The Bi'r Tawilah, Masarrah and Mansourah open pitable resources are members of an ~50 km long, north-south oriented string of gold deposits and occurrences distributed along the major regional *Ad Dafinah thrust fault zone*. Bi'r Tawilah, which is ~50 km east of Zalim (Dhalm), is ~5 km north of Masarrah, which is, in turn, ~8 km north of Mansourah. They are located [illegible] km NE [illegible] WSW to SW of Riyadh in Saudi Arabia.

The Bi'r Tawilah area contains ancient gold and tungsten mine workings.

Ad Dafinah thrust is within the core of the Nabitah Mobile Belt, the suture that straddles the boundary between the Jiddah and Afif terranes to the west and east respectively. This suture zone is characterised by a linear complex of synorogenic gneissic to massive granitic rocks, separated by amphibolite- to mid greenschist-facies metamorphic rocks mostly of the Siham (or Hulyfah) Group volcanosedimentary sequence and the younger molassic sedimentary and volcanic rocks of the Bani Ghayy (or Murdamah) Group, as well as ophiolitic mafic-ultramafic rocks (Stoeser and Camp, 1985). These rocks are all intruded by a series of granitoids.

The main thrust zone occurs as a semi-parallel pair of west vergent thrusts that are 5 to 15 km apart, where an eastern plate of Siham Group is overthrust onto a central block of Bani Ghayy Group, which are, in turn, overthrust onto more Siham Group, leading to along thin corridor of Ghayy Group rocks that has been step offset by late, sinistral, NW-SE trending Najd System faults.

The 750 to 685 Ma *Siham Group* was deposited above an east-dipping subduction zone in an eastward swallowing basin that grades from volcanic deep oceanic in the west to shallow continental sedimentary margin in the west and comprises andesite, basalt, rhyolite, shale, lithic sandstone, conglomerate, quartzite and marble. These have been metamorphosed to highly foliated and deformed chlorite, sericite and hornblende ortho-schists. The 630 to 620 Ma *Bani Ghayy Group* is composed of sedimentary, volcaniclastic and volcanic rocks deposited in pull-apart grabens that post-dated the incipient motion of the Najd Fault System. The sedimentary sequence is dominated by clast-supported polymictic conglomerates, sandstone and limestone, whilst the volcaniclastic facies are dominated by welded, lithic and lapilli tuffs that are interbedded with transitional to volcanic conglomerate, and is capped by flows and sills of porphyritic rhyolite.

The thrust zone which separates the Bani Ghayy Group in the west from the Siham Group in the east is occupied by listwaenized (carbonate altered) serpentinites after ophiolites (Buission and Leblanc, 1985, 1987; Saber and Labbé, 1986).

The Siham and Bani Ghayy groups and ophioites were intruded by syn- to late-orogenic and post-orogenic intrusive rocks. On the basis of intrusive ages the thrust fault is younger than 620 Ma, and is coincident with or post-dates the third of the major event of the Nabitah suture which were at 710, 680 and 640 Ma (Quick, 1991). The syn- to late-orogenic intrusive are mostly to the east of thrust fault and locally in the central part, range from diorite to granodiorite and occur along the contact between listwaenitized serpentinite and the late Siham Group rocks. Some of these appear to be contemporaneous to the Siham group and are overlain in parts by the Bani Ghayy Group. The granodiorite of this suite contains gold-bearing pyrite and arsenopyrite disseminations (Al Jahdli, 2004).

Post-orogenic intrusive rocks of the 640 to 625 Ma Haml suite occur as large batholiths, mostly to the north and east. Late NW-trending aplitic microgranite dykes cross-cut the volcano-sedimentary rocks of the Siham Group and the syn- to late-orogenic intrusive rocks and host the Bi'r Tawilah tungesten mineralisation (Saber and Labbé, 1986).

At ***Mansourah***, the thrusted contact between the Siham Group schists and younger, less deformed, Bani Ghavy Group is marked by a variably altered serpentinised ultramafic unit and diorite and quartz-feldspar porphyry intrusives. The thrust zone is repeatedly offset by sinistral strike-slip faults of the Najd System which also offset mineralisation and the youngest intrusives. The serpentinised ultramafic is commonly listwaenite-altered to an assemblage of quartz-carbonate-fuchsite. Remnants of the serpentinite occur along the margins of the listwaenite, particularly along the footwall side.

Gold mineralisation is closely associated with quartz veins and breccia zones that are preferentially developed within listwaenite. Mineralisation is developed over thicknesses of from a few metres up to 60 m, both within quartz veins and listwaenite wall rock, with good continuity over a strike length of approximately one kilometre. Quartz veins and mineralisation are developed to a lesser extent within the diorite and porphyry intrusives which have been deformed and are sub parallel to the regional structural grain. Gold mineralisation has also been intersected within footwall greywackes and shales of the Bani Ghavy Group, but forms narrower and less continuous zones compared to that in the listwaenite. High grade zones are associated with an assemblage of chlorite-graphite-pyrite-arsenopyrite in fractures or in brecciated quartz veins, as disseminated, and as semi-massive pyrite-arsenopyrite veinlets in sheared diorite. Low grade zones are associated with networks of centimetre scale quartz stockworks in listwaenite-breccia zones and with disseminated pyrite-arsenopyrite in almost all fractured rocks including the younger footwall sediment and quartz-feldspar porphyry dykes. The deposit is thought to represent intrusive related orogenic vein and disseminated type gold mineralisation (SRK Consulting, 2007).

At ***Masarrah***, the same geological and structural setting as described for Mansourah above, and accompanying gold mineralisation has been traced over a strike length of 3 km. Mineralisation is hosted largely within listwaenite and is closely associated with stylolitic sulphidic quartz veins. It has been suggested Mansourah and Masarrah deposits represent a single deposit displaced by 6.5km across Najd Fault System structures. Mineralisation is developed over similar widths to strongly associated with quartz veins and breccia zones preferentially developed within listwaenite. Mineralisation is developed over significant widths Mansourah both within the quartz veins and listwaenite wall rock, and shows good continuity over a strike length of ~1 km (SRK Consulting, 2007).

At ***Bi'r Tawilah***, both hypogene and supergene ores are known. The hypogene gold mineralisation is hosted in intermediate to felsic intrusions that occur along the north-south structural corridor as detailed above. Four intrusive rock units are differentiated in this zone, from oldest to youngest: **i).** serpentinites and related listwaenites; **ii).** diorites; **iii).** granitic rocks and **iv).** porphyries. Hydrothermal alteration minerals include chlorite, sericite, carbonates and silica which affects all rock types. Chloritisation of biotite resulted in abundant rutile, whilst sulphide mineralisation coincides with carbonate alteration. The Bi'r Tawilah mineralisation is confined to NW-trending Riedel shears related to north-south slip of the pre-existing thrust interpreted to have been due to activation within the Najd Fault System. Sulphides and gold occur in most rock types, with a sulphide assemblage of abundant pyrite and relatively lesser amounts of arsenopyrite, as well as very minor chalcopyrite