



Directional Control in Longhole Drilling

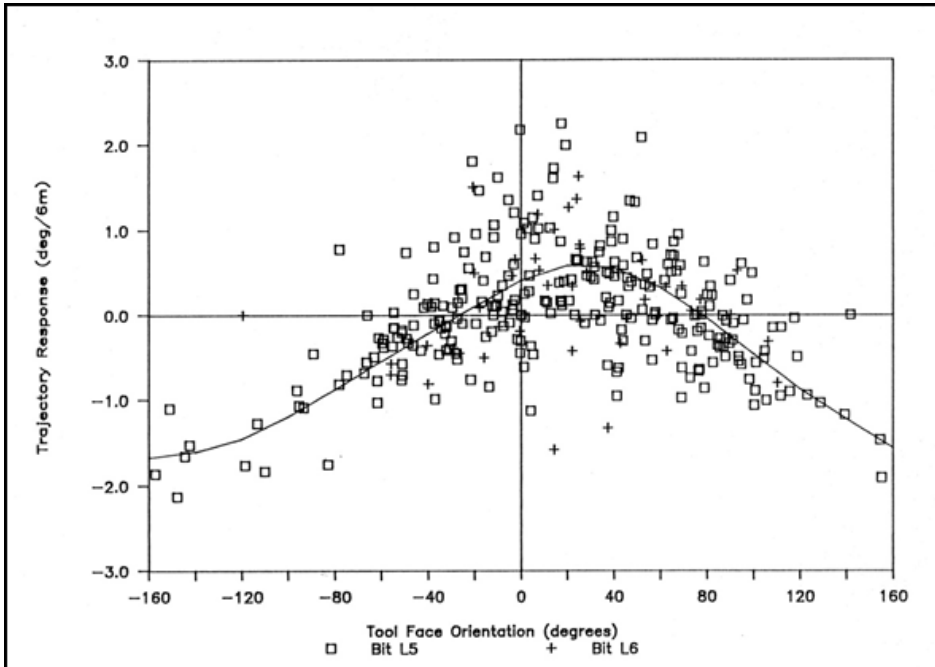
Gas and Coal Outburst Committee
Half Day Seminar
27 June 2012

Frank Hungerford
Ting Ren
Naj Aziz

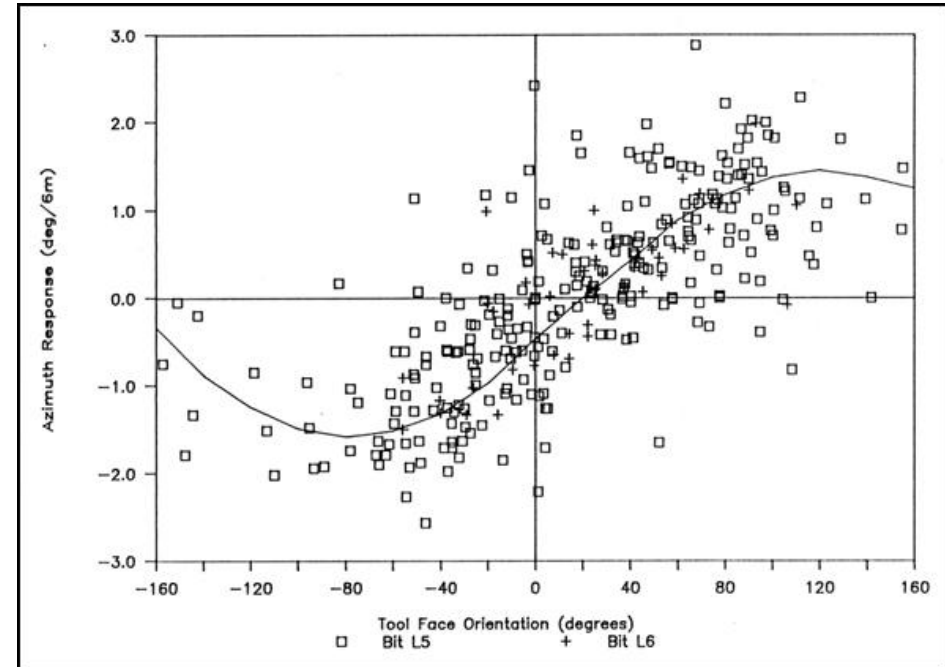


INTRODUCTION

- **Directional drilling allows boreholes to be accurately positioned to provide effective gas drainage**
- **Ability to steer boreholes allows alternate functions such as exploration and water management**
- **Early projects defined drilling and steering characteristics**
- **1005m maximum depth**

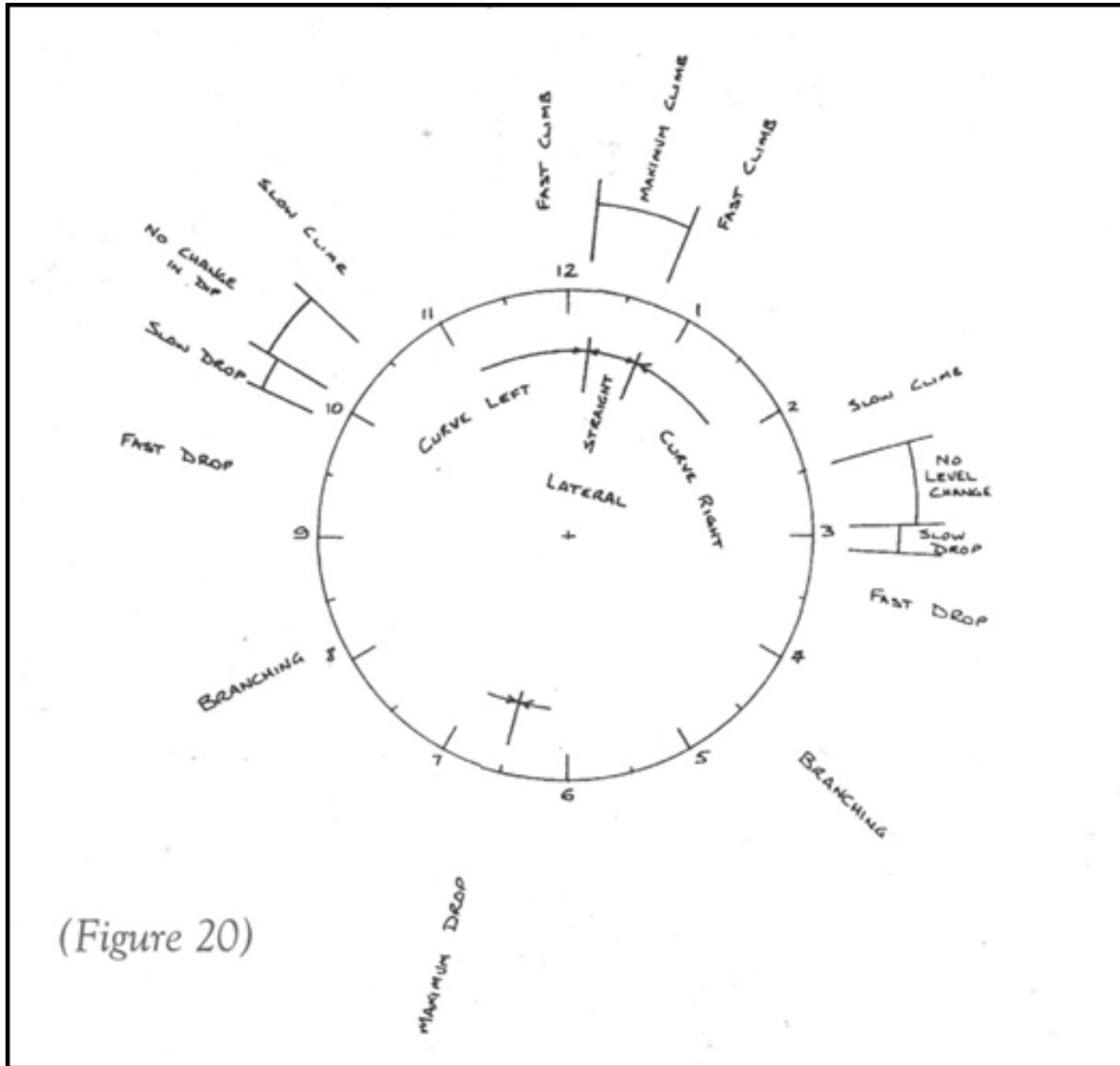


Vertical Response



Lateral Response

- **74 mm Slimdrill DHM**
- **3/4 degree Bend**
- **89 mm Bit**



(Figure 20)

