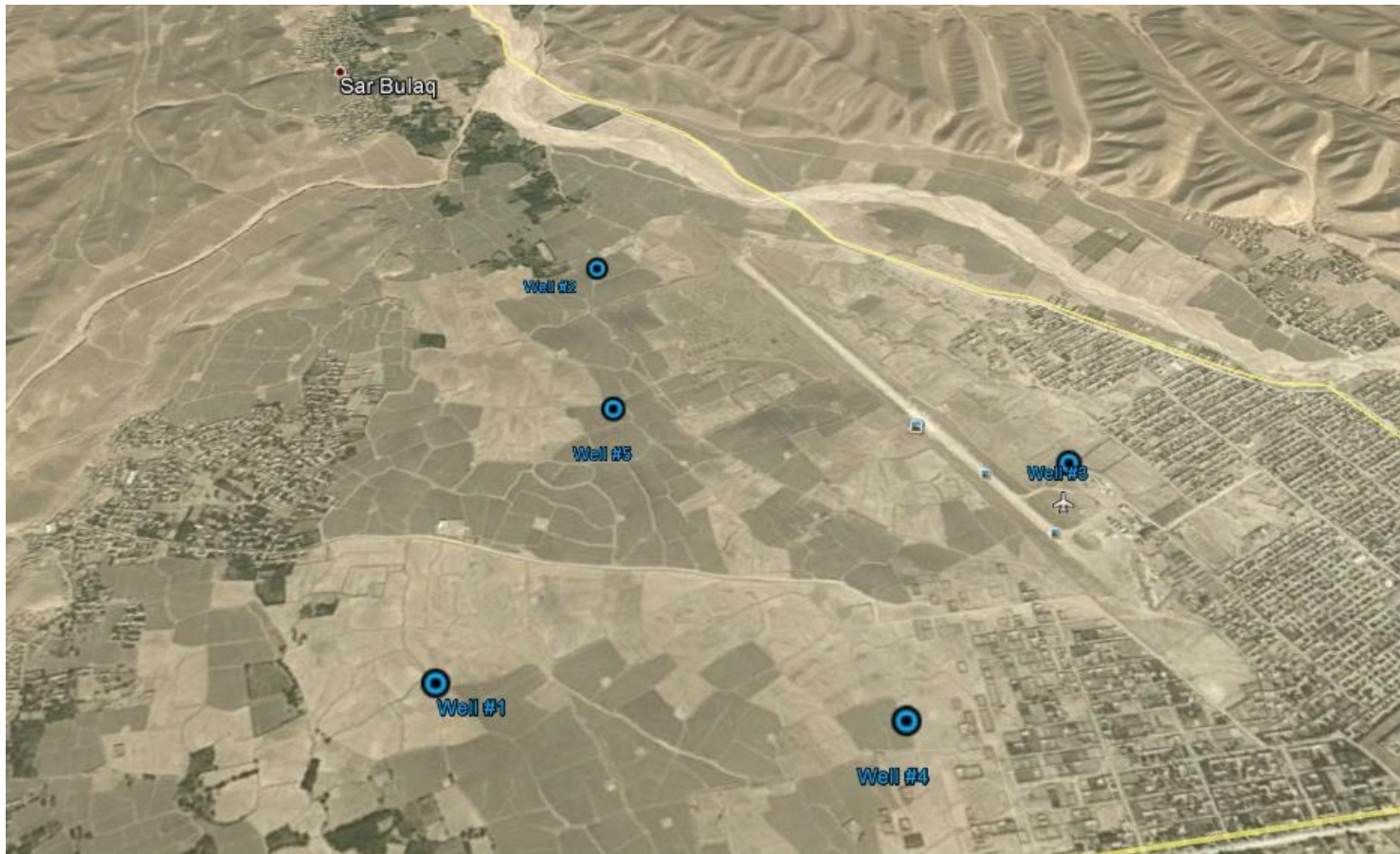


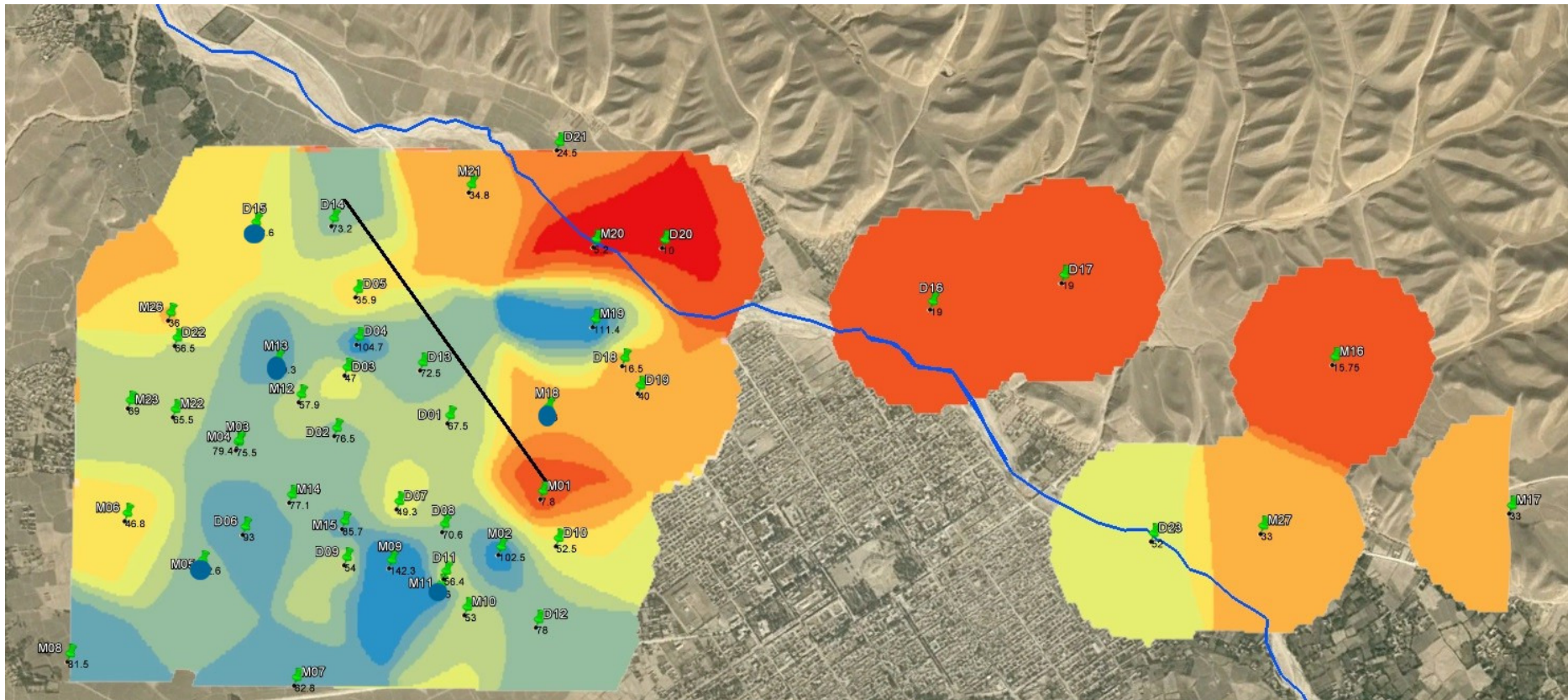
Decisions from meeting at MRRD 10th June 2014: Present: Qader, Safi, Jalil, Poya (MRRD); Abrar, Eqrar, Banks, de Jong (NORPLAN), Jawed (DACAAR)

1. Maimana Airport

MRRD originally proposed 5 new boreholes at Maimana Airport area, based on geophysical survey.



Contoured geophysical interpretation of base of aquifer (m below ground level) Blue circles show wells originally proposed by MRRD

