

Grids & Datums

STATE OF KUWAIT

by Clifford J. Mugnier, C.P., C.M.S.

“Evidence of the first proper settlement in the region dates from 4500 BC, and shards of pottery, stone walls, tools, a small drilled pearl and remains of what is perhaps the world’s earliest seafaring boat indicate links with the Ubaid people who populated ancient Mesopotamia. The people of Dilmun also saw the potential of living in the mouth of two of the world’s great river systems and built a large town on Failaka Island, the remains of which form some of the best structural evidence of Bronze Age life in the world. A historian called Arrian, in the time of Alexander the Great, first put the region on the map by referring to an island discovered by one of Alexander’s generals en route to India. Alexander himself is said to have called this, the modern-day island of Failaka, Ikaros, and it soon lived up to its Greek name as a Hellenistic settlement that thrived between the 3rd and 1st centuries BC. With temples dedicated to Artemis and Apollo, an inscribed stele with instructions to the inhabitants of this

ill-advised) unearthing, the same could be said of the rest of Kuwait’s 10,000 years of history” (*Lonely Planet, 2010*).

Bordered by Iraq (240 km) and Saudi Arabia (222 km) (*PE&RS, August 2008*), Kuwait’s coastline is 499 km long, the lowest point is the Persian Gulf (0 m), and the highest point is unnamed (306 m). Kuwait is slightly smaller than New Jersey. Kuwait entered into a treaty with Great Britain in 1899. The Directorate of Military Survey of the British military was responsible for all mapping of Kuwait until its independence in 1961. The 1:100,000 scale map series of Kuwait and the Neutral Zone (Kuwait – Saudi Arabia) was published from 1958–1961. The coordinate system used was the Iraq Zone Grid where the Lambert Conformal Conic projection used a Central Meridian (λ_o) = 45° E, Latitude of Origin (ϕ_o) = 32° 30' N, Scale Factor at Origin (m_o) = 0.998786408, False Easting = 1,500 km, False Northing = 1,166,200 m. The ellipsoid of reference is the Clarke 1880 (IGN)

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high-flying little colonial outpost, stashes of silver Greek coins, busts and decorative friezes, Ikaros became an important trading post on the route from Mesopotamia to India. While there is still a column or two standing proud among the weeds, and the odd returning Kuwaiti trying to resettle amid the barbed wire, there’s little left to commemorate the vigorous trading in pearls and incense by the Greeks. There’s even less to show for the Christian community that settled among the ruins thereafter.

“At the time of the Iraqi invasion of Kuwait in 1990, there was some speculation, in Western countries at least, as to why such an unprepossessing splinter of desert should be worth the trouble. Of course, anyone watching the retreating Iraqi army, under skies black from burning wells, could find an easy answer: oil. But oil was only half of the story. Kuwait is not, nor has it ever been, simply a piece of oil-rich desert. Rather, it represents a vital (in all senses of the word) piece of coast that for centuries has provided settlement, trade and a strategic staging post. The latter is a point not lost on US military forces, who until recently camped out on Failaka Island. A decade ago, the same island, at the mouth of Kuwait Bay, was occupied by the Iraqis. Roughly 2300 years before that, it was the turn of the ancient Greeks, attracted to one of only two natural harbors in the Gulf; and 2000 years earlier still, it belonged to the great Dilmun empire, based in Bahrain. The country has a curious way of cleaning up history once the protagonists have departed, and just as there’s very little evidence of recent events without some determined (and

where: $a = 6,378,249.2$ m, and $1/f = 293.4663077$. I am informed by Gener Bajao that the first major geodetic Datum of the Persian Gulf area was established by W.E. Browne of the Iraq Petroleum Company in 1927–1931 at the South End Base at station Nahrwan (East of Baghdad) such that: $\Phi_o = 33^\circ 19' 10.87''$ North, $\Lambda_o = +44^\circ 43' 25.54''$ East of Greenwich. Subsequent adjustments have resulted in the name Nahrwan Final Datum 1958.

The Kuwait Aminoil Grid of 1951 is based on the Azimuthal Equidistant Projection (Postel Projection) and the ellipsoid of reference is the Clarke 1866 where: $a = 6,378,206.4$ m and $b = 6,356,583.6$ m. The Central Meridian (λ_o) = 48° 20' 53.2" East, Latitude of Origin (ϕ_o) = 28° 33' 48.5" North, False Easting = 105,600 U.S. Survey Feet, False Northing = 264,000 U.S. Survey Feet. This curious system is likely the result of a geophysical exploration of the area by an American Oil Company that did not have a command of international geodetic surveying practices – not exactly an uncommon occurrence in the 1950s. Control is likely a series of temporary radio-location towers used for offshore positional control. The Kuwait Oil Co. Datum does not seem to have a known origin; it may be an ersatz system.

Sometime after WWII, the U.S. Army Map Service and the British Directorate of Military Survey (DMS) recomputed all of the classical geodetic datums of the Middle East on the European Datum of 1950 by using a 2-dimensional transformation on the complex conformal plane of the Universal Transverse Mercator (UTM) Grid. Of course, Kuwait was included in this new datum coverage and ED50 is ref-

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erenced to the International 1924 ellipsoid where: $a = 6,378,388$ m and $1/f = 297$. Large-scale topographic maps of Kuwait at 1:50,000 scale are on ED50 with a UTM Grid, published by DMS. A new edition published after the war is referenced to the WGS84 Datum.

The KUDAMS mapping project of Kuwait was initiated in 1983 using the Kuwait Transverse Mercator Grid where the Central Meridian (λ_o) = 48° E, Scale Factor at Origin (m_o) = 1.0, and the False Easting = 500 km. The datum used for the KUDAMS project is the Ain el Abd Datum of 1970 located in the "Arq" Oil Field of Saudi Arabia near the Neutral Zone where: $\Phi_o = 28^\circ 14' 06.171''$ N, $\Lambda_o = 48^\circ 16' 20.906''$ East of Greenwich, and the ellipsoid of reference is the International 1924. The 3-parameter transform to WGS84 Datum is: $\Delta X = +294.7$ m, $\Delta Y = +200.1$ m, $\Delta Z = -525.5$ m, thanks to the EPSG Database.

The United Nations (U.N.) prepared a report on the Iraq – Kuwait Boundary Survey and orthophoto mapping project which consisted of

a number of points determined on the WGS 84 Datum for the physical monuments established by personnel from New Zealand and Sweden. As of October 1994, the point lists were still secret (*IKBDC/Doc.20, 15 February 1993*). From what can be determined from the U.N. work, they apparently did not attempt to recover the points established by the 30th Engineer Battalion (Topographic), 18th Airborne Corps in 1990 (*Desert Storm Surveying, Funk & Lafler, POB, vol.17, no.1, October-November 1991*).



The contents of this column reflect the views of the author; who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the American Society for Photogrammetry and Remote Sensing and/or the Louisiana State University Center for Geoinformatics (C²G).