Steering Guide



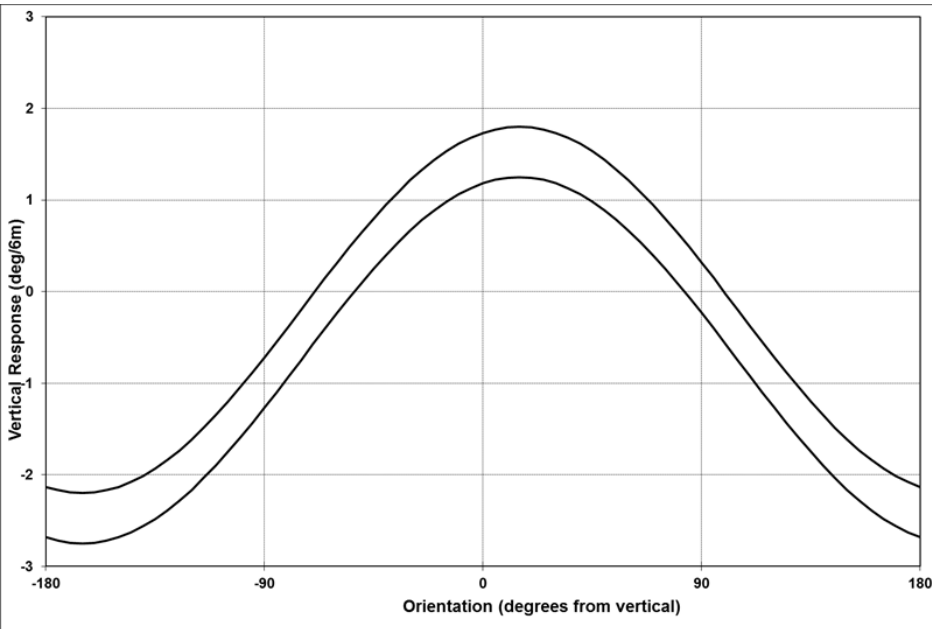
EQUIPMENT DEVELOPMENT

- **Availability non-magnetic of high-torque, low speed Accu-drill DHM**
- **Increase bit diameter to provide a bigger diameter borehole to reduce friction – coincidentally standard HQ open-hole bit diameter of 96.1mm suited**
- **Increased bend to 1.25 degrees to provide off-set and steering ability**
- **Boreholes drilled to 1250 m and 1500 m**

