



**United States Army Garrison- Kwajalein
Atoll Information Handbook**

**Produced by DYNCORP INTERNATIONAL LLC
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U.S. ARMY GARRISON KWAJALEIN ATOLL/ REAGAN TEST SITE

U.S. ARMY INSTALLATION MANAGEMENT COMMAND

KWAJALEIN ATOLL, MARSHALL ISLANDS

I. INSTALLATION DATA

Name of Site: The installation is currently called “United States Army Garrison - Kwajalein Atoll/ Ronald Reagan Ballistic Missile Defense Test Site” (USAG-KA/RTS) effective 01 October 2013. The installation has undergone multiple name changes since its inception: U.S. Army Kwajalein Atoll/ Ronald Reagan Ballistic Missile Defense Test Site (USAKA/RTS) from 15 June 2001 to 01 October 2013; U.S. Army Kwajalein Atoll/ Kwajalein Missile Range (USAKA/KMR) from 01 March 1998 to 15 June 2001; U.S. Army Kwajalein Atoll (USAKA) from 14 November 1986 to 30 September 1997; Kwajalein Missile Range (KMR) from 15 April 1968 to 13 November 1986; Kwajalein Test Site from 1 July 1964 to 14 April 1968. Between 1945 and 30 June 1964, while under the command of the United States Navy, the installation was referred to at various times as the Navy Operating Base Kwajalein, Naval Air Station Kwajalein, Naval Station Kwajalein and Pacific Missile Range Facility (PMRF) Kwajalein.

Site Number: NQ100 [for Military Real Property Inventory purposes, assigned by the U.S. Army Chief of Engineers per paragraph 2.2.1 (3) of AR 405-45]

U.S. Mail Address: PSC 701-PO Box 26, APO AP 96555-0001

Status: USAG-KA/RTS is a Class II site (Active) of the United States Army and is designated a subordinate activity of the U.S. Army Installation Management Command (IMCOM), headquartered in Houston, TX with an Initial Operating Capability (IOC) of 1 October 2012 and Full Operating Capability (FOC) of 1 October, 2013. Command of the site with regard to its National Range Mission as an element of the Department of Defense’s Major Range and Test Facility Base (DOD Directive 3200.11) is exercised under funding guidance from the U.S. Army Test and Evaluation Management Agency.

II. GEOGRAPHICAL DATA

Location: Kwajalein Atoll is located in the “Ralik” (sunset or western) chain of the Marshall Islands in the West Central Pacific Ocean. It is 2,100 nautical miles southwest of Honolulu and about 4,200 nautical miles southwest of San Francisco. Lying less than 700 miles north of the equator, Kwajalein is in the latitude of Panama and the southern Philippines. It is in the longitude of New Zealand, 2,300 miles south and the Kamchatka Peninsula of the former Soviet Union, 2,600 miles north. Its remoteness from centers of population and its proximity to the sea has a major bearing on the operation and maintenance of USAG-KA/RTS.

Atoll Configuration and Size: Kwajalein Atoll is a coral reef formation in the shape of a crescent loop enclosing a lagoon. Situated on the reef are approximately 100 small islands with a total land area of only 5.6 square miles (3,854 acres). The largest islands are Kwajalein (1.2 square miles), Roi-Namur and Ebadon at the extremities of the atoll. Together they account for nearly half the total land area. While the “typical” size of the remaining islands may be about 150 yards X 700 yards, the smallest islands are no more than sand cays that merely break the water’s surface at high tide. In contrast, the lagoon enclosed by the reef is the world’s largest, having a surface area of 1,100 square miles. Its depth is generally between 20 to 30 fathoms (120 to 180 feet). However, there are numerous coral heads approaching or breaking the lagoon surface. The atoll’s longest dimension is 75 miles from Kwajalein to Ebadon and its average width is about 15 miles. Kwajalein, at the atoll’s southern tip and Roi-Namur at its northern extremity, are the principal islands at USAG-KA/RTS.

Atoll Structure: Coral atolls are seamounts, which are capped by calcareous marine growth constructed by lime-secreting organisms (coral polyps and algae). Presumably, the lower parts are composed of non-calcareous rocks, usually volcanic materials. The coral superstructures may be hundreds or even thousands of feet in thickness. Emergent portions of reef and islands are composed of loose, poorly consolidated calcareous materials derived from foraminifera, coral, shells and marine algae or their debris, resulting from destructive action of the elements. One notable characteristic of atolls is the steep slopes of the mountain seaward of the reef. Around Kwajalein Atoll, the depth plunges to as much as 1,000 fathoms (6,000 feet) within two miles of the atoll and 2,200 fathoms (13,200 feet) within 10 miles. The Kwajalein Atoll reef lies at inter-tidal level, mostly exposed at low tide and submerged at high tide. There are about 25 passages from the open ocean into the lagoon, through or over the reef, which will admit small boats. Ocean going ships ordinarily use Gea Pass, 10 miles north-northwest of Kwajalein.

Elevation: All islands of the atoll are quite flat with few natural points exceeding 15 feet above mean sea level. The average elevation of Kwajalein is 5.9 feet. Its highest point, “Mount Olympus,” the original missile launch hill, is about 57.6 feet high and is man-made. Because of

the coral base and the lack of elevation of the islands, there is a very shallow water table. This condition presents a major problem for underground construction.

