Waterview Connection Video Answers

Thursday 28 August

1. The Tunnel Boring Machine

Meet TBM Shift Engineer Rachel Kelpie to find out more about what a tunnel boring machine (TBM) is and how it operates.

1. How does the TBM work?
   - Like a giant drill with a cutter head that rips away at the ground and the spoil is taken out and the machine moves forward, once two metres has been mined the machine places the concrete segments to line the tunnel
2. Why does the ground above the tunnel not collapse?
   - The TBM is an Earth Pressure Balance machine which means it balances the pressure with the use of the spoil so the ground around the machine does not move
3. Do people on the ground above the tunnel notice the drilling?
   - Not really, there may be small vibrations but nothing very noticeable.

Next step learning: Make a model of your own to show how a TBM works.

2. Getting to Alice

Sign in, get your re-breather unit on and travel down into the tunnel to meet Alice the TBM.

1. Why do you think it is important to sign in?
   - So everyone is accounted for
2. What do you think a re-breather is and how does it work?
   - It is a unit that provides oxygen in case the ventilation in the tunnel fails
3. Why do you think you can't drive all the way to Alice the TBM?
   - Because the road has not been built (the culverts have not been put in that far yet).

Next step learning: What do you think some of the hazards are of travelling in the tunnel during construction?

3. Meet Alice the Tunnel Boring Machine

Take a look around Alice the TBM to see how she works.

1. What pushes Alice forward?
   - 28 hydraulic rams
2. How fast does Alice move?
   - About 80mm/minute at top speed which is like a snail's pace.
3. At what height will the road through the tunnel end up?
   - At about a metre above where the road is now (about half way up the tunnel)

Next step learning: Find out what other methods can be used to construct a tunnel other than using a TBM.

4. Working in the Tunnel

Talk to Shivani Siva and find out about who operates Alice the TBM and what types of skills they need.

1. How many people work on Alice the TBM?
   - 3 crew of 20-30 people each
2. When does Alice the TBM work?
   - 24 hours a day 6 days a week
3. What type of skills and training are needed to work in the tunnel?
   - Tunnel or mining experience, experience working with mechanical and electrical equipment, crane operating licenses etc…

Next step learning: Find out more about the types of jobs that are available on the Waterview Connection construction site.

5. Grout For The Tunnel Lining

Come and have a look at the concrete segments used to line the tunnel and the grout used behind these

1. Where are the concrete segments made?
   - Prefabricated in East Tamaki
2. Where is the grout injected and why?
   - Behind the concrete segments to fill in the gap between the concrete and the excavated tunnel and hold the concrete in place
3. How is the grout created?
   - Two liquids are mixed together and they set very quickly

Next step learning: Find out more about how different tunnels in New Zealand have been constructed.

6. Field Trip Summary

Take time at the end of the field trip to reflect on all that you have learned this week.

1. What was your favourite part of the field trip and why?
   - Answers will vary
2. If you could interview one of the experts from the field trip who would it be and what would you ask them?
   - Answers will vary
3. Help your teacher to complete the online evaluation for this field trip

Next step learning: Plan an inquiry into part of the field trip that sparked your curiosity.