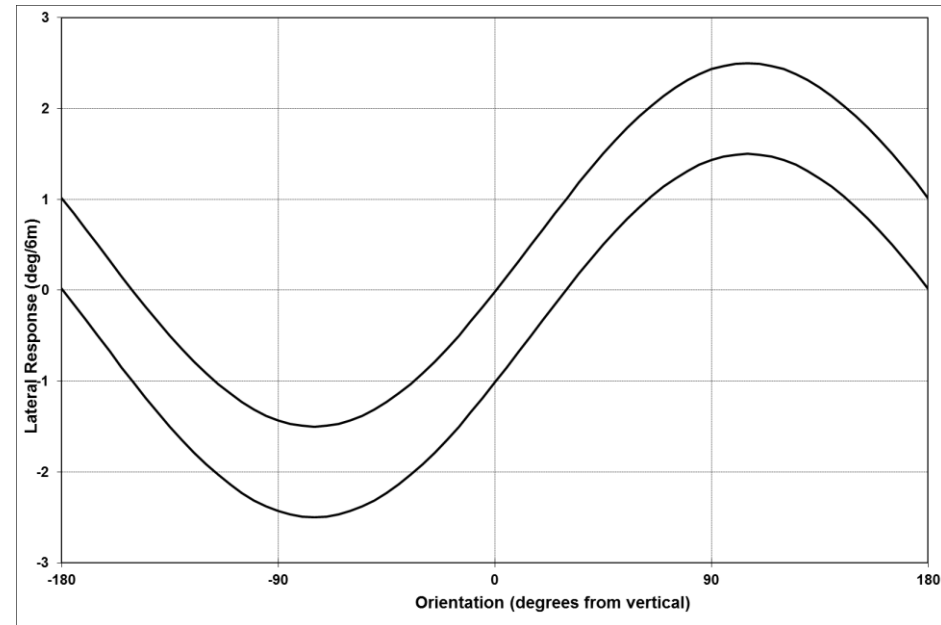
DHM Construction



DHM Bend Off-set

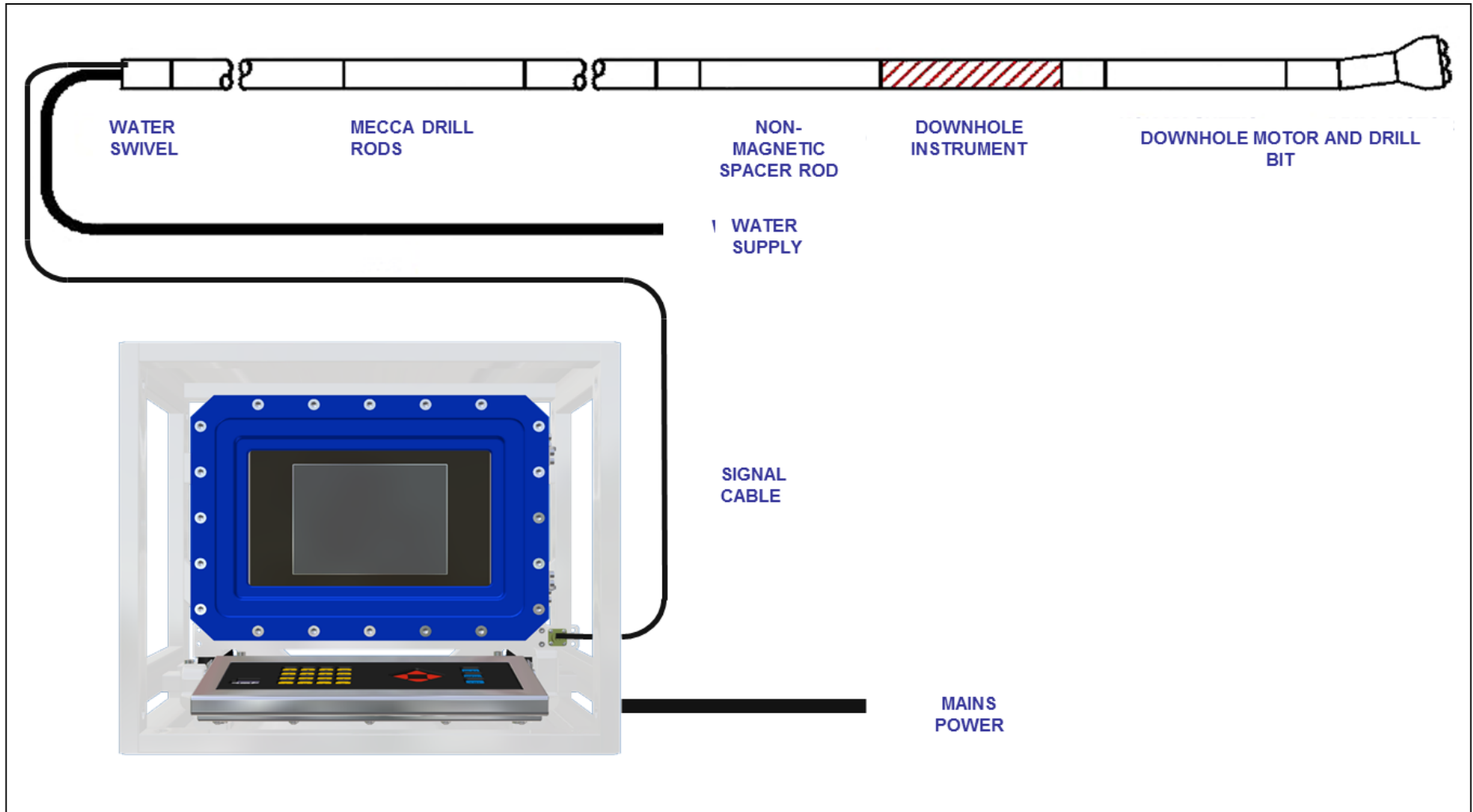


Vertical Response

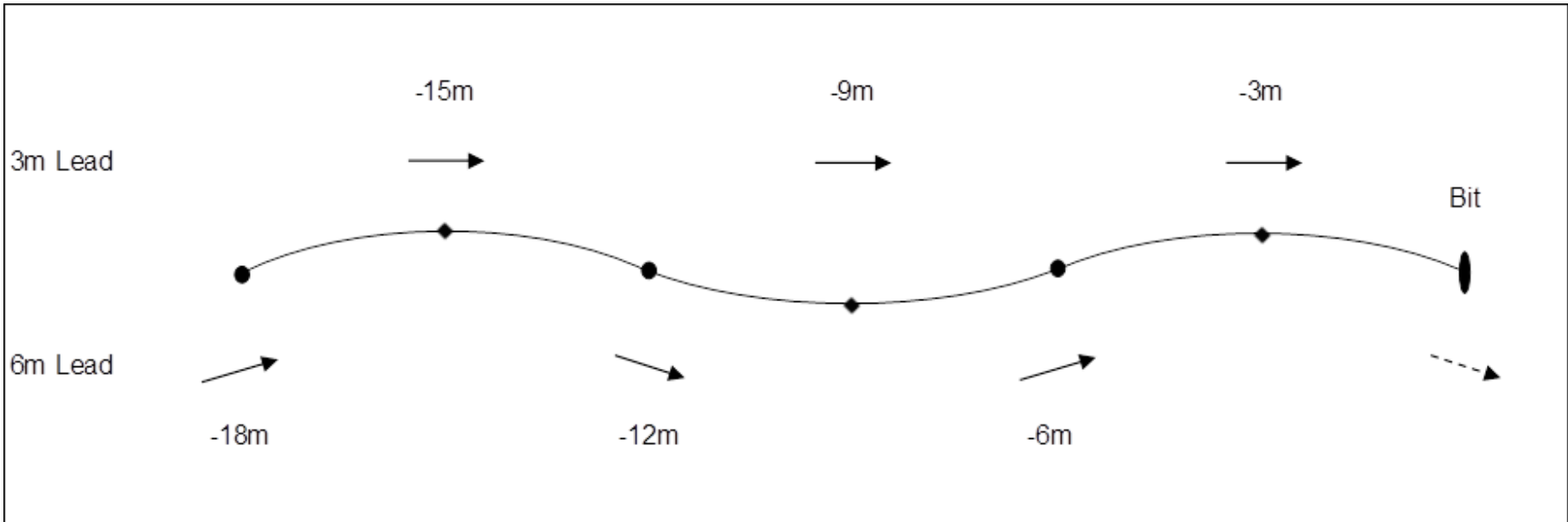


Lateral Response

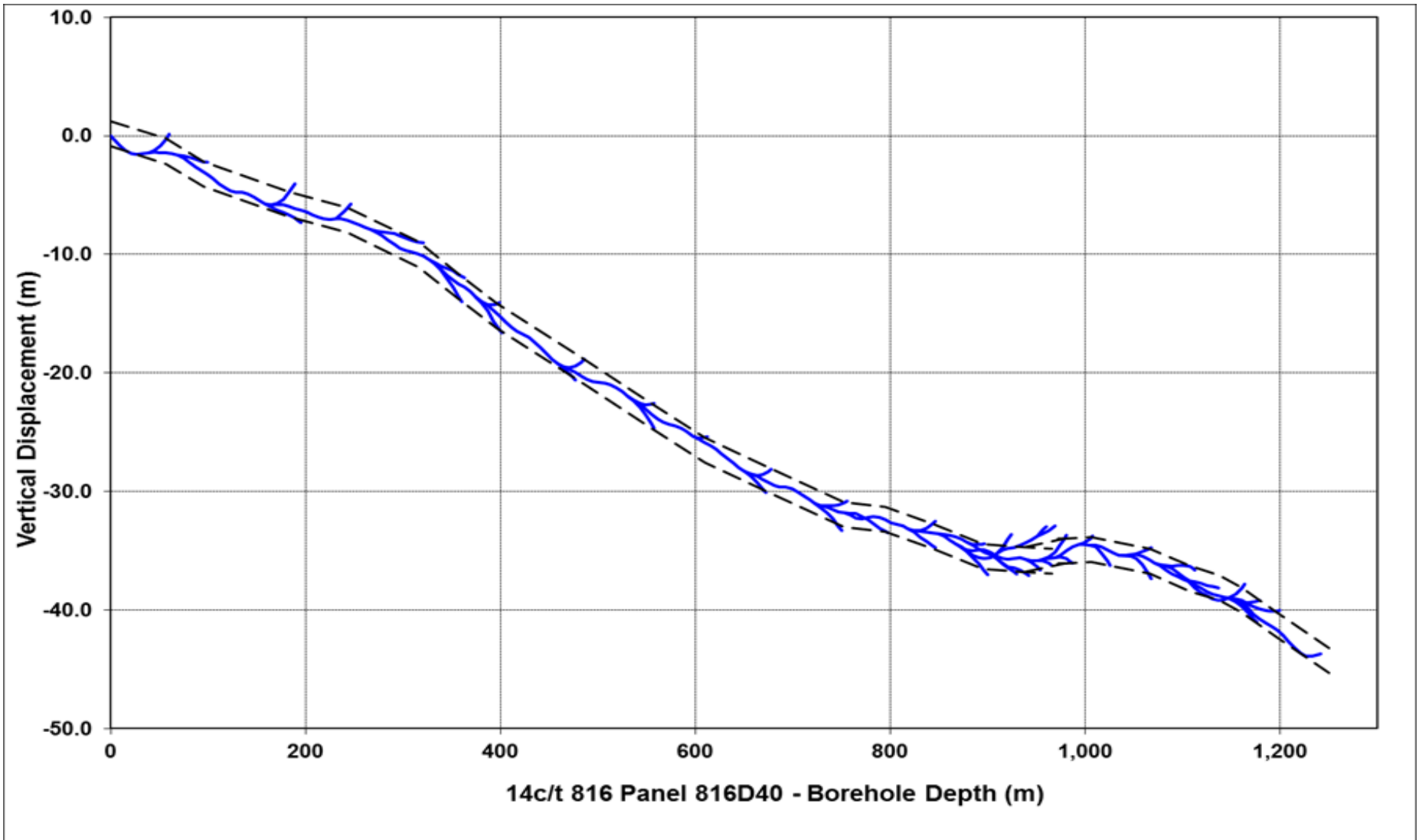
- **73 mm Accu-dril DHM**
- **1.25 degree Bend**
- **96 mm Bit**