III. CLIMATE

Kwajalein has a tropical marine climate characterized by a relatively high average annual rainfall of nearly 100 inches and warm-to-hot, humid weather throughout the year. The principal rainfall season extends from May through November, with about 75 percent of the annual rainfall recorded during this period. A pronounced diurnal cycle exists in the tropics, with two thirds of atoll rainfall typically recorded between midnight and sunrise. Easterly winds, almost constant cloudiness, and frequent moderate to heavy showers prevail during the wet season. The dry season is mid-December through April with lighter showers of short duration, but not a complete absence of significant rainfall events. In this season, brisk trade winds out of the northeast are persistent and cloudiness is at a minimum.

Note on Variances: Periodic warming of equatorial waters (El Nino) greatly alters wind, wave, and weather patterns, which not only affects the tropics but also can change weather on a global scale. For Kwajalein Atoll, El Nino triggers more extreme conditions, as noted in the text. Similarly, abnormal cooling of equatorial waters (La Nina) also disrupts weather patterns, but along generally less predictable patterns. These events are called El Nino Southern Oscillation or ENSO events.

Temperature: Temperatures vary little from day to day and month to month. Typical daily average temperatures are a low of near 78 degrees Fahrenheit (F) and a high near 87 degrees F. Due to the low latitude, only slight variations occur in the length of daylight and the altitude of the sun. The small variation in solar energy and moderating ocean influence are primary reasons for such uniform temperatures in the area. The average monthly temperature is 82.2 degrees F. Normal temperature range between the coldest and warmest months is about one degree F, with an average daily temperature range of 10 degrees F. Maximum daily temperatures occur in the early afternoon and the minimum occurs during showers or in the early morning. The highest temperature ever recorded was 97 degrees F while lowest was 68 degrees F.

Relative Humidity: The relative humidity is quite high, with the 30-year normal being 79%. Relative humidity is typically 70% to 80% during the day and 80% to 90% at night. Humidity is on the low end of the range in the dry season and the high end in the wet season. Unusually dry episodes occur a few times in each dry season, when the humidity drops below 70%.

Winds: Northeasterly trade winds are dominant most of the year. From December through June, the wind blows mostly from the east-northeast (the bearing of the Kwajalein aircraft runway) at speeds averaging about 17 miles per hour. During the summer months, winds are generally weaker with occasional doldrums of almost no winds; the direction tends to be more easterly, sometimes southeasterly, and even westerly on occasion. Winds seldom exceed moderate gale strength (38 miles per hour). Typhoons are rare in the immediate vicinity of Kwajalein but are possible at any time of the year due to the warm water temperatures in the region. Significant west-wind and west-swell episodes have been recorded and appear particularly associated with strong El Nino events. West winds can also occur in the atoll with transiting tropical cyclone threats. Many atoll harbors lack protection from west-winds and swells.

Clouds: Kwajalein is one of the more cloudy places on the planet. Partly to mostly cloudy skies, with one-half to three quarters cloud cover, prevail most of the time. Periods of scattered to broken cumulus clouds (40-90% sky coverage) with bases at 1,500 to 2,000 feet are common throughout the entire year. The atoll does not experience fog and only heavy showers reduce visibility below two miles.

Dry Season and Droughts: The dry season is of particular significance to an installation such as USAG-KA/RTS. As many as 19 weeks have passed with practically no rainfall (in 1983 the rainfall for January-May was only 3.89 inches). Light showers of short duration fall on dry, heated ground and render little, if any, catchable water. During the dry season, fresh water consumption exceeds the amount of rainfall available from catchments and it is necessary to obtain fresh water by extracting it from lens wells or by extracting it from seawater.

Kwajalein had a severe dry season in 1983 and 1984, with 1984 being the driest year on record. Kwajalein sustained a severe dry season in the first half of 1992. Tropical Storm Zelda (Nov 1991) affected the fresh water table by decreasing the amount available. Therefore, fresh water had to be shipped from Kwajalein to the outer islands. In 1995, USAG-KA/RTS installed a permanent seawater desalinization unit capable of augmenting fresh water reserves. Drought conditions attributed to ENSO event followed Typhoon Paka in December 1997 and another severe drought was observed in 2016 following the 2015 ENSO events.

Tropical Cyclone Threats: The generic term for Tropical Disturbances, Tropical Storms (TS) and Typhoons (TY) is tropical cyclone. Typhoons are classified as tropical cyclones with sustained winds greater than or equal to 64 knots (74 mph). Due to Kwajalein's location, typhoons are rare. Tropical storms, which are less intense than typhoons, are more frequent.

In January 1988, TS Roy caused extensive shoreline damage at Kwajalein. Various facilities were damaged, mostly the roofs, with the damage estimated at approximately two million dollars

for Kwajalein. Because of the storm's track, most of the damage was to buildings on the ocean side and the shoreline areas along the runway and golf course. Ebeye received even worse damage, leaving 3,500 people homeless, with major damage to more than 50% of the homes, while 30% were destroyed.

TS Zelda came through Kwajalein on Thanksgiving Day 1991 with 55 knot sustained winds and peak gusts of 71 knots. Zelda's winds and driving rains uprooted trees and severely damaged many facilities. The center of the storm was 19 miles southwest of Kwajalein. Kwajalein Atoll was declared a disaster area and was supported by Federal Emergency Management Agency (FEMA) with damage of more than eight million dollars.

TY Paka passed 83 miles south of Kwajalein on December 12, 1997. Sustained winds of 39 knots were recorded on Kwajalein, with gusts to 47 knots. While damage was widespread, it was generally minor.

In December 2004, TS Talas made its way through the Marshall Islands, affecting Kwajalein Atoll from the evening hours of December 10 through the morning hours of December 11. Talas' track brought it 16 miles south of Kwajalein. The weather station recorded sustained winds of 40 knots, with gusts to 56 knots. There were a few structures on Kwajalein that sustained significant structural damage; however, the storm's overall impact was not great. Reports indicated more severe damage on Ebeye, with many roofs blown off and significant structural damage to houses.