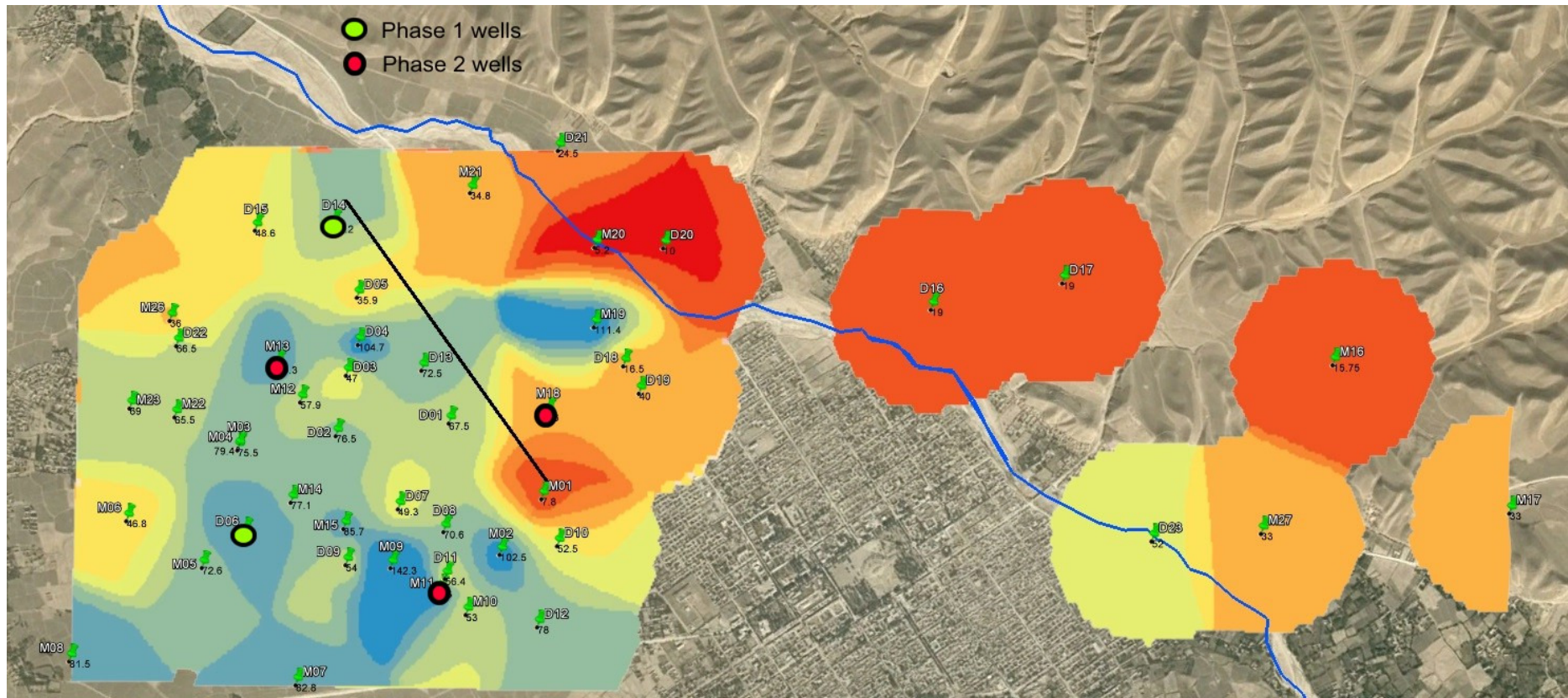


At the meeting of 10th June 2014, it was proposed to divide the drilling into two Phases:

Phase 1: Drill two production wells, each with two observation wells, at Locations D14 and D06 and carry out 2 week test-pumping

Phase 2: If Phase 1 is smooth and successful, drill 3 more production wells (each with at least 1 observation borehole) at M13, M11 and M18

Contoured geophysical interpretation of base of aquifer (m below ground level) with revised well proposal