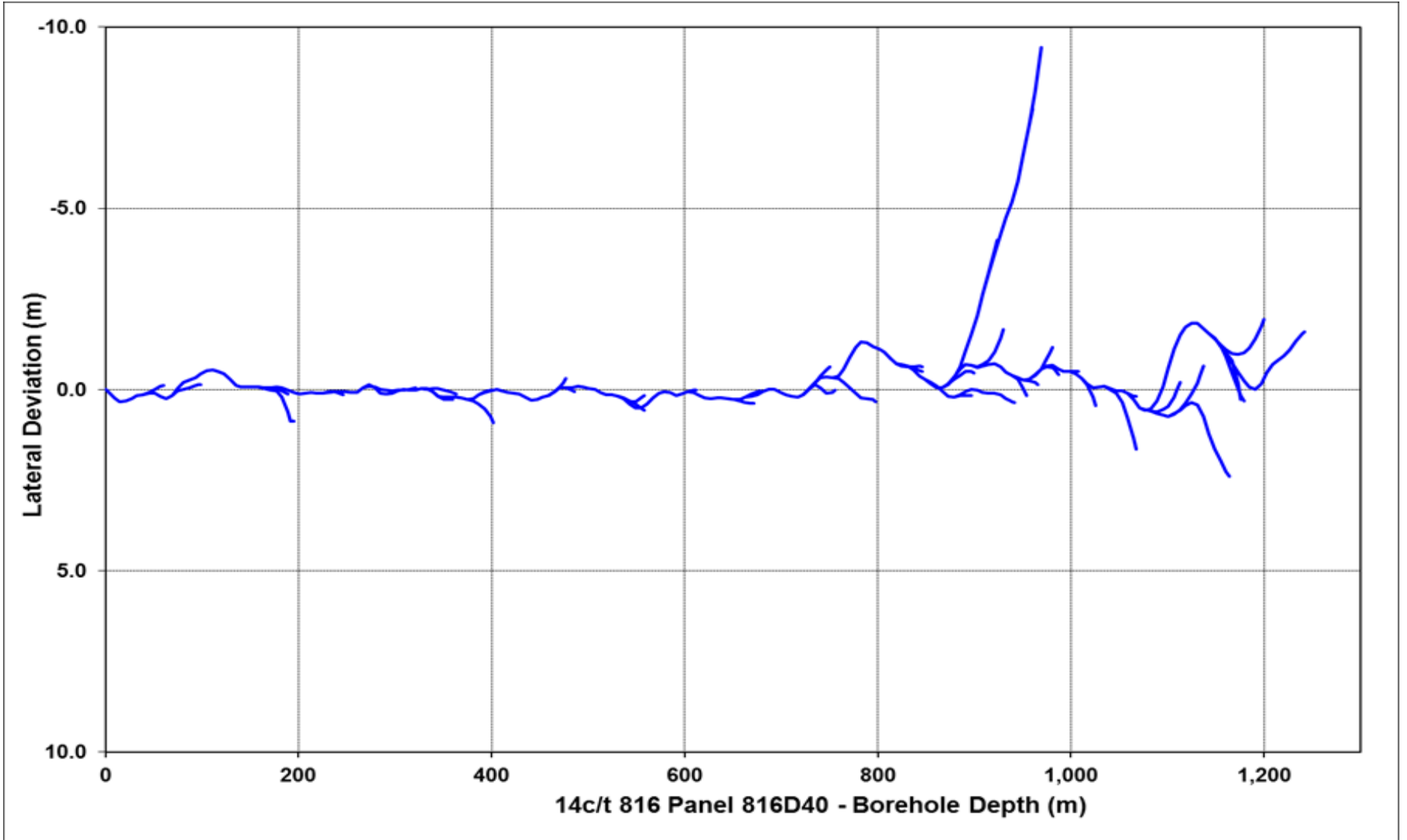
DGS Surveying Configuration – 3m lead



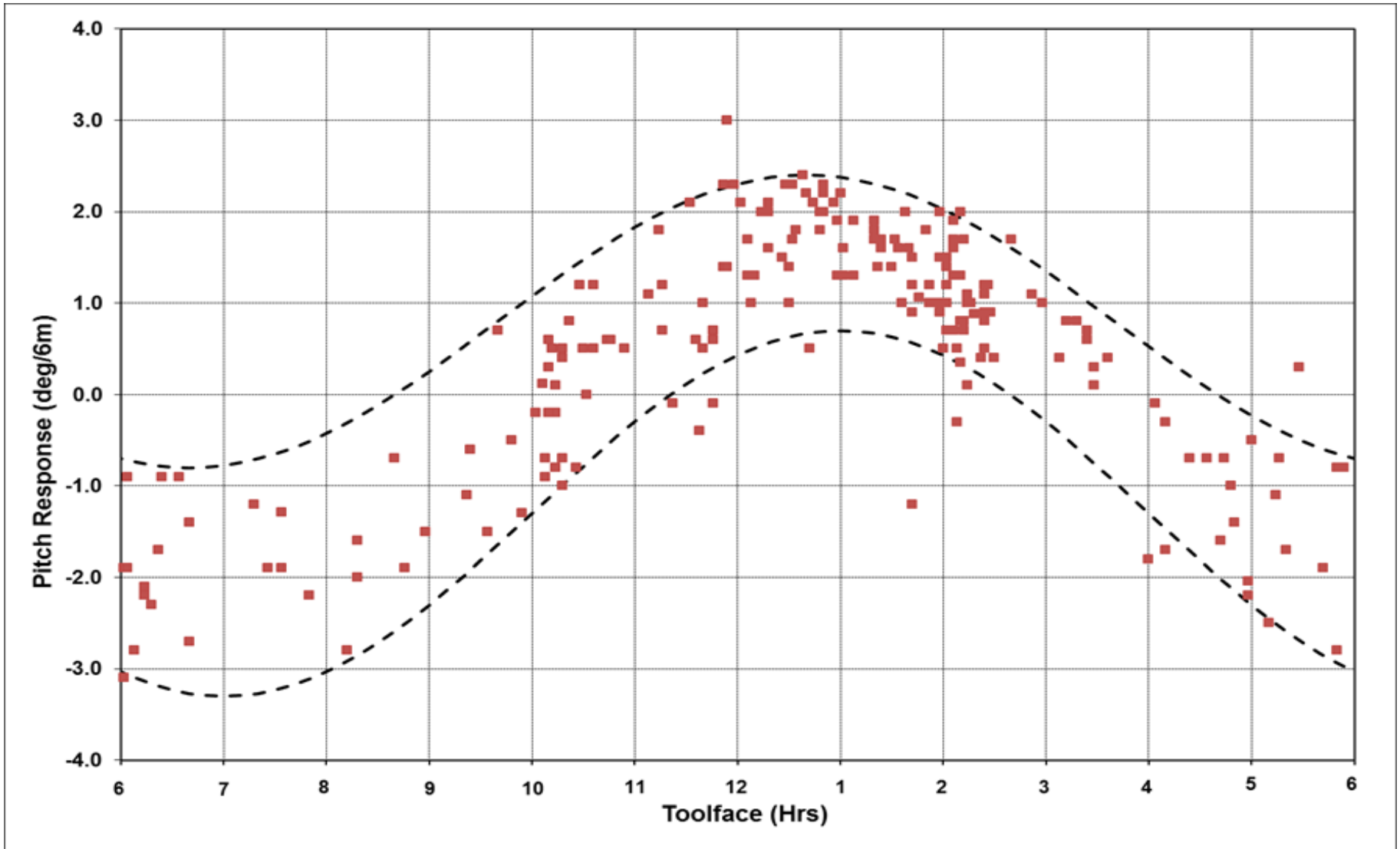
Survey positions relative to drill bit



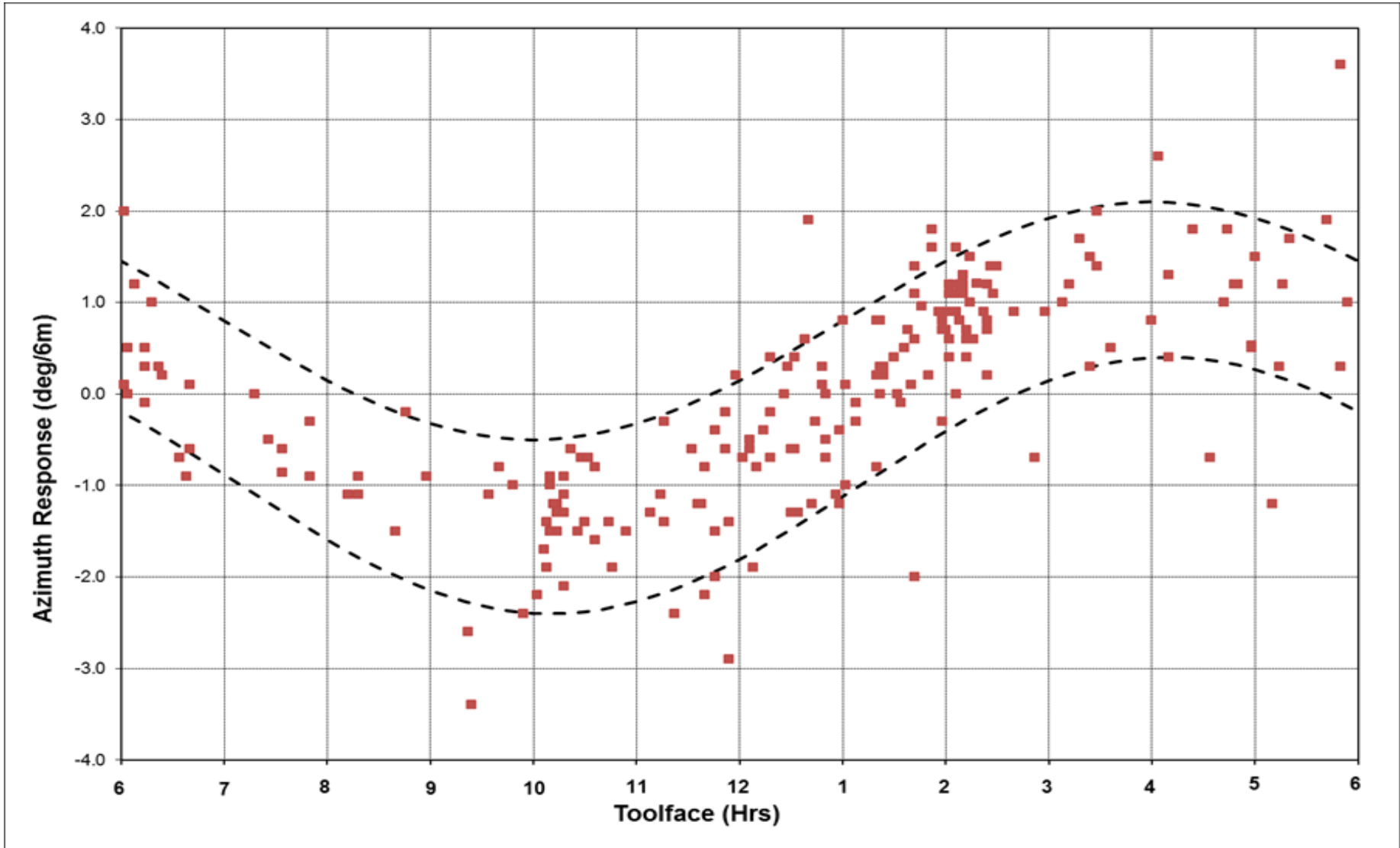