TS Bavi formed in the RMI in March 2015 and moved within 111 miles southwest of Kwajalein. The Kwajalein Atoll experienced several days of blustery winds in excess of 25 knots with several short peaks of sustained winds over 34 knots. The maximum sustained wind speed was 36 knots with a maximum-recorded gust of 44 knots. TS Bavi damaged the roofs on several buildings, toppled trees, and did damage at both Roi-Namur and Kwajalein. Damage was estimated to be more than a million dollars.

As observed during the strong El Nino of 2015, the general region for tropical cyclone formation and spawned disturbances shifts eastward, increasing the likelihood of tropical cyclone activity throughout the Marshall Islands. When intensification of a tropical disturbance does not happen in the Marshall Islands, westerly winds can occur if the system intensifies further west. The lagoon geography allows westerly winds to pile up water on the lagoon shores of Kwajalein and Roi-Namur Islands, resulting in unusually high surf and wash-over in low-lying areas. Structures such as docks, boats and housing, which are usually sheltered from easterly trade winds, become vulnerable to damage during these conditions. Several years ago, and again in 2015, harbor docks and boats were significantly damaged by lagoon waves during west winds.

Rough seas along the watercraft traffic channels in the lagoon can hinder transport capabilities, disrupt logistics, and hinder safe commute of the Marshallese workforce.

Rainfall: Average annual rainfall at Kwajalein is slightly less than 100 inches. Variation can be significant and ranges from a low of 59.35 inches in 1984 to a high of 149.13 inches in 1950.

Lightning: On average, Kwajalein only experiences ~15 days per year when lightning and thunderstorms. Meteorologists study the strength of reflectivity of storms at the -20 C level in showers to provide early warning of the potential for discharges, even before lightning occurs. An advanced lightning detection network installed on the atoll helps validate lightning activity.

Tsunamis: Kwajalein has a low risk for devastating effects from tsunamis. For a tsunami to produce devastating inundation and damage along coastlines, the sea floor must gradually rise up to the shoreline. This allows the tsunami to stack wave upon wave and amplify its energy, producing a powerful wave that can wash inland and cause significant damage. In contrast, Kwajalein Atoll, along with the other atolls of the Marshall Islands, has an extremely steep drop-off from the reef front into deep ocean waters. The steep run-up to the reef edge prevents the tsunami's energy from amplifying, with little to no water buildup available over the intertidal reef to carry the wave to the shoreline.

However, while rare, tsunamis can have an effect on Kwajalein if certain conditions exist. If a powerful tsunami moves through the area at or near high tide, there may be enough water over the ocean-side reef to allow the tsunami to propagate all the way to and over the shoreline. Additionally, effects can be evident, if the tsunami waves enter the lagoon where the run-up to the shoreline is much more gradual. This occurred during the April 2011 8.6M Tohoku earthquake and tsunami. Since the tsunami was propagating from the northwest, Roi-Namur and other areas along the northern atoll experienced more visible effects from the tsunami than areas further south. Some reports indicated that boats at the Small Boat Marina hit the bottom as the surge receded inside the lagoon, while there were other reports of damage to the northern shoreline and breakwaters with minor flooding or splash over in some areas.

Big Waves: Inundation and other effects from large wind-driven waves are also rare, for the same reasons tsunamis pose a low risk for devastating effects. Large expanses of shallow reef exist around most of the east and north facing shorelines, causing most waves to break well before they reach the shore. However, as with tsunamis, certain conditions can lead to large waves causing inundation or other effects.

The most severe instance of this was during December 2008, when a sub-tropical cyclone located north of Kwajalein Atoll began moving southward and then westward. The sustained

winds associated with this system, over a large area of mostly open ocean, began creating very large wind-driven swells that propagated southward toward Kwajalein Atoll. For several days, each time the twice-daily high tide occurred, enough water existed over the shallow reef area to allow these waves to propagate to the shoreline. This caused severe inundation at Roi-Namur, contaminating lens wells and the supply of fresh drinking water on the island. Along the northern shoreline, the sea walls and RTS buildings sustained water damage.

Other less damaging large wave events have occurred, and tend to be more common than events that result in severe inundation of 2008. Splash-over and minor ponding/flooding has occurred on Roi-Namur in February 2010, March 2014, and February 2018. On Kwajalein in February 2019, a prolonged strong easterly trade wind caused a splash over event near the dome housing. Minor sea wall damage was noted during some of these events. Sea level changes will also have a major influence in splash over and inundation events and severity.

Weather Summary Table:

The table below summarizes the previous text and highlights most likely periods for weather threats. West-wind events are more common in strong ENSO years. Average rainfall is highest (wet season) in May-November, with a sudden drop (dry season) early in the year (mid-December thru March). Tropical cyclone threats can occur anytime, but are more common in the fall and may be stronger in the atoll during ENSO events.