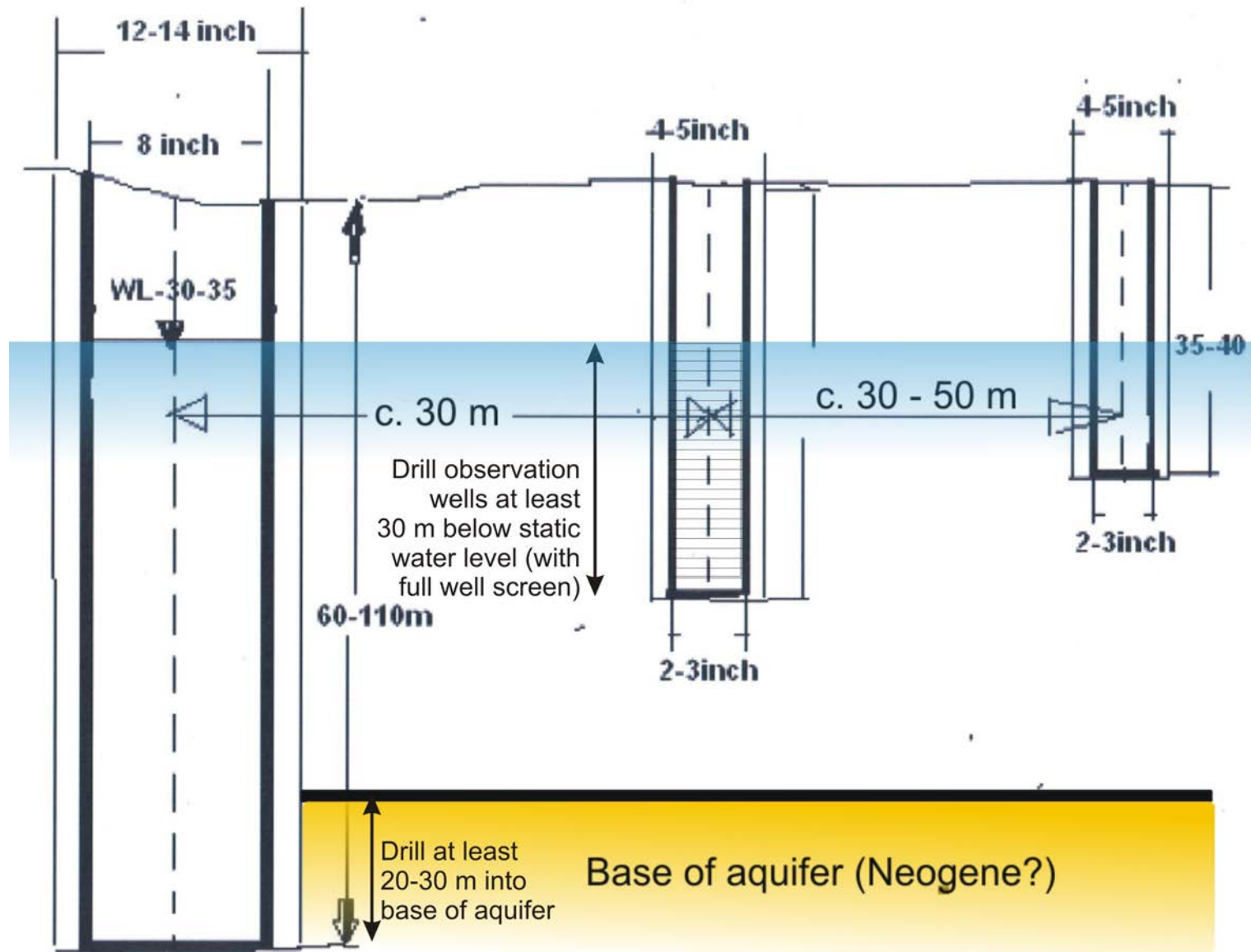


Well locations: **Phase 1:** D14 and D06 (or M05)

Phase 2: M13, M11 and M18

Note that **Production wells** should be drilled at least 20 m into base of aquifer (Neogene). Thus rig must be capable of 150 m depth and 14" diameter

Observation wells should be drilled at least 30 m below the water table (minimum 60 m total depth in most cases)



We suggest that the nearest observation borehole to the production borehole is drilled at around 30 m distance.

Preparations - before drilling

1. **Visit Maimana area and Identify exact drilling sites for each borehole and obtain permission from landowner (prefer to drill on government land, if possible).**
2. Carry out survey of any pollution sources or groundwater wells within 300 m of well locations.
3. Install divers in selected existing nearby wells (if any) for longer-term background monitoring
4. Identify locations for discharge of water from pumping test (e.g. water-filled irrigation channels or drains). These should be such as to ensure there is no re-infiltration and “feedback” to the aquifer. The water should ideally be discharged at least 200 m from the production well.
5. If drilling locations are at “new sites”, then carry out VES sounding at site
6. Repair and mobilise rigs. Mobilise or purchase pumping equipment. Pumps should be capable of sustaining a minimum of 6 L/s against 50 m head.....but larger ones would be better. Ensure generator set is sufficient to power pump (including start-up).
7. During drilling, collect samples of cuttings every 2 m. Preserve these systematically in sample bags. Site geologist to describe cuttings, photograph them and estimate grain size distribution.