Borehole and Seam profile



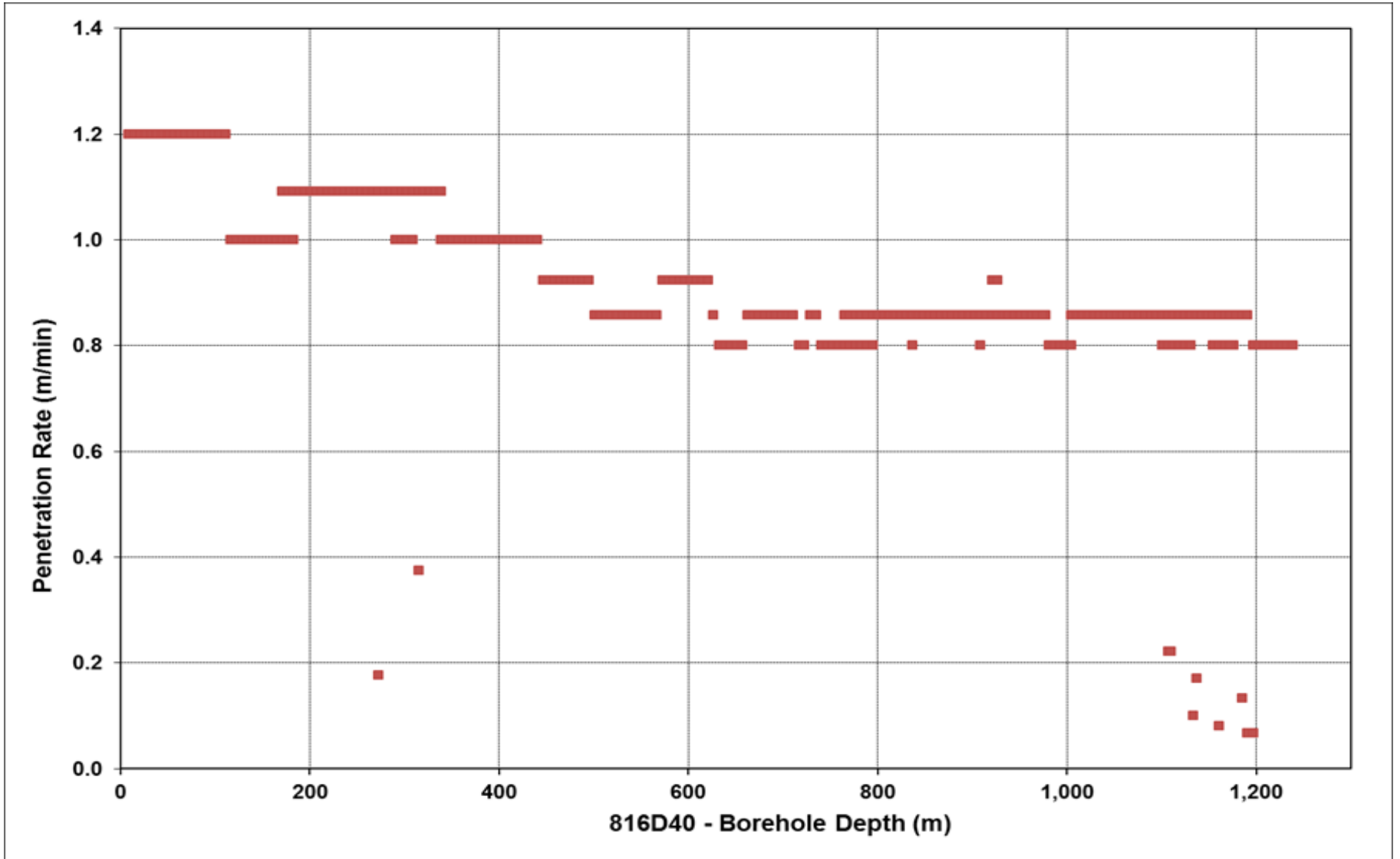
Lateral Deviation



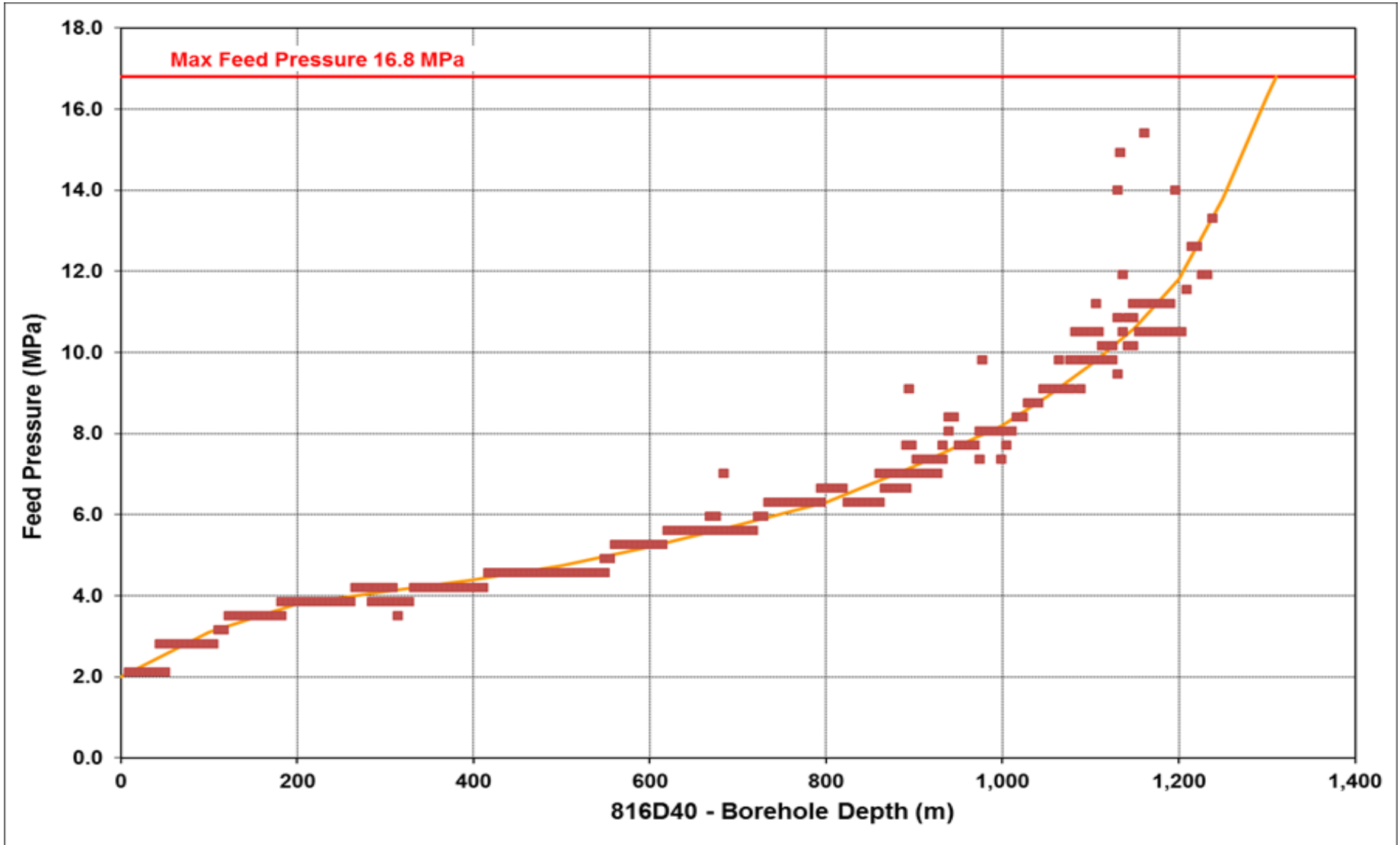
Vertical Response



Lateral Response



Penetration Rate (m/min)