Weather Summary Table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daylight (Hours)	11.6	11.8	12.0	12.2	12.4	12.5	12.4	12.2	12.0	11.8	11.6	11.5
Avg. High Temp (°F)	85	86	86	87	87	87	87	87	87	86	86	86
Avg. Low Temp (°F)	78	78	78	79	79	78	78	78	78	78	78	78
Normal Wind Direction (from)	NE - E	NE - E	NE - E	NE - E	NE - E	NE - E	NE - E*	NE - E*	NE - E*	NE - E*	NE - E*	NE - E
Avg. Wind Speed (mph)	17 - 22	16 - 21	15 - 20	14 - 19	13 - 18	12 - 17	11 - 16	9 - 14	11 - 16	13 - 18	14 - 19	16 - 21
Daily Chance of Rainfall % ***	55%	45%	50%	55%	60%	65%	70%	80%	80%	85%	75%	60%
Avg. Rainfall** (inches)	4.0	3.3	3.6	6.2	6.6	7.9	9.9	10.4	10.9	11.8	11.1	8.1
Big Rains # Days>=1"	1	1	1	2	3	3	3	3	3	4	3	2
Average Cloud Cover % ****	85%	80%	80%	80%	80%	85%	85%	85%	90%	90%	85%	85%
Big Winds * # Days>=35mph	4	4	4	2	2	3	4	2	2	3	6	6
West Winds *							-----Higher Risk Period-----					
Big Waves *	---Moderate Risk---			-----Low Risk-----						-----Higher Risk-----		
# Days w/Lightning	1	1	1	1	2	2	2	3	3	3	2	1

* Significant west-wind and west-swell events are more likely to occur in strong El Nino years.

** Averages can be misleading. The tropical climate normally produces long wet or dry periods. On small tropical islands, without mountain effects, about 2/3 of annual rainfall occurs between midnight and sunrise.

*** Shows probability of experiencing at least a few drops of rain (trace or more) anytime in the 24-hour day.

**** Many high clouds are generated from deep tropical convection patterns. These high clouds frequently spread into our area.

Updated: 23 August 2019

IV. SOIL

The atoll's soils are extremely poor mainly because of the lack of nitrogen and potash (two major plant nutrients). Although small amounts of all the required trace elements are probably present (they are found in the seawater that surrounds the atoll), they are insufficient for normal development of many imported plants. The high alkalinity of the calcareous sands also inhibits the growth of many non-native species of vegetation. Water-holding capacity of the soil, largely determined by the size of the particles, is poor because of the generally, coarse-grained sands. The presence of humus materials formed from decayed organic matter improves the capacity. Unfortunately, these humus materials do not readily form under the aerobic conditions of Kwajalein's temperature and alkalinity.

V. VEGETATION

Usefulness: Plants perform vital services for an installation in Kwajalein's environment, aside from their considerable decorative value in enhancing the scenic aspect of the development island as a place to live. Trees, shrubs and ground cover vegetation, by providing shade, absorbing light and preventing heat reflection from the white sandy soil, greatly lower the heat energy that would otherwise be generated on the island surfaces by the tropical sun. For example, assuming a radiation of 1.5-gram calories per square centimeter per minute, a coconut tree 10 feet in diameter, which casts a shade of only 33 percent coverage of its overall shaded area, is either absorbing or reflecting a total of over the two kilowatts of energy or about 112 BTU per minute. Trees with wider diameters of foliage will absorb correspondingly more of this radiant energy and provide greater cooling effects. Plants, particularly of the ground cover type, also serve to control dust and erosion caused by wind and rain.

Types: While the variety of trees and plants found on the islands occupied by USAG-KA/RTS is relatively limited, there are several of them. Many are particular strains, which have adapted to the difficult growing conditions. By far the most common tree is the coconut palm; others frequently seen are the heliotrope, pandanus, pemphis, and ironwood. Common grasses, vines and shrubs include *Desmodium canum*, Bermuda grass, *thuarea*, *scaveola*, "vigna" marina, beach morning glory and *wedelia* creeper. Some of these are considered no more than weeds in other locales but at Kwajalein, they are beneficial. The last three plants named, for example, will flourish where nothing else will survive and are therefore valuable as ground cover. *Desmodium canum* (beggar's lice, commonly known as "hitchhikers") is a nuisance because of its flat, clinging seeds that catch on socks and clothing, but it helps the growth of other plants by

transferring nitrogen from the air into the soil through its roots. Those plants that grow most readily seem to be spurred by disturbance of the ground surface and a jungle-like tangle of growth can develop quite rapidly. However, since all of the vegetation, even the largest trees, are shallow rooted, the clearing of an island offers no problem to modern machinery.

VI. ANIMAL LIFE

Native fauna on the Kwajalein Atoll consists of only a few species of birds, terrestrial reptiles, various insects and a bountiful profusion of marine life, both on the reef and in the surrounding sea. There are a number of sensitive marine species in the waters of Kwajalein Atoll. The *Environmental Standards and Procedures for United States Army Garrison Kwajalein Atoll (USAG-KA) Activities in the Republic of the Marshall Islands (UES)* identifies numerous marine mammals, sea turtles, corals, marine mollusks, marine sponges, and fish that are protected as threatened, endangered, or candidate species.

Non-indigenous animals include cats, dogs, chickens, ducks and pigs, most of which can be found in domestic and wild forms on different islands throughout the atoll. Creatures that at times create economical or public health problems include wild cats, pigs, rats, mice, termites, cockroaches, mosquitos, and several species of filth flies.

VII. REAL ESTATE

Islands Used: USAG-KA/RTS has facilities and personnel residing on the islands of Kwajalein and Roi-Namur. Operations personnel commute on an as needed basis to the structures sited on the islands of Ennylabegan, Gagan, Meck, Legan, Gellinam, Omelek, Eniwetak and Illeginni.

Political Jurisdiction: The Kwajalein Atoll first came under U.S. administrative control at the time of its capture in February 1944, according to the International Law of Belligerent Occupation. However, in July 1947, the former Japanese-mandated islands of the Marshalls, Carolinas and Marianas groups became a Trust Territory of the United Nations. By agreement between the U.N. Security Council and the United States government, the Trust Territory was placed under U.S. administrative authority (not ownership). Civil administration was delegated to the U.S. Navy on 1 July 1951, when it was transferred to the Department of the Interior by Executive Order 10265.

