

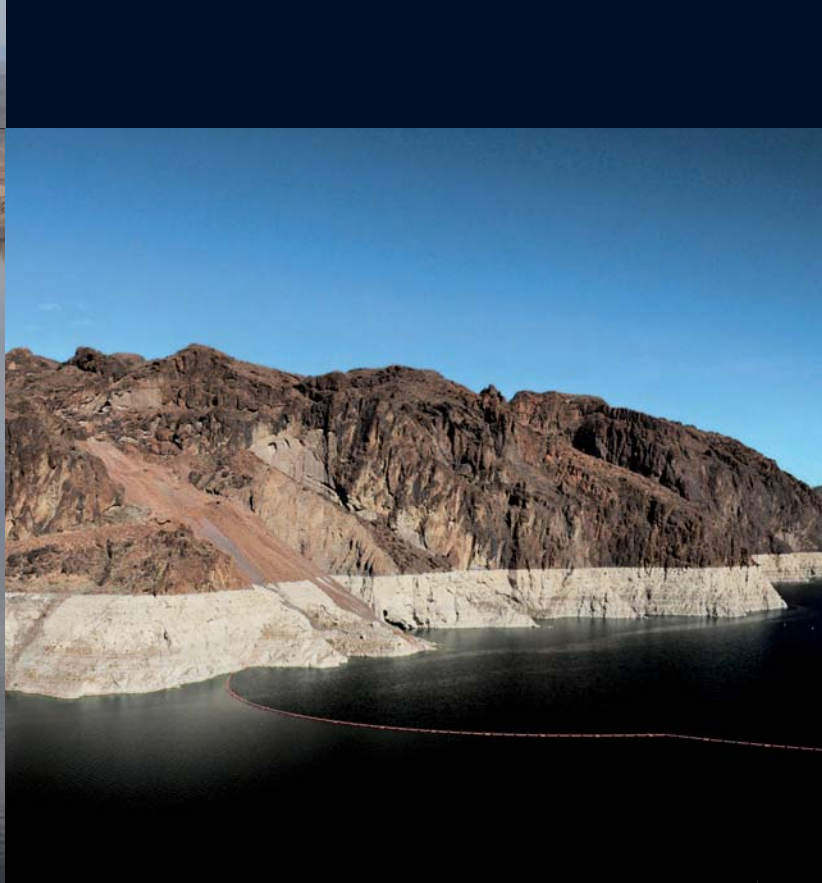


# Ready to go in **LAS VEGAS**

In Nevada, Las Vegas Tunnel Constructors (VTC), a joint venture of Impregilo and SA Healy, is currently gearing up for the launch of its state-of-the-art 23.5ft (7.2m) diameter Herrenknecht Mixshield TBM this summer, for Southern Nevada Water Authority's third raw water intake tunnel, at Lake Mead.

**THE JV RECENTLY** completed excavation of the 197ft long x 35ft high x 46ft wide (60m x 10.5m x 14m) TBM assembly chamber, located 600ft below ground on Saddle Island, from the project's main construction shaft. Drill and blast operations are now continuing on the 348ft (105m) long TBM starter tunnel, which is being driven in a northern direction from the assembly chamber utilizing ribs and shotcrete for immediate ground support.

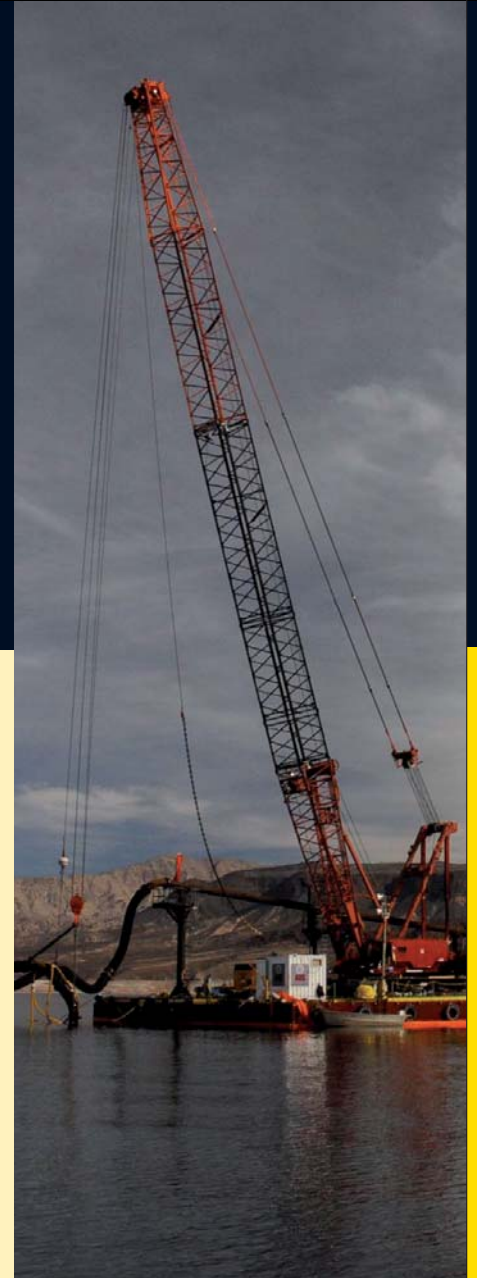
All of the components of the 600ft (180m) long, 1,500 ton dual-mode TBM were on site last September, having been shipped from Germany to the Port of Long Beach, California, and then delivered to Lake Mead using more than 60 tractor-trailers. As soon as the starter tunnel is complete (currently scheduled for August), the TBM will be