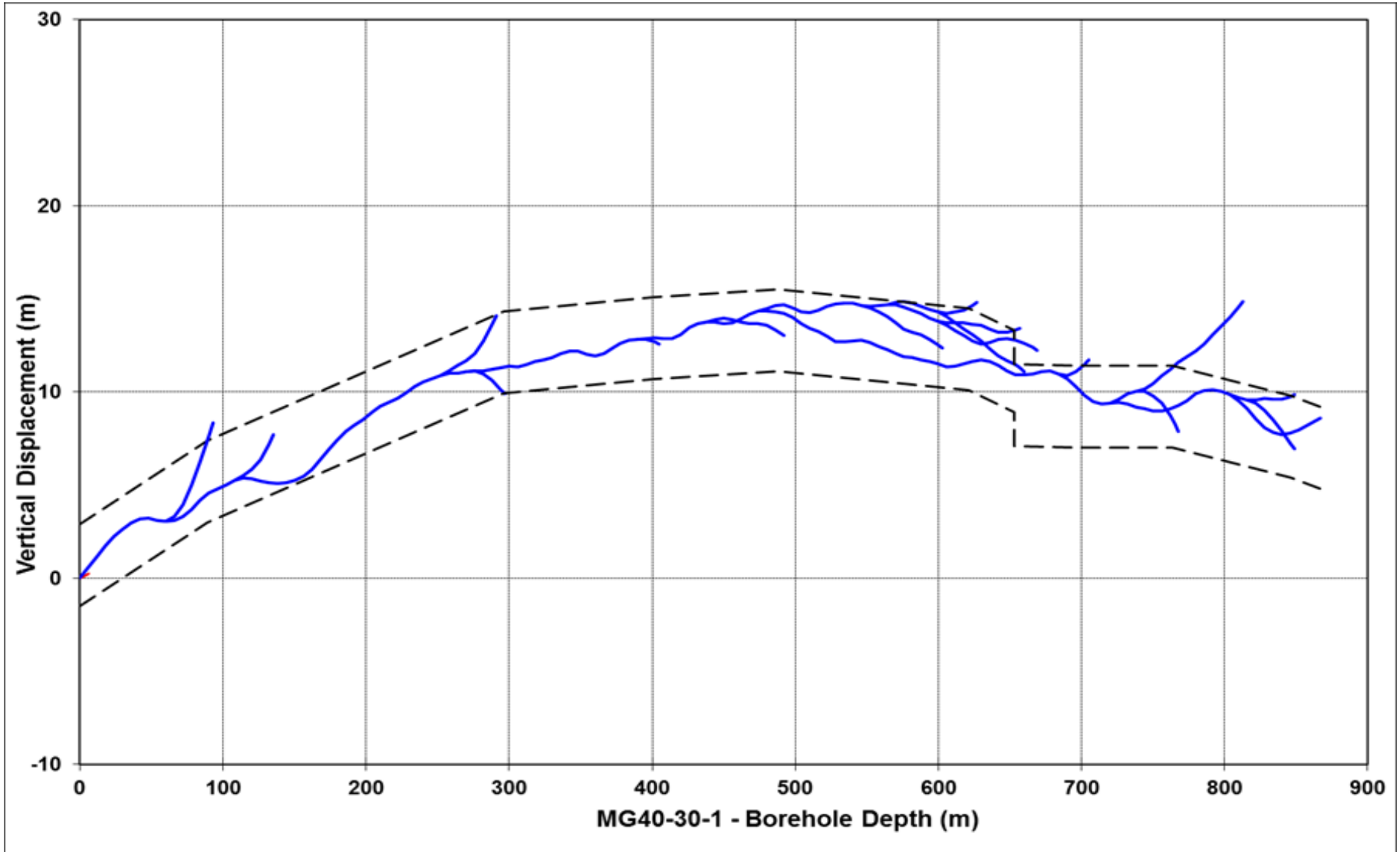


Feed Pressure

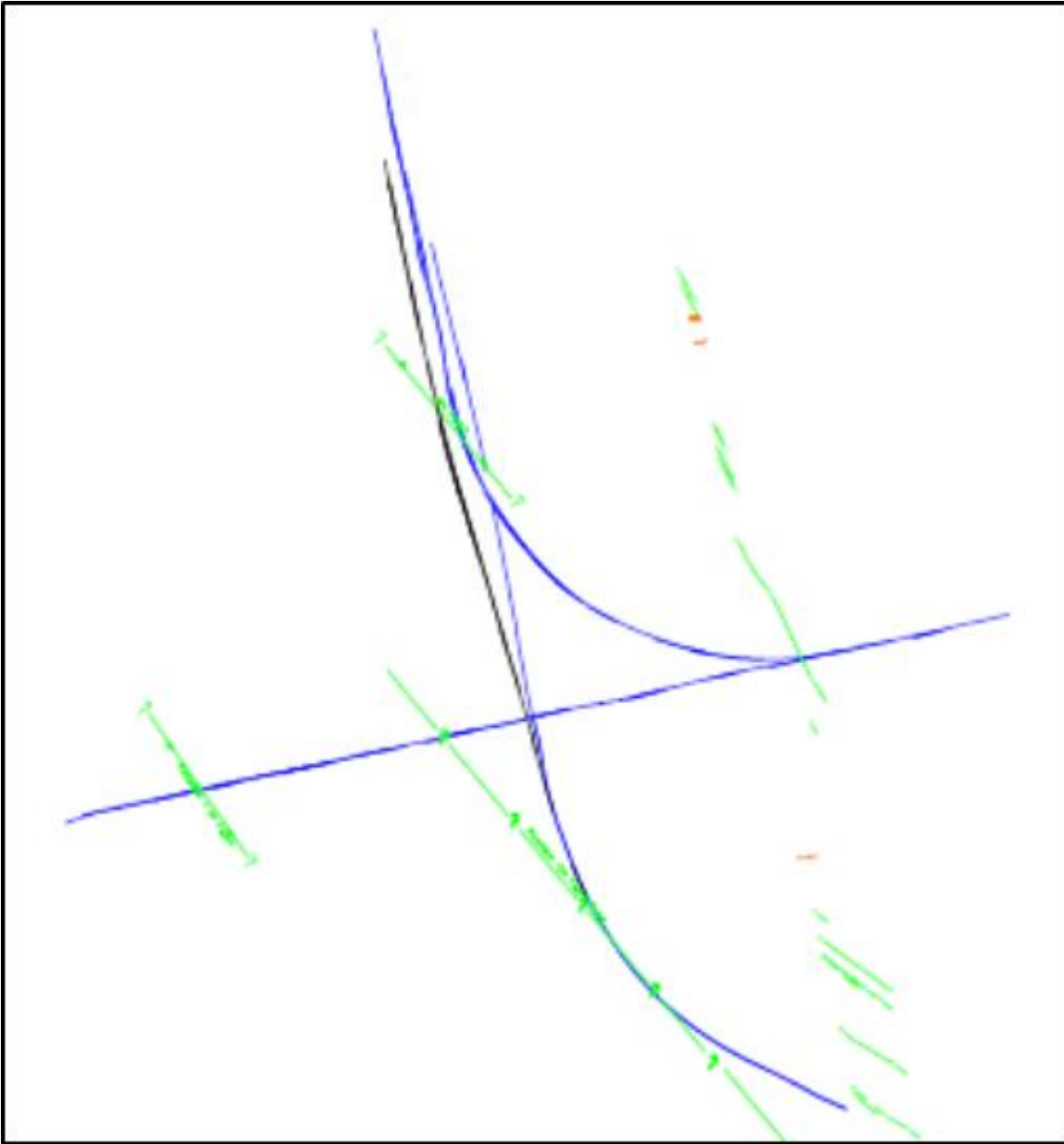


Planned Borehole with Roof Intersections



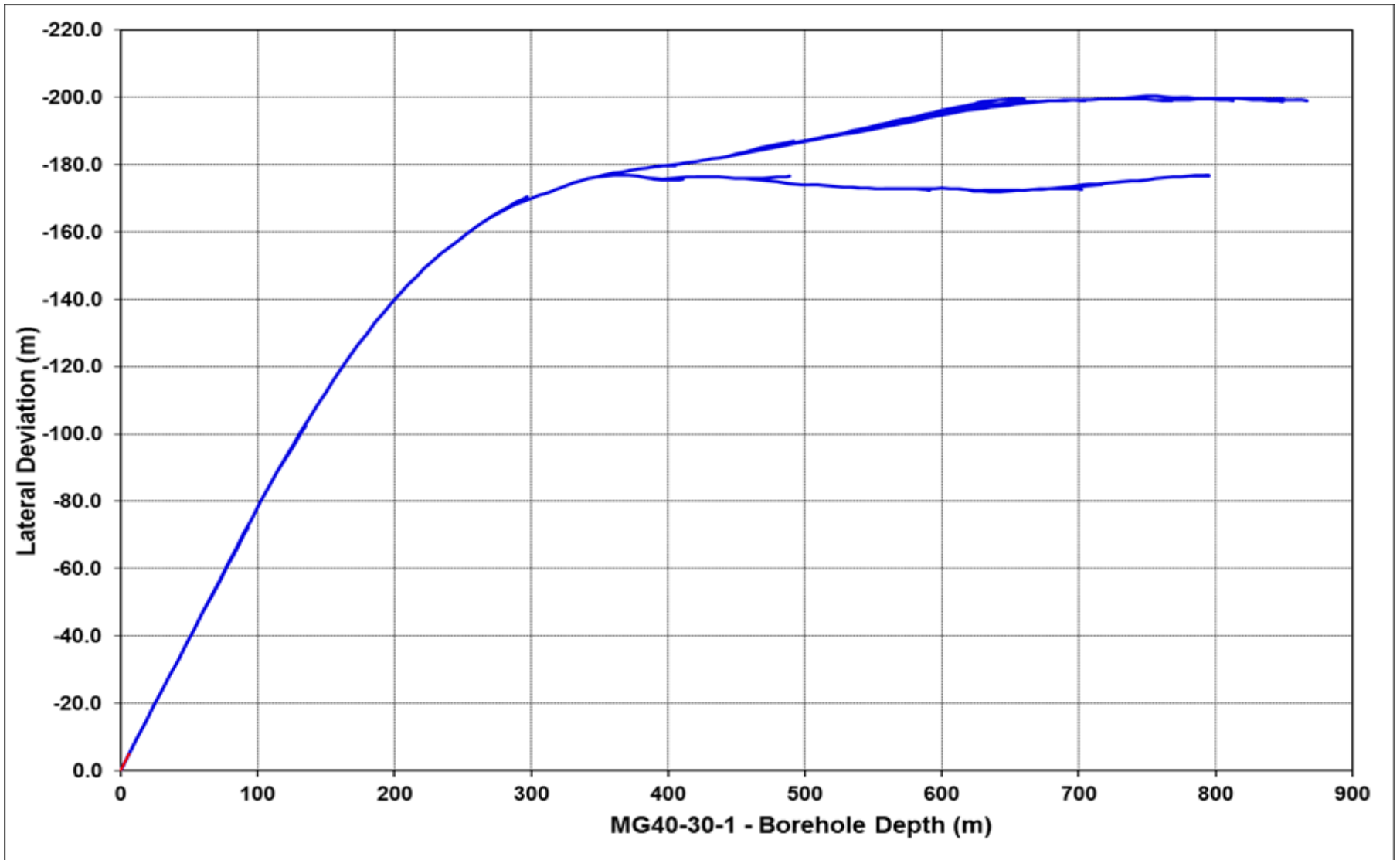