On 14 January 1986, the signing of the Compact of Free Association between the Republic of the Marshall Islands and the U.S. Government dissolved the Trust Territory of the Pacific Island (TTPI) authority over the Republic of the Marshall Islands (RMI). The two countries negotiated

an Amended Compact that entered into force on 1 May 2004. Under the Compact of Free Association, the political status of RMI is one of independence with the Marshallese people electing their own leaders as a self-governing nation. The U.S. Government provides sufficient funding for most government operations, social services and development. The U.S. Government also has full responsibility for defense of the islands for a period of 20 years. The Republic of the Marshall Islands shall provide to the U.S. Government the following land areas for its exclusive use, unless otherwise provided. Upon request of the RMI Government, the U.S. Government may grant limited access to these islands.

Outside Mid-Atoll Corridor:

<u>Island</u>	<u>Approximate Acreage</u>
Kwajalein	748 (includes 205 acres of landfill constructed by the U.S. Government)
Roi-Namur	398 (includes 40 acres of landfill constructed by the U.S. Government)
Ennugarret	6 (of 24 total acres)
Ennylabegan	71 (of 124 total acres)

Within the Mid-Atoll Corridor:

<u>Island</u>	<u>Approximate Acreage</u>
Meck	55 (Includes 18 acres of landfill constructed by the U.S. Government)
Eniwetak	15
Omelek	8
Gellinam	5
Gagan	6
Illeginni	31
Legan	18

The U.S. Government has control of entry and movement of personnel within the Mid-Atoll corridor area of the Kwajalein Atoll as delineated in the Compact of Free Association. The Mid-Atoll Corridor is defined as the area within the Kwajalein Atoll bound on the north by a line drawn from north of Boked Island on the east reef to Yabbernohr Island on the west reef and bound on the south by a line drawn from south of Bigej Island on the east reef to north of the high tide mark on Ninni Island on the west reef.

National History Site: The Kwajalein and Roi-Namur Battlefields were officially dedicated National Historic Landmarks in 1985. As such, they are listed on the National Register of Historic Places. Although the original islands have been filled and are covered with modern

structures and facilities, the entire land area underneath these features is considered historically significant. A fierce battle was fought over the original islands. The aboveground historically significant structures are listed in the Master Plan for Kwajalein Atoll.

VIII. DATE AND TIME

In the past, both date and time were set arbitrarily for the convenience of the U.S. installation and did not conform to the atoll’s geographic position west of the International Dateline in the Time Zone centered on the 165-degree E. meridian.

The RMI government requested that USAG-KA/RTS observe the proper time and date according to the International Date Line. In August 1993, this change was implemented.

Time: Kwajalein time is 22 hours ahead of Honolulu. Thus, when it is 7:30 Tuesday morning on Kwajalein, it is 9:30 Monday morning in Honolulu. Read down the following table to see the relationship to other U.S. time zones.

Kwajalein Time	7:30 AM	11:30 AM	4:30 PM	10:00 PM
Hawaii Time	9:30 AM	1:30 PM	6:30 PM	12:00 Midnight
Pacific Standard Time	11:30 AM	3:30 PM	8:30 PM	2:00 AM
Pacific Daylight Time	12:30 PM	4:30 PM	9:30 PM	3:00 AM
Mountain Standard Time	12:30 PM	4:30 PM	9:30 PM	3:00 AM
Mountain Daylight Time	1:30 PM	5:30 PM	10:30 PM	4:00 AM
Central Standard Time	1:30 PM	5:30 PM	10:30 PM	4:00 AM
Central Daylight Time	2:30 PM	6:30 PM	11:30 PM	5:00 AM
Eastern Standard Time	2:30 PM	6:30 PM	11:30 PM	5:00 AM
Eastern Daylight Time	3:30 PM	7:30 PM	12:30 AM	6:00 AM

IX. SIGNIFICANT FACTORS RELATED TO SITE OPERATION & CONSTRUCTION

The location of U.S. Army Garrison - Kwajalein Atoll/ Reagan Test Site in an isolated and sparsely populated area of the West Central Pacific Ocean is dictated by requirements of the missile-testing programs conducted here. This setting, together with the nature of the installation, introduces conditions not generally encountered at Army posts and requires consideration in the planning, operation, maintenance and construction of USAG-KA/RTS facilities. Briefly described below, are factors of significance.

Status as a National Range: National Range policies govern the occupancy of the installation by activities such as Range users and tenants. Security requirements limit the accessibility of the installation to USAG-KA/RTS personnel employees of contractors and subcontractors, crews and passengers of transit aircraft and ships, and dependents.

Preponderant Civilian Scientific Community: The success of the R&D programs at USAG-KA/RTS is, to a large measure, dependent on the high caliber of scientific and technical personnel at the site. It is to be stressed that there is no such thing as “off post housing” for Americans at USAG-KA/RTS. The U.S. Government provides all the housing and community facilities. Attracting and retaining the most competent personnel obtainable for operation of the technical programs on the installation, are vital factors in fulfilling the mission of the missile range.

Regional Limitations: Because USAG-KA/RTS is located in a remote area with a small population, many of the facilities and services normally available in a community and provided by commercial or civil sources are either nonexistent or minimal in the accessible surrounding area. The nearest urban area is Honolulu, 2,100 nautical miles away. The following list indicates the types of facilities and services provided, which are available to island residents, only to the extent that they are provided as part of the operation of the installation.