**ABOVE:** Water levels have been dropping in Lake Mead about 1% a year since 1999

**LEFT:** Underwater excavation at the intake structure site is ongoing

**RIGHT:** Lake Mead's third intake will take over if water levels drop below the existing Intake No 1, which delivers 40% of Las Vegas' water



lowered in pieces and assembled underground within the cavern and starter tunnel.

The machine will then be launched on a 15,420ft (4.7km) long drive to a new intake shaft at the bottom of Lake Mead about 600ft (182m) below the current water level. As the machine advances from hard rock into softer rock formations and water bearing silts and sands the heading has the potential of being subjected to the full 600ft (182m) hydrostatic pressure of the lake. The machine has therefore been designed with a maximum closed-mode operating pressure of 17 bar.

Mining remains due to begin this August and will continue for 23 months. The TBM will ultimately enter the intake structure via the reception chamber, approximately 27.5ft

(8.4m) from the center of the intake structure, which will be covered with a soft eye. The soft eye of the intake reception chamber will be 29ft (8.8m) in diameter and reinforced with fiberglass-reinforced polymer.

The tunnel will be lined with 2,500 pre-cast concrete rings, each formed of 5 x 6ft (1.8m) long steel rebar reinforced segments + a key segment. This lining has been procured under a VTC materials purchase order from Precast Management and is currently being fabricated off-site at a facility located about 10 miles south of Las Vegas.

#### **Current site activity**

The project's main site is now well established and is, in the main, ready for TBM production to commence. With daily deliveries of liner segments having been arriving on site for



**BELOW:** VTC's state-of-the-art 23.5ft (7.2m) diameter Herrenknecht Mixshield, designed with a maximum closed-mode operating pressure of 17 bar



some time now, there are currently over 1200 rings already stockpiled on site. The shaft's gantry crane is assembled and ready for duty, and the TBM's gantries, trailing gear and rail-bound locomotives are all also essentially ready for underground assembly.

A batch plant is already up and running to make concrete and shotcrete for the current drill and blast activities and will go on to provide contact grout and backfill for the TBM operations.

Set up of the slurry separation plant is also complete and ready to go. The plan is to stockpile and landscape the separated muck, in order to provide a viewshed berm that will reduce the visual impacts on the Lake Mead National Recreation Area for visitors, with the water being treated and returned to Lake Mead.

**Marine activities**

While the starter tunnel is being finished, marine activities are ongoing, with underwater excavation continuing to clear a platform for the placement of the intake structure. Excavation of the lake bottom overburden 350ft (105m) below the surface of the lake is being removed via air lift, hammer/chisel, and clam shell. Following this, 42,300 cubic yards of overburden and rock material is due to be removed in order to make room for the intake structure.

At the beginning of June small underwater test blastings will take place with shape charges and production underwater blasting is expected to follow this summer. The shape charges will be used to break up the hard rock once the overburden is removed and the rock exposed.

The charges will be lowered in a frame and set on the lake bottom (like bowling pins) and an air mirror will hover over them to reduce peak overpressure by 1/40. Sonar and ROV operations will enable crews to

identify the lake bottom topography, measure excavation progress and guide the placement of the overburden and rock removal equipment.

The project's 100ft (30.5m) high intake structure will ultimately consist of a 32ft (9.7m) diameter reinforced concrete base with a stainless steel upper. A docking barge is assembled and includes a moon pool (wet porch) and strand jacks to hold the future intake structure over the moon pool. The intake will be built on the docking barge and lowered in the water for buoyancy as it is built.

Once the concrete base is complete and the steel top riser portion is on site, tugboats will push the docking barge to the intake site out on Lake Mead and a crane on the crane barge will complete the intake structure assembly. A cabling system will help lower the intake structure into place on the bottom of the lake.

Physical work on the actual intake structure is in the very early stages, with forms currently being set. The first concrete pour for the intake structure is also scheduled for early June.

VTC's \$447-million design-build contract was awarded in March 2008. Lead designer for the JV is Arup, supported by Brierley Associates. The total current cost estimate for the entire Lake Mead Intake No 3 scheme, which encompasses five other key construction contracts, as well as planning, design, construction management, contingencies and administration is approximately \$700M.

The project is being driven by the worst drought to hit the Colorado Basin in recorded history. Lake levels have been dropping about 1% a year since 1999 and by 2012 its surface could drop below the existing Intake No 1, which currently delivers 40% of Las Vegas' water supply.



**ABOVE:** Empty shape charges await the start of test blasting in early June

**ABOVE MIDDLE:** The beginnings of the TBM starter tunnel at the end of the chamber

**TOP:** View of the TBM assembly chamber from the main shaft