Borehole and Seam Profile

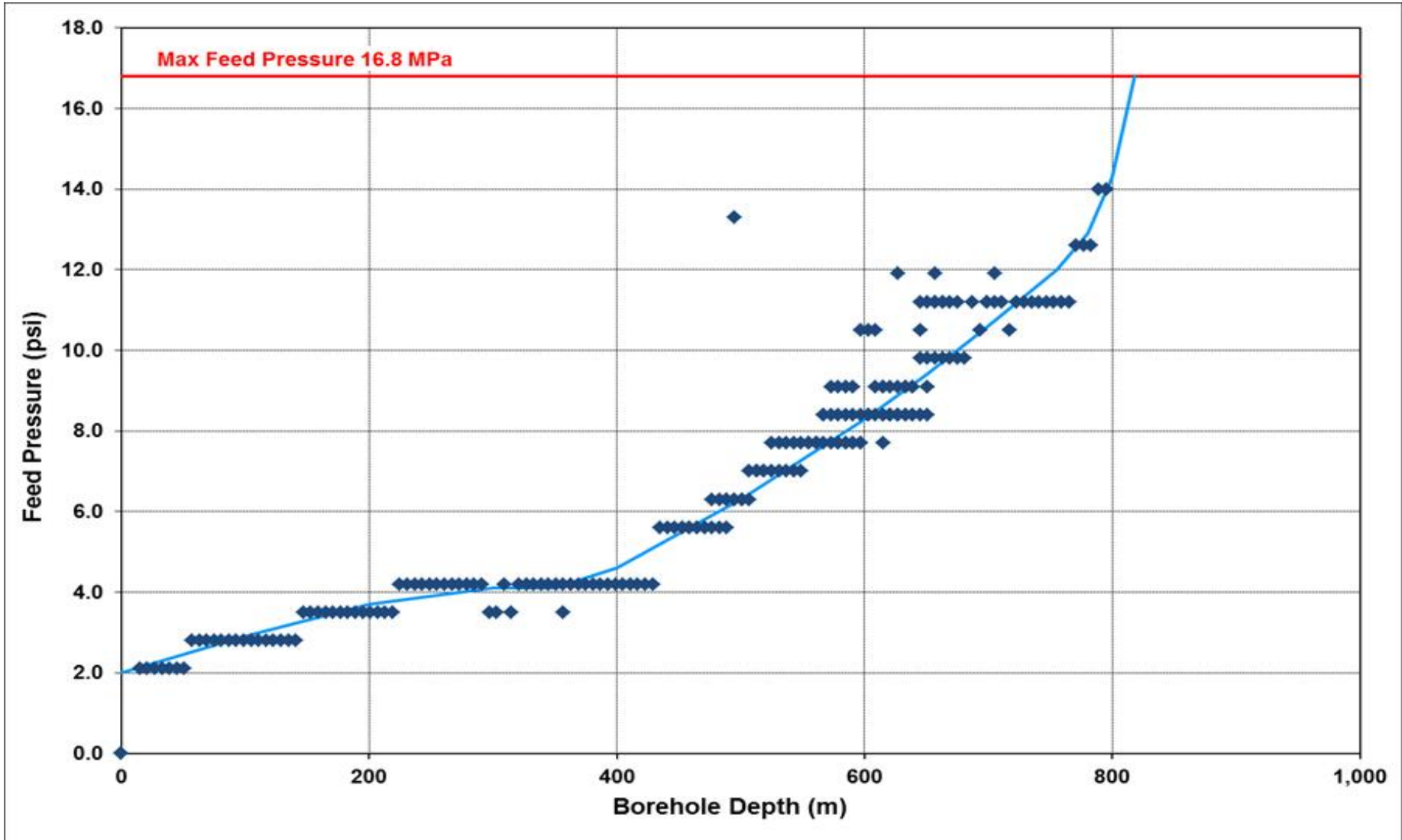


Plan

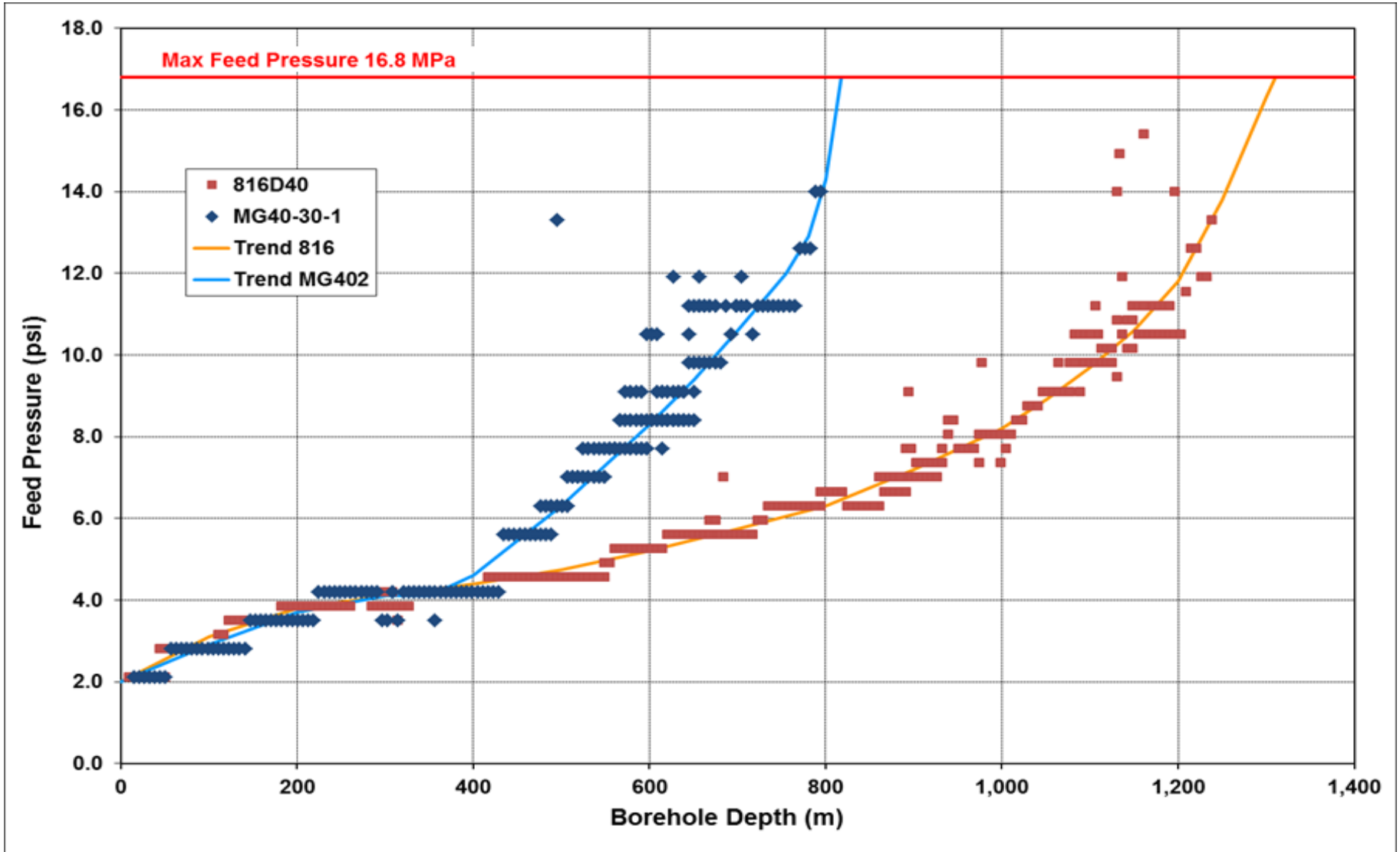
- Exploration Borehole
- Previous Borehole
- Defined Structures