Housing facilities include dormitory-style bachelor quarters, a variety of one to three bedroom houses, and transient accommodations. All modern utilities are provided, including direct dial telephone service to the mainland and in the spring of 2014, residential high-speed internet became available.

Personal service facilities include dining facilities, commissaries, hardware store, beauty/barber shop, laundry service, schools, library, hospital, dental clinic, Community Bank, a religious education building, churches, travel agency and U.S. Army Post Office.

Recreation facilities include golf courses, swimming pools, softball fields, soccer fields, bowling alley, racquetball courts, tennis courts, beach volleyball courts, gymnasiums, boat rentals and recreational centers.

Entertainment services include movie theaters and the Armed Forces Radio and Television Network (AFN).

Requirements for Air Conditioning: Criteria for air conditioning at Army installations are set forth in Army Regulation 420-54 Engineering manual, Air Conditioning-Evaporative Cooling-

Dehumidification-Mechanical Ventilation. These standards are set in order to maintain acceptable comfort levels for personnel under oppressive climatic conditions and to protect government and personal property from deterioration due to climate. Of the four weather zones described in AR 420-54, the one authorized the most air conditioned facilities is Zone B, defined as having a wet bulb temperature of 67 degrees F or higher for 1000 or more hours during the six warmest months of the year. A subdivision of Zone B covering additional air conditioning for personnel quarters raises the 1000-hour requirement to 1800 hours. Kwajalein exceeds that maximum requirement 2 1/2 times over, as it has 100 percent of the hours (4416 hours) in any six months registering temperatures higher than 67 degrees F wet bulb. According to the National Weather Service, Kwajalein's wet bulb reading is higher than 67 degrees F the entire year. Rarely does the temperature drop below 71 degrees F wet bulb at any hour in any month. Clearly, air conditioning is a necessity at this site for efficiency of personnel, operations of equipment, and protection of property.

Corrosive Climate: The constant high humidity, warm temperatures and high salt content of the air have a severely corrosive effect on buildings and equipment. Between 1955 and 1988, the U.S. Navy Civil Engineering Laboratory conducted studies of the sample protective coatings exposed to the atmosphere of Port Hueneme (California), Kaneohe (Hawaii) and Kwajalein. The Laboratory's Technical Report R-197 of 2 July 1962 concluded that the Kwajalein exposure site has the most corrosive marine atmosphere of the three test sites; coatings tested were consistently less durable at the Kwajalein location. Continuous maintenance is required to preserve the usability of buildings and equipment at USAG-KA/RTS but even so, the life span of facilities is significantly shorter than would be expected in most other environments. The Kwajalein environment is particularly conducive to electrolytic action between contiguous dissimilar metals, causing destruction of one of the metals. Many small but vital parts (screws, hinges, fittings) of buildings, vehicles and equipment are affected by this condition. In many cases, more expensive, difficult-to-obtain materials must replace materials that are standard in other locations. For example, experience has shown that aluminum flashing on roofs will not stand up in the Kwajalein environment and that stainless steel flashing must be used instead.

Long Supply Lines: Almost all materials and supplies supporting the Garrison programs, population and construction are shipped from Hawaii or Continental United States (CONUS). Only a small part of the total requirements can be airlifted. Surface vessels send the bulk of the cargo. Lead-time for procurement of supplies is ordinarily figured at three to four months, depending on point of origin and assuming immediate availability from suppliers.

Warehousing Requirements: The long lead-time for procurement necessitates warehousing of sufficient supplies, materials and repair parts to insure uninterrupted operation of technical programs and construction activities, plus support of the Kwajalein community. Much of the

material requires dehumidified storage to protect it from damage by Kwajalein's moist, corrosive climate. During construction of technical buildings, precautions are taken to protect delicate, costly electronic equipment that requires carefully controlled humidity and temperature conditions prior to its installation.

Intra-Atoll Shipping: Supply lines are lengthened up to 50 miles on items for use by outer-island installations of the Kwajalein Atoll. The items are transported from Kwajalein by USAG-KA/RTS aircraft or watercraft. This requires additional handling and off-loading at points where the use of bulk-handling and off-loading equipment is not practical. Intra-atoll shipments require extra labor, time and usually temporary warehousing space on Kwajalein. USAG-KA/RTS operates a fleet of U.S. Army vessels in order to transport personnel, cargo, fuel and water to the outer islands.

Non-fluidity of Manpower: Required personnel, other than general labor, is usually brought in from Hawaii or CONUS. As indigenous laborers gain skills and training, this situation is showing some signs of change but it is still the rule. The expense, in both time and money, of transporting employees is a significant factor in overall project costs. When dependents are involved, the cost rises.

Groundwater: The presence of both pure and brackish ground water underlying the islands causes a problem when excavating to depths of more than five feet. The water table fluctuates with the tide. The water does not adversely affect placement or curing of concrete but it does aggravate nature's attack on items such as reinforced steel and subsurface piping. Valves and fittings of underground utility lines are therefore subject to a severely corrosive environment.

Shore Erosion: Although small in area, the islands of the Kwajalein Atoll have long shorelines that are constantly exposed to wind and wave action. Erosion is controlled by existing protective measures (riprap, sea wall, revetments, etc.) and has no effect on facilities away from the shore. Even so, adverse weather conditions can cause severe damage in a short time. The prevailing winds at Kwajalein are easterly or northeasterly. However, the winds shift occasionally and blow from the southwest. A southwesterly wind occurring in conjunction with a high tide tends to "pile up" the water in the lagoon. In severe instances (such as those which took place in August and September 1965, January 1968, October 1972, January 1979, November 1982, October 1997 and September 2015), the high water attacked the shorelines and piers with resultant damage and flooding. During those storms, the sea washed over Echo Cargo Pier, riprap was displaced and road damage occurred. Limited flooding occurred on Gugeegue, Ebeye, Eniwetak, Meck and Roi-Namur.

