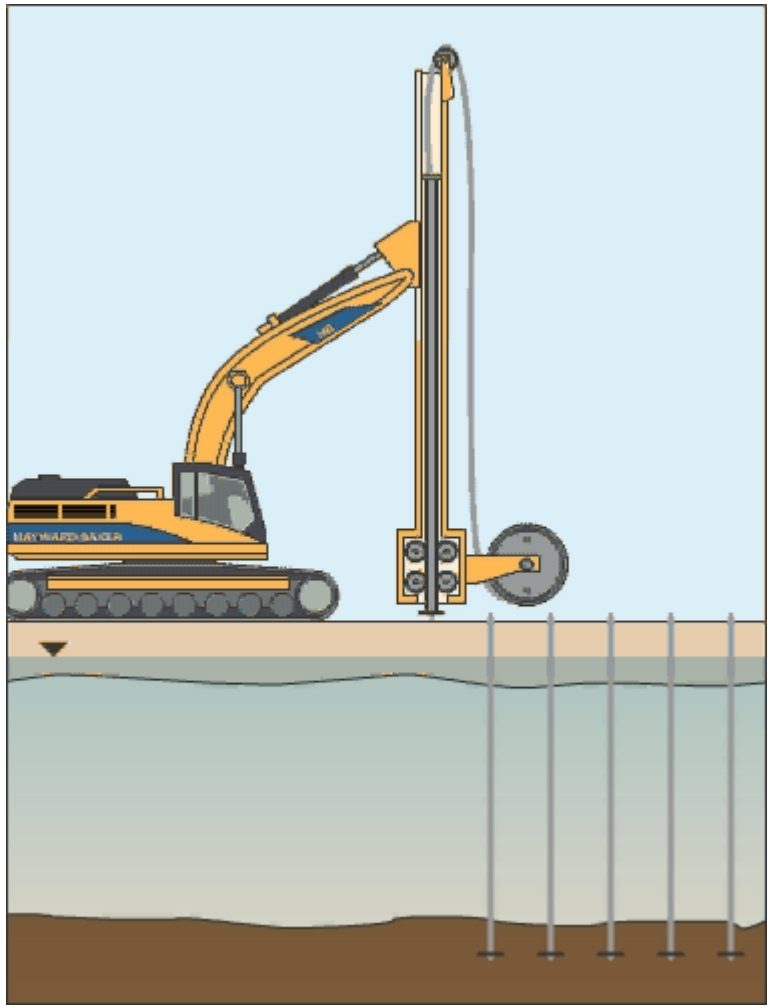
DYNAMIC COMPACTION LAYOUT

IMPROVEMENT OF FILL



ERTECH KELLER JV

WICK DRAIN INSTALLATION



ERTECH KELLER JV

GEOTECHNICAL OPERATIONS

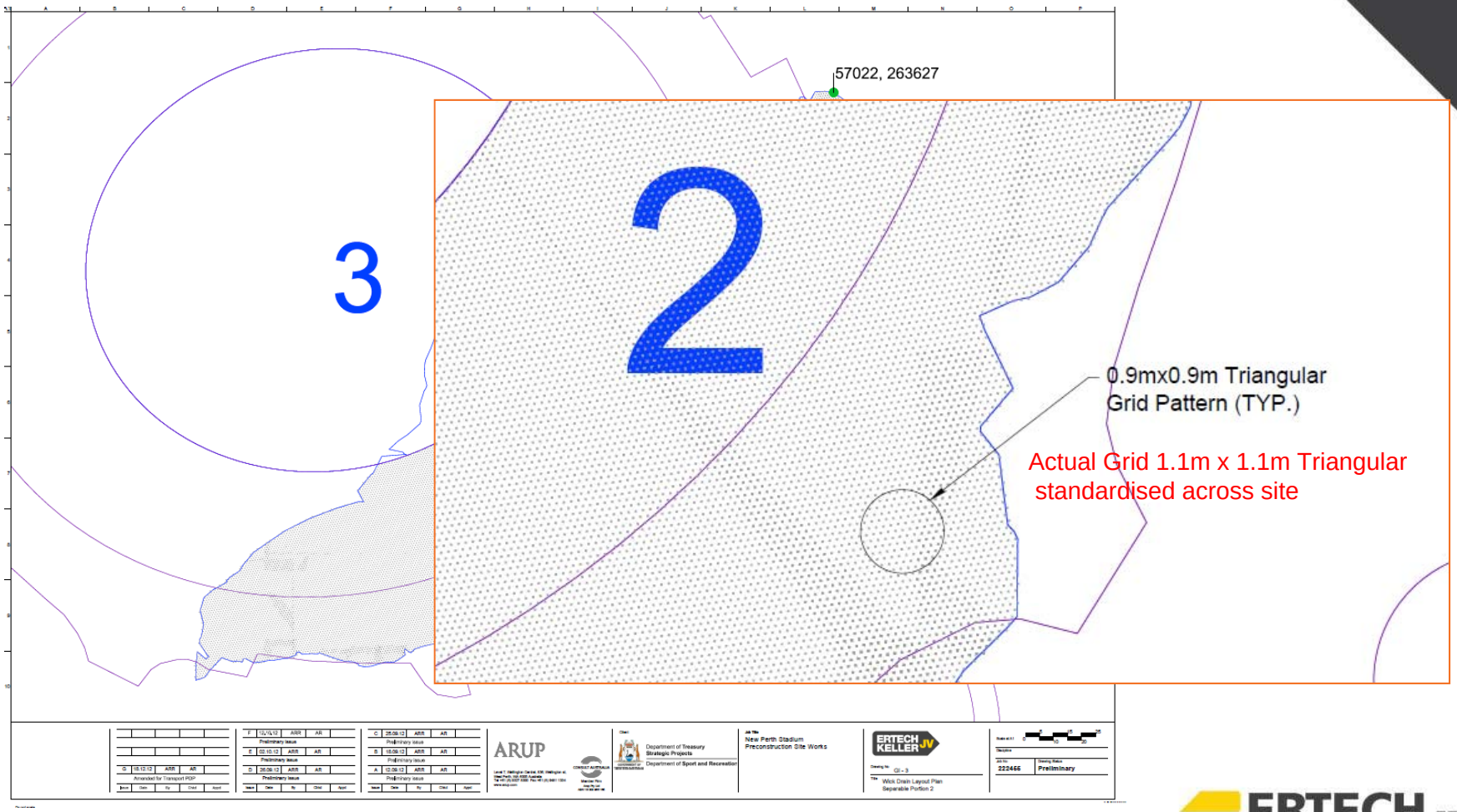
SEQUENCE OF CONSTRUCTION – TENDER ASSUMPTION

- Prepare and confirm safe working platform.
- First pass Wick drain installation – consider 36% refusals. (Actual 11.3%)
- First pass 2nd and 3rd attempt – consider 50% refusal of refused locations.
- Pre-punch at the remaining 18% of ‘failed’ locations. (Actual 6.2%)
- Second Pass Wick drain installation – target of 100% success rate exceeding our design rationale of 95% (Actual 100%)
- Main shift was not just due to the ground conditions but to selection of the wick machines with vibrators and the punching methodology and sequencing.