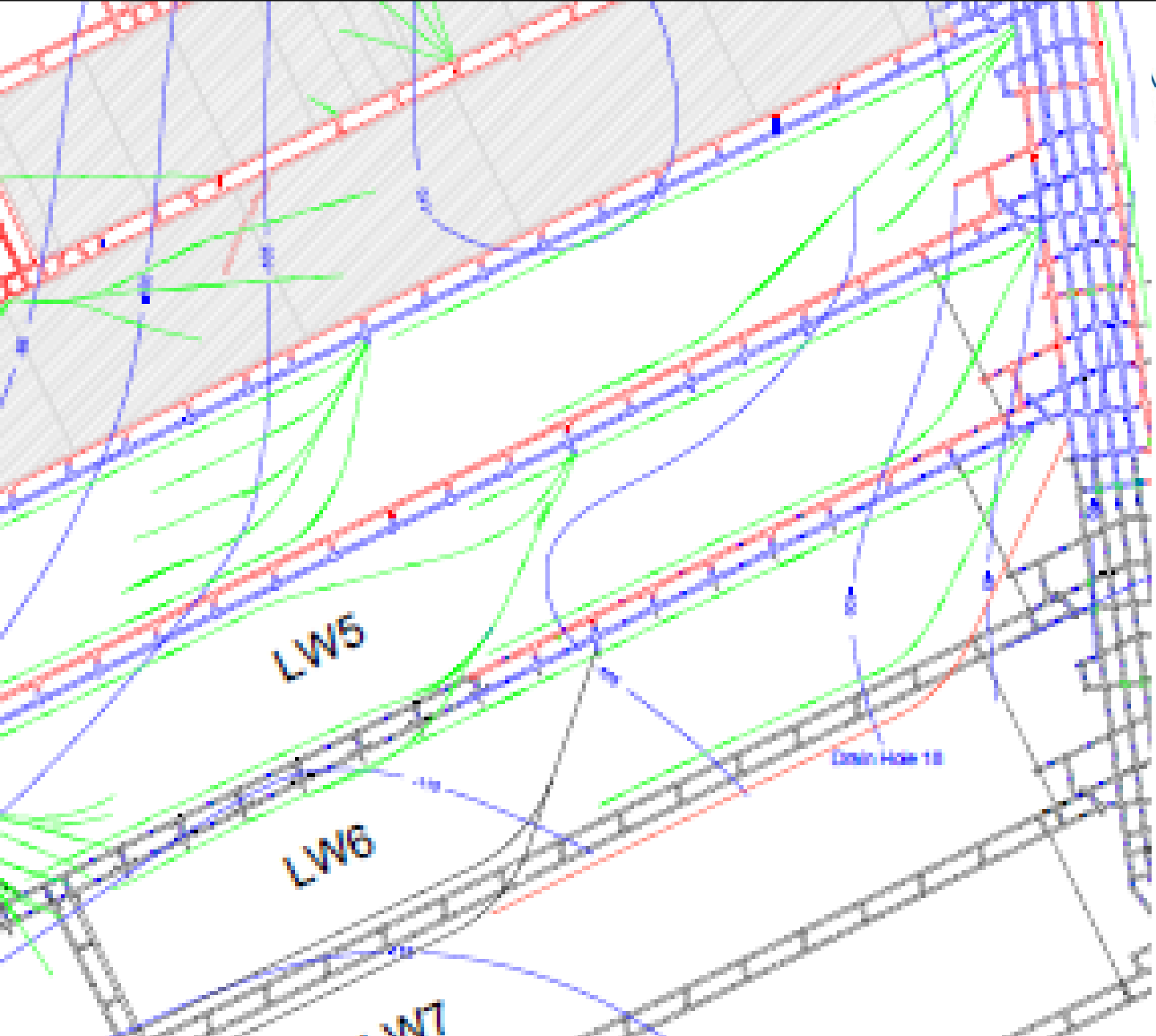
Lateral Deviation Vs Borehole Depth

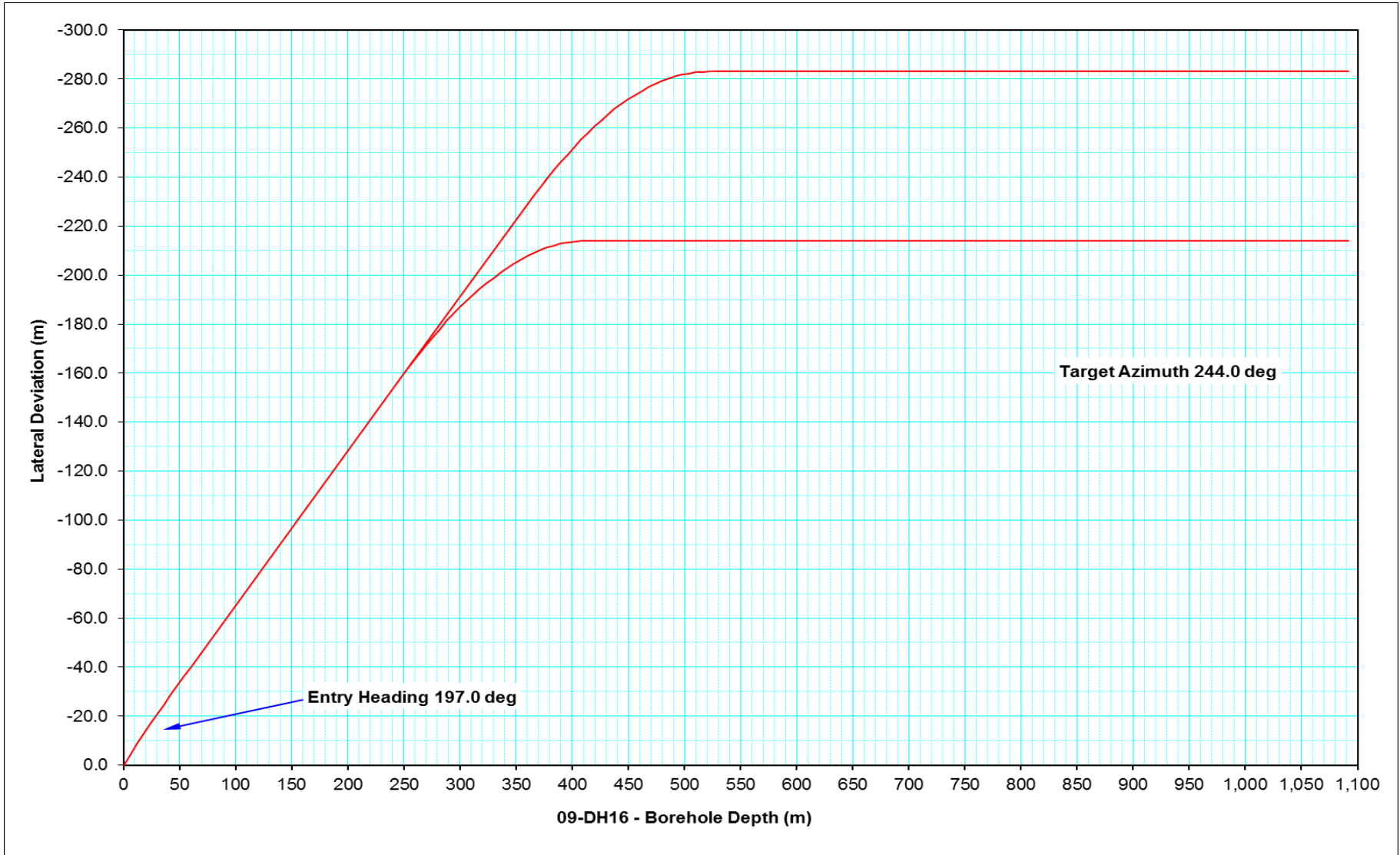


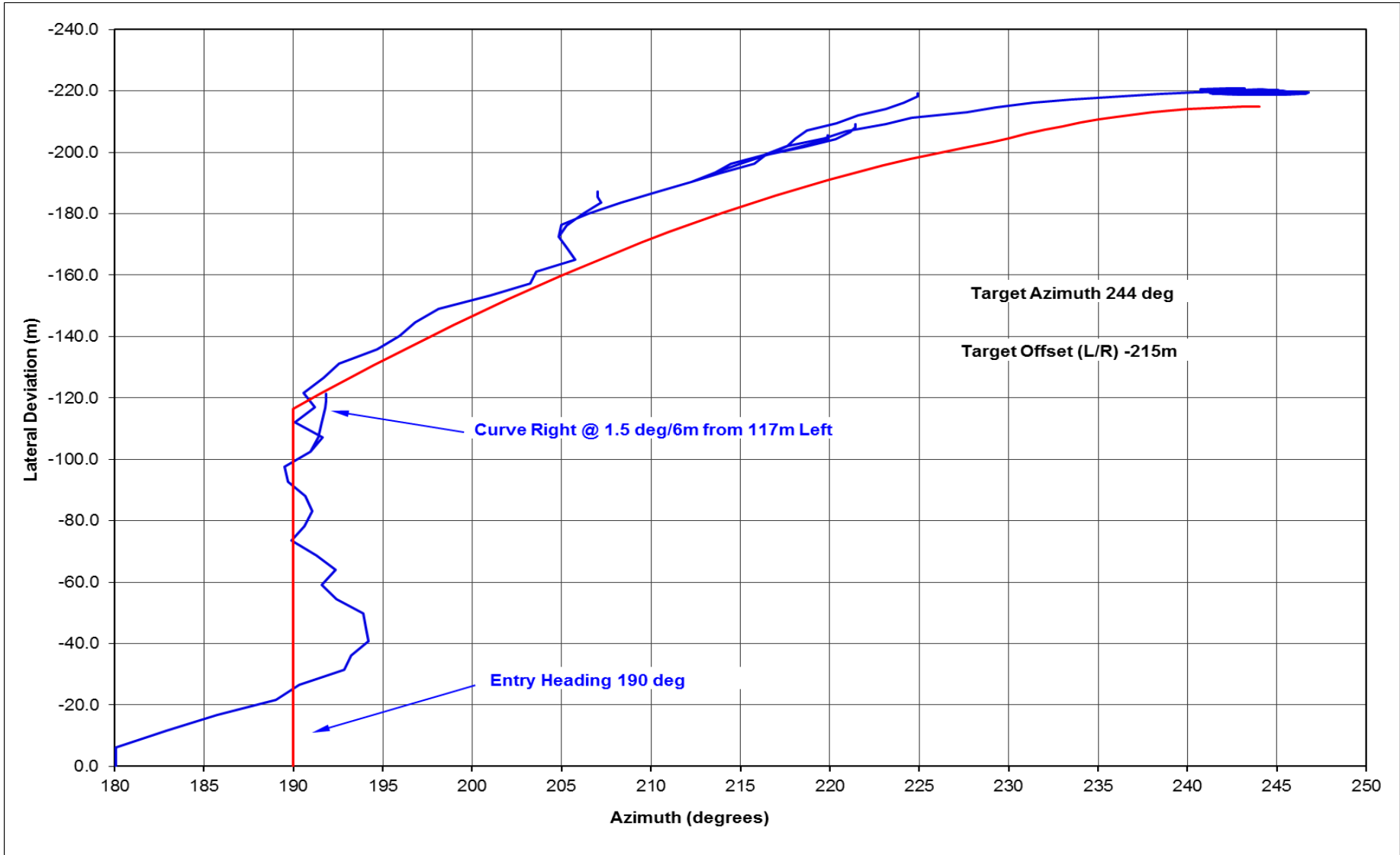
Feed Pressure vs Borehole Depth



Feed Pressure vs Borehole Depth







Lateral Deviation vs Azimuth



FUTURE RESEARCH / DEVELOPMENT

- **Introduce 6 m survey “lead” to VLI drilling operations**
- **Improve data collection in areas of feed pressure, rates**
- **Produce Response Curves from each drilling project for each DHM/Bend/Bit configuration**
- **Assess accumulated friction effects from various steering practices**
- **Assess friction effects from overall curve rates and initial off-set angle of standpipe from Target Azimuth**
- **Define optimum borehole design and steering practices for consistent longhole depths**
- **Define optimum DHM configuration for individual project requirements**



CONCLUSION

- **Understand in-hole friction effects**
- **Provide optimum drilling practices**
- **Provide optimum equipment design / configuration**
- **Enhance driller knowledge and skills**
- **Improve ability of recovering gear bogged in longholes**