Storms: Tropical storms and typhoons hit Kwajalein Atoll from time to time. See “Climate” (Section III) for historical data on specific events.

Facility Deterioration: A dramatic increase in the discovery of concrete spalling and other types of structural deterioration occurred between 1996 and 1998. These failures have created a significant number of safety concerns in key areas. Facility 808 had severe spalling in one of the automotive repair bays and shut down for several years until 2006, when funding was made available to repair it and several other localized spalling conditions. Facilities 603, 704, 708, 900 and 901 have all suffered localized concrete failure due to spalling of the reinforcing steel. In 2013, Facilities 803, 1045 and 1658 were all closed and use of the facilities discontinued.

The residential housing area quarters 490-495 started spalling on the outside to the extent it became a safety hazard. When the quarters were renovated, much of each roof had to be replaced due to rebar corrosion. Repairs were made on 35 family housing facilities in 2011-2012. In 2013-2014 another 36 family housing facilities were repaired. Repairs included fixing horizontal spalling along the roof edge and eyebrows and replacing built-up roofs with insulated hydro-stop roof system.

In 2012, the Zamperini Dining Facility’s kitchen was closed due to the severe concrete spalling condition of its structural columns and beams. It reopened in 2013.

X. HISTORY OF THE INSTALLATION

The United States has used Kwajalein for military purposes since 1944. For one and a half years as a wartime sea and air base, seven years as a small, all- male naval outpost, seven years as a small naval community and since 1960 as a military and civilian community devoted to missile research and testing programs. Since 1 July 1964, it has been a Class II Army installation assigned to the Nike-X Project Office and its successors; the SENTINEL System Command, the Safeguard Systems Command, the Ballistic Missile Defense System Command, the Space and Strategic Defense Command (SSDC), the Space and Missile Defense Command (SMDC) and now the U.S Army Installation Management Command (IMCOM).

Kwajalein’s first use as a military base was during the late 1930’s when Japan began to fortify its Micronesian mandates. During World War I, Japan occupied Micronesia and in 1920, was given mandate over the islands by the League of Nations. In 1935, Japan withdrew from the League, closed Micronesia to foreigners and began military preparation. Kwajalein Atoll’s huge lagoon provided an excellent fleet harbor.

The Japanese built their largest naval and supply base in the Marshall group on Kwajalein, a major air base on Roi-Namur and a seaplane base on Ebeye. Minor installations were built on other islands in the atoll to support these bases. Kwajalein played a key role in the initial Japanese strike against the United States on December 7, 1941. The submarines that attacked Pearl Harbor and the task force that assaulted Wake Island departed from Kwajalein's bases. By 1943, Kwajalein was the headquarters of the Japanese Fourth Fleet and a part of the Sixth (submarine) Fleet.

Kwajalein Atoll was one of Japan's first prewar territories to fall to American forces during World War II. After two days of air and surface bombardment (15,000 tons of ammunition rained down on the tiny land area), the atoll was invaded from the north by the U.S. Fourth Marine Division and from the south by the U.S. Army's Seventh Infantry Division on January 30, 1944. The islands were taken one by one in the ground combat and the entire atoll was in American hands by February 8, 1944. American casualties numbered 372 killed and 1,582 wounded out of 41,446 troops committed. The Japanese defending forces were almost eliminated, 7,870 were killed and 265 taken prisoners. On the fortified islands, virtually all Japanese installations were destroyed and vegetation stripped from the land.

Navy Construction Battalion (Seabee) units immediately began clearing the debris-littered islands to make them usable as American naval and air bases. On Kwajalein, a 5,000-foot Japanese airstrip was reconstructed and lengthened to 6,668 linear feet, hardstands were laid for 102 heavy bombers and several hangars were erected. Echo Pier was rebuilt and a small boat slip added. On Roi-Namur, the runway was reconstructed and 100 fighter planes were based there. On both Kwajalein and Roi-Namur, temporary buildings were erected for hospitals, barracks, shops, storage and other garrison uses. Several buildings dating from 1944-1945 are still in use on Kwajalein including the Commander's quarters and Chapel. Military personnel stationed on Kwajalein at the time built both buildings on a volunteer basis.

In the northern section of the Atoll, there were originally three islands. Roi, Enedrikdrik and Namur. During the years 1945 to 1946, American occupation forces commenced a fill operation from both Roi and Namur. By the end of 1946, the three islands were combined and a road built. Over the years, more fill was added and Enedrikdrik has disappeared. It is now all one island, Roi-Namur.

After the war, Kwajalein was one of the seven islands in the Gilbert-Marshall-Mariana area chosen by the Navy for retention as a United States base. Congress appropriated funds for these bases in 1946. Kwajalein served as the main support center for the first atomic tests on military targets during "Operation Crossroads," March to August 1946. Over 300 ships and 20,000 men took part in this operation. The remains of the German super cruiser, Prinz Eugen (currently

lying at the bottom of the Kwajalein lagoon), are a grim reminder of this major military test. The Kwajalein base was under Navy command for 19 years, until July 1, 1964, when it transferred to the U.S. Army. Besides the Navy, units of the U.S. Marine Corps, Air Force and Coast Guard, also operated on the island during the 1950's. Kwajalein was described as "an important refueling transportation and communications point linking East with West." After the war, a community averaging some 300-400 Marshallese workers lived on Kwajalein in the area where the Weather Station is now located. They relocated in January 1952 to a village on Ebeye constructed under Navy auspices.