ERTECH KELLER JV

WICK DRAIN LAYOUT

IMPROVEMENT OF SRA



ERTECH KELLER JV

WICK INSTALLATION

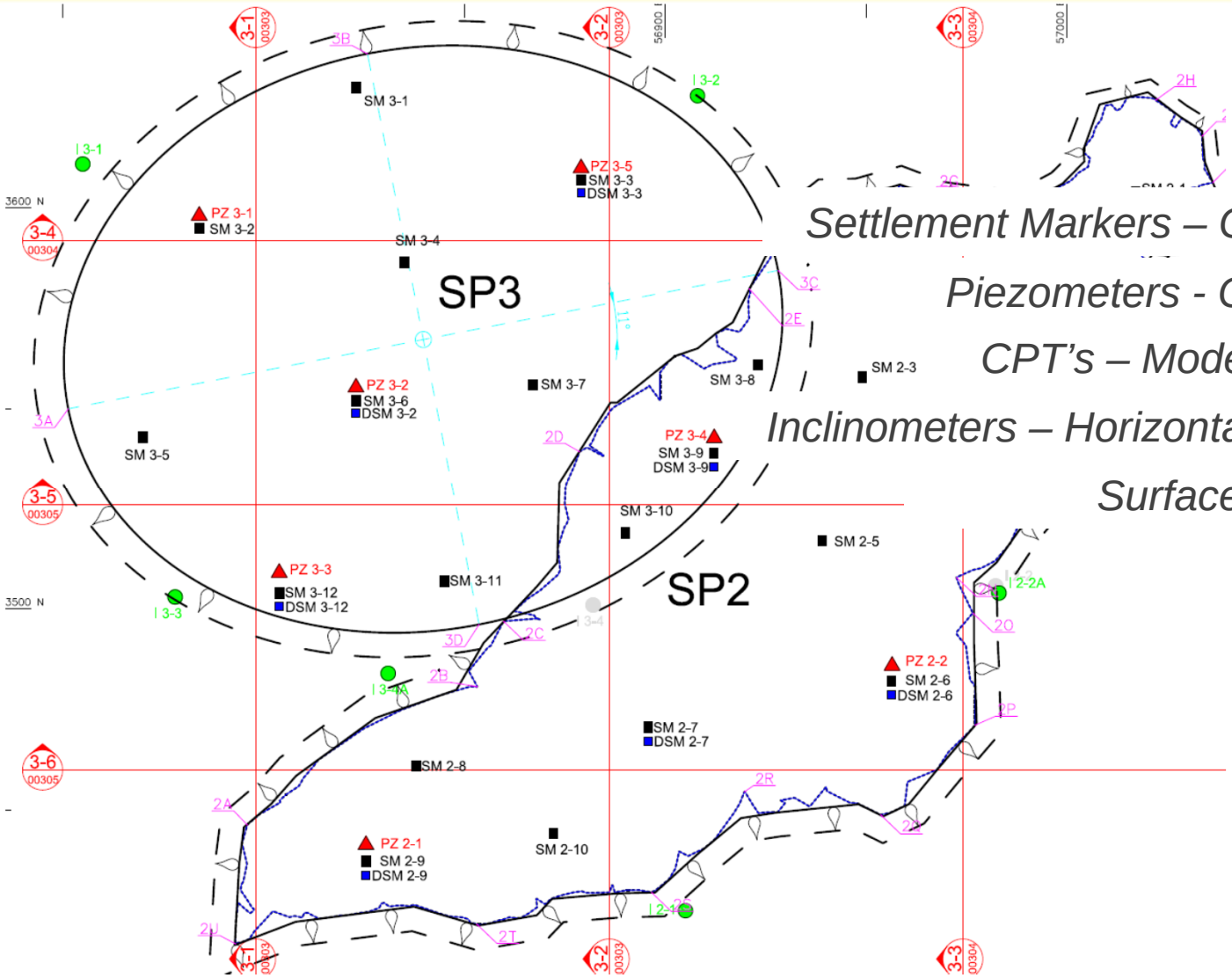
Wick Drain Grid in SP4

- Vibro assisted wick mandrel provided greater success rate
- Drains installed up to 35m depth
- Boundary between SRA and SCD not solid transition therefore upto 2m penetration into SCD
- Pre-punch reduced stress on wick mandrels reducing breakdowns, but increased maintenance of punching mandrels significantly