After drilling

1. Make sure the well top is fitted with a good flange plate, so that the well can be securely closed and locked.
2. Install divers in new boreholes
3. Install manual dipping tubes in pumping wells
4. Estimate likely potential yield during well-development/clearance pumping
5. Geophysical logging (if MRRD NORPLAN equipment not released from customs, arrange loan of equipment from MoEW). Recommend fluid temperature / conductivity, natural gamma, caliper and inductance resistivity (if PVC casing)
6. Ensure pumping test rig has:
 - generator and pump of adequate capacity (at least 6 L/s from 50 m and preferably more)
 - means to regulate discharge (throttle valve on rising main)
 - means to accurately measure discharge (weir tank, orifice plate or correctly installed inline flowmeter, or even barrels of known size)
 - non-return valve on rising main
 - at least 200 m of discharge pipe (to ensure discharge can reach selected discharge point.)
7. Do not rely on electronic divers to measure water level. Collect regular manual readings
8. Test pumping should consist of
 - Development pumping
 - Clearance pumping
 - Step test to consist of 4-5 x 2 hour steps of increasing discharge, with 2 hr rest periods in between.
 - Constant rate test of 2 weeks in Phase 1 boreholes (may be shorter in Phase 2)
 - Recovery monitoring
9. Regularly measure temperature, electrical conductivity, pH, redox / dissolved oxygen during test (every 30 minutes during step testing, twice daily during constant rate testing). Ideally also perform alkalinity titration.
10. Use clean new sampling bottles and filters for collecting water samples during pumping test.

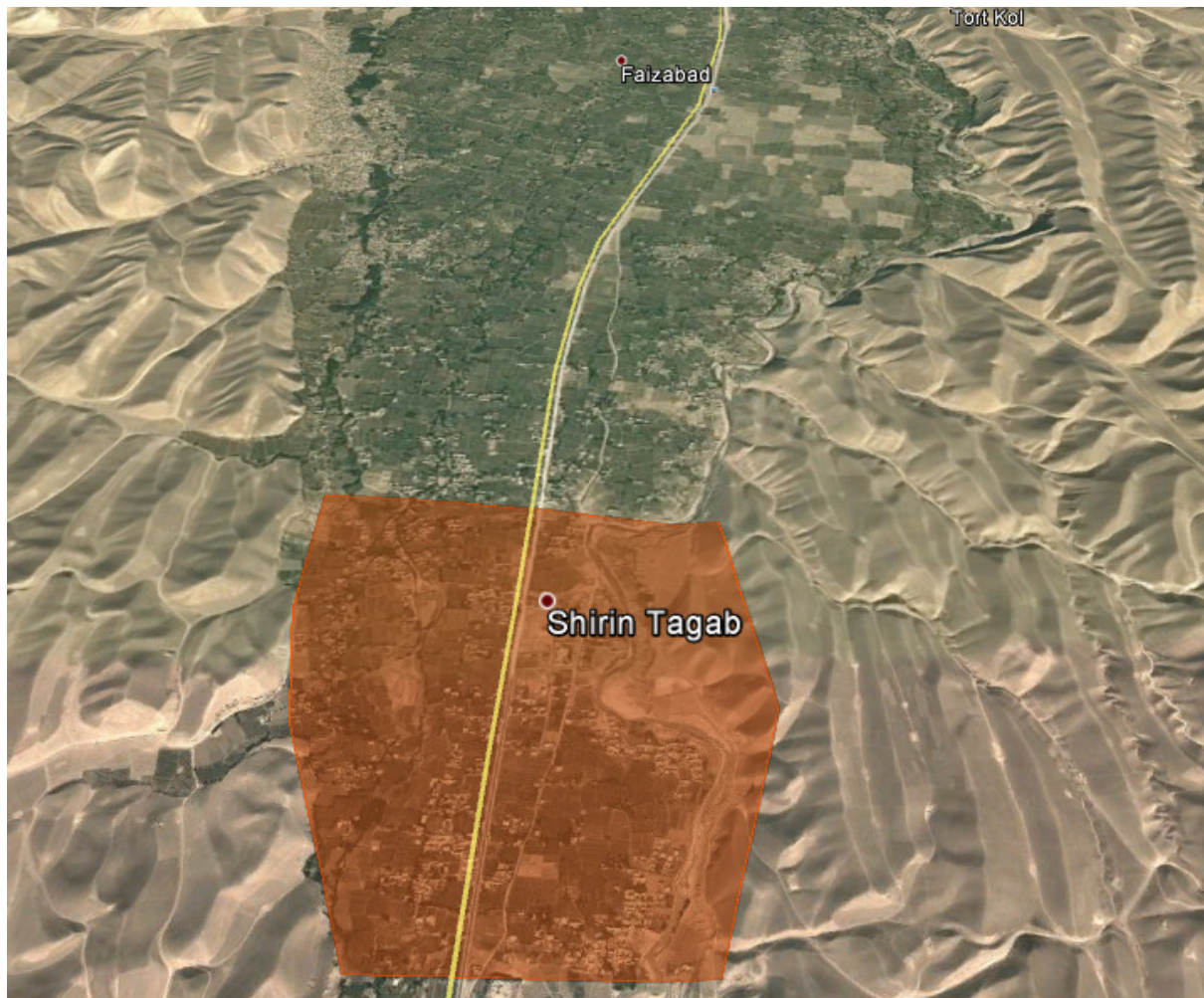
- Suggest 1 sample during step testing, then 1 samples every two days during long term test.
 - Collect 60 mL filtered bottle for chemical analysis, plus 15 mL filtered bottle for isotope analysis.
 - Send samples to NORPLAN for analysis at British Geological Survey.
11. Make sure we have a clear plan for “abandoning” the well. There are 3 options:
- Restrict diameter of headworks to 4” and convert to a long-term monitoring well?
 - Restrict diameter of headworks to 4”, install a handpump and hand over to the landowner.
 - Abandon the well by backfilling and sealing.
- My preference is for the monitoring well. The restriction of diameter to 4” is to prevent the well being used in an uncontrolled manner for irrigation.

2. Shirin Tagab

No further progress has been made at the proposed Shirin Tagab test site near Islam Qala.

At this late stage, it is proposed that, security conditions permitting, geophysical surveys (VES sounding) shall be carried out in the Shirin Tagab study area, along very similar lines to those carried out at Maimana).

Thus: **MRRD (and DACAAR?) to mobilise geophysical teams to carry out VES survey of study area (see below) according to same methodology developed at Maimana Airport.**



Orange area shows area for proposed VES survey near Islam Qala in Shirin Tagab

Based on the results of the geophysics, a decision will be made as to whether any drilling will be undertaken.

3. Andkhoy

It was agreed that we should carry out a few VES surveys around the Andkhoy area, to ascertain if any fresher groundwater can be “seen” below the saline groundwater layer.

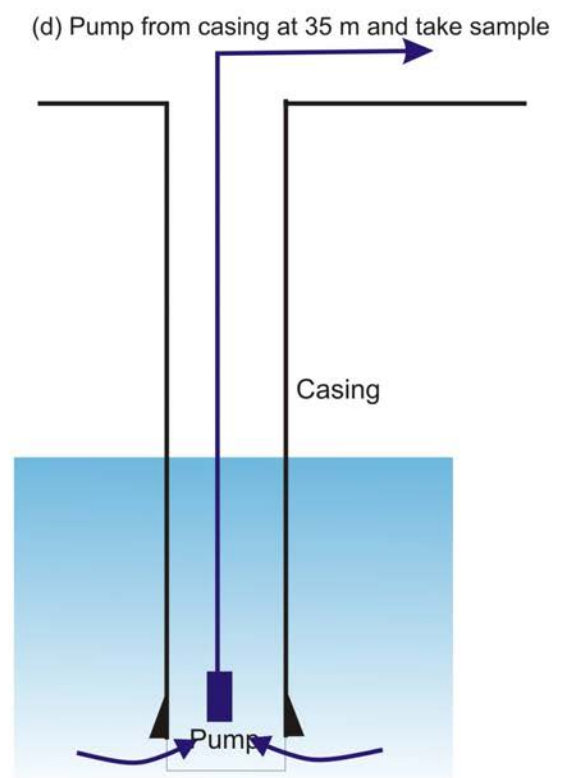
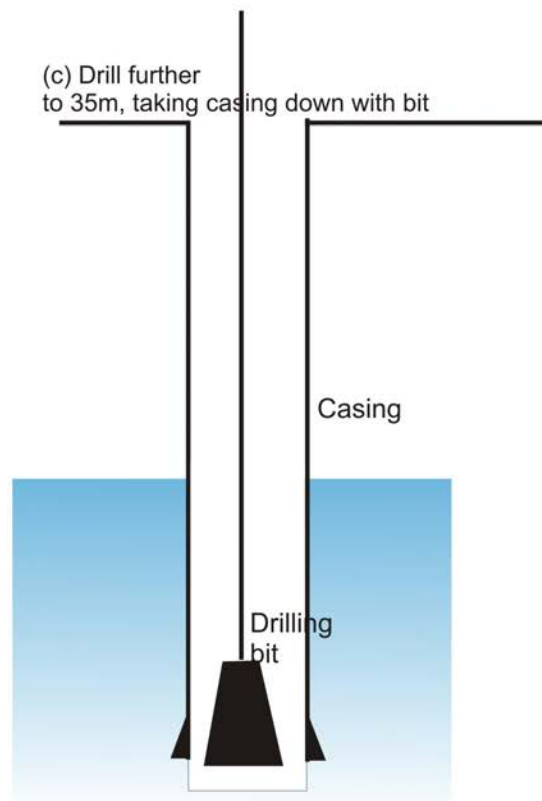
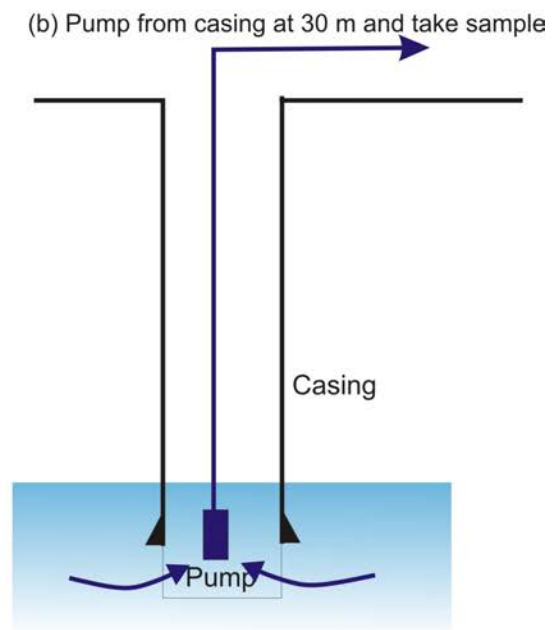
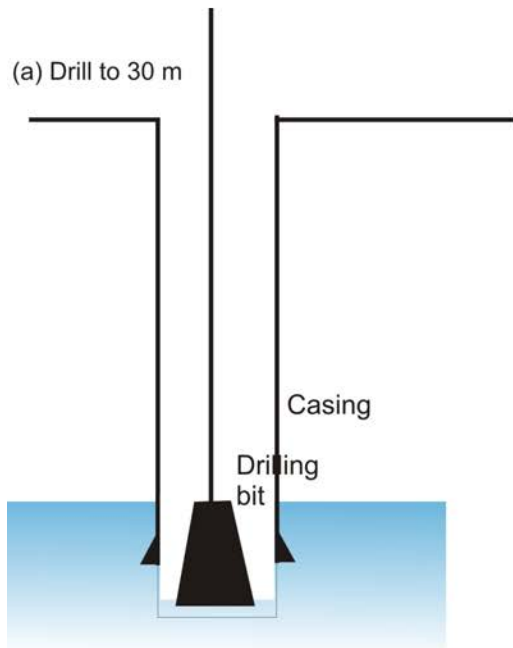
I have no strong opinions about the locations for these points and rely on local expertise to identify these. I would tentatively suggest the following:



Thus: **MRRD (and DACAAR?) to mobilise geophysical teams to carry out limited number of VES profiles in three locations (tentatively outlined in orange above) in Andkhoy area.**

If, the geophysics provides any suggestion that fresher water may exist in any of the profiles, consideration should be given to drilling **one percussion borehole to 100 or 120 m**, with sampling of groundwater every 5 m or so (see next page).

Drilling methodology for depth sampling with percussion drilling, Andkhoi



Or you can use a bailer instead of a pump!