ERTECH KELLER JV

PERTH STADIUM PRE-CONSTRUCTION WORKS

INSTRUMENTATION & MONITORING



Settlement Markers – Consolidation

Piezometers - Consolidation

CPT's – Model Verification

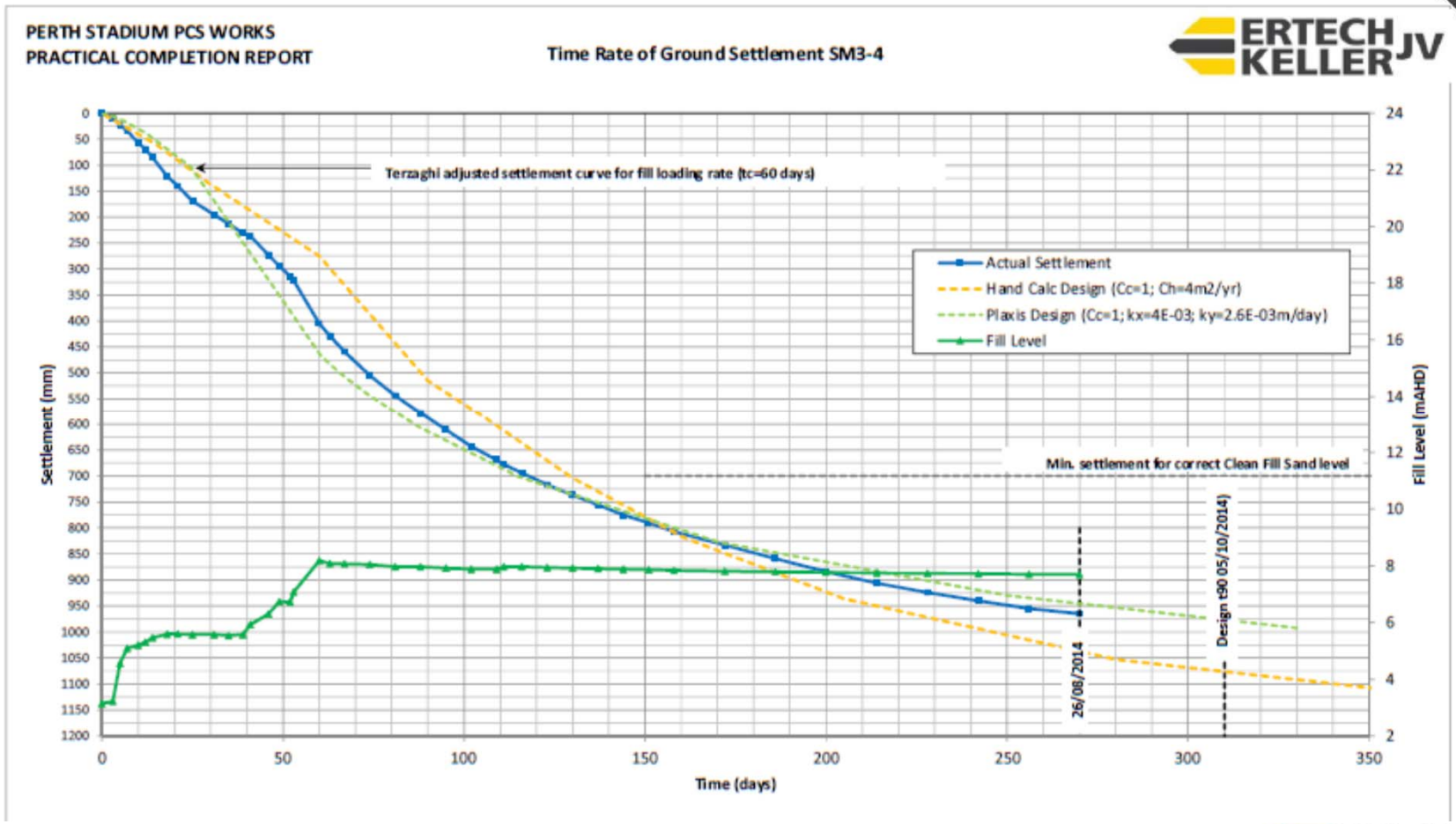
Inclinometers – Horizontal Movement

Surface Monuments

ERTECH KELLER JV

PERTH STADIUM PRE-CONSTRUCTION WORKS

CONCLUSIONS



PERTH STADIUM PRE-CONSTRUCTION WORKS

INTRODUCTORY VIDEO