During the period from the end of World War II through 1950, only a few buildings were constructed on Kwajalein. However, early in this period a considerable area of usable land was added to the island by filling in the shallow beach area along the lagoon side for distances ranging up to 200 yards from the original shoreline. In 1946, an underground sewage system was installed on the island and the first part of an extensive fuel storage area was built, which is still in use today.

Most of Kwajalein's existing support facilities were erected in the period 1951 to 1956 when the base's activity increased sharply due to its strategic location in the shipping lane for operations in the Korea and the Eniwetak-Bikini areas. Provisions were made to accommodate dependents of officers and senior enlisted personnel. Nearly all buildings dating from this period, located on the northern half of the island, are of permanent concrete block construction. They were built by civilian contractors (the company names have been recalled as "Mid-Pac", "Burns" and "Fisher") and Navy Construction Battalion crews and include the following facilities:

1951-1953: Ten houses (31 family units), 1,000-man barracks (Pacific Barracks) Surf BQ, mess hall (Pacific Dining Room), hospital, Yokwe Yuk-Club, Crossroads Clubs, two swimming pools, two tennis courts, commissary (Surfway), two cold storage buildings, telephone exchange, main supply warehouse, transit cargo warehouse (on Echo Pier), fire station, Rawindsonde (Weather) Station, vehicle shop building, steam plant and the main power plant.

1954-1956: One hundred seventy-seven houses (257 family units), air terminal building, special services building, laundry, engineering/maintenance shops, aircraft and marine maintenance shops, fuel pier, Yokwe Yuk Theater, and the photo lab facility at the west end of the island.

1951-1956: Extensive permanent additions were made to the island's utilities, including power lines and electrical substations, street lighting, three sewage pumping stations, fresh and saltwater lines, water filter plant, two freshwater pumping stations, two saltwater pumping stations, fifteen 1,000,000 gallon freshwater storage tanks and one 100,000 gallon elevated tank, plus most of the major structures in the Fuel Farm.

1957-1961: Few additions were made to existing facilities due to decreasing activity at the Kwajalein Naval Station. The station was on somewhat of a caretaker status serving as a base for sea/air rescue operations, MATS flights and occasional calls for servicing ships and aircraft of other services. In 1959, the Navy placed Kwajalein on the military base surplus list with the intent of abandoning it that year.

A new chapter in its history began in early 1959 after Kwajalein was selected to be the testing site in the Nike-Zeus Anti-Missile Program of the (then) U.S. Army Rocket and Guided Missile Agency. At about the same time, the island of Roi-Namur was chosen for development as a center for missile re-entry characteristics studies, sponsored by the Advanced Research Projects Agency (ARPA) of the Department of Defense. This program, designated Project PRESS (Pacific Range Electromagnetic Signature Studies), had related facilities in California, Hawaii and Wake Island.

Naval Station Kwajalein became “Pacific Missile Range Facility Kwajalein” under the Navy’s Pacific Missile Range Command at Point Mugu, California, with the Army and ARPA as tenant activities on the naval station. A further major change began on July 1, 1959 when the Navy let a contract to a civilian concern, Transport Company of Texas (TCT), to operate and maintain all the base’s support facilities, replacing the military personnel who had previously performed those functions. A small staff of naval personnel was retained to supervise the execution of the contract. TCT continued as Logistics Support Contractor until March 1, 1964 when the contract was awarded to another civilian company, Global Associates, with head offices in Oakland, California.

Construction of facilities for the Army Nike-Zeus and the ARPA programs was under the responsibility of the (then) Honolulu Engineer District (HED) of the U.S. Army Corps of Engineers. On 30 June 1959, HED awarded the basic contract for construction of the Nike-Zeus technical building to Pacific Martin-Zachary (PMZ), a joint venture of companies based in Honolulu, Fairbanks and San Antonio. By June 1962, when the construction was substantially completed, the contract totaled \$55,823,000 for Nike-Zeus and support facilities on Kwajalein, Gugeegue, Ennylabegan and Roi-Namur and under a separate contract, \$19,200,000 for Project PRESS technical support facilities on Roi-Namur.

A complex of highly technical buildings, radar, missile assembly and launching facilities were constructed on the western end of Kwajalein Island. The Ralph M. Parsons Company of Los Angeles under the Mobile (Alabama) District Office (MDO), Corps of Engineers, performed architectural and engineering services. Related radio transmitter and receiver sites and living accommodations for operating personnel were built on Gugeegue and Ennylabegan, respectively.

On Roi-Namur, a launching facility for Speedball test missiles was built in the northwest corner as part of the Nike Zeus Program.

Approximately \$15,000,000 of the contract, covered support facility work done by PMZ on Kwajalein, including the following: extension and rehabilitation of both the fresh and saltwater systems, construction of three 3-story bachelor quarter buildings, construction of the 20-room school building for dependent children, addition of 20 acres by filling along the lagoon shore on the northern end, installation of 257 three-bedroom house trailers on the new site, rehabilitation of the existing (Navy built) houses, mess hall, Yokwe Yuk Club and other service buildings, rehabilitation and extension of fuel farm facilities and the fuel pier and the addition of two 1500 kW generators to Power Plant #1.

On Roi-Namur, facilities for Project PRESS included the TRADEX and computer buildings, optical facilities and the precise power plant. Support facilities included four permanent dormitories, messing, administrative and service buildings, a freshwater system including two 750,000-gallon storage tanks, a saltwater distribution system, fuel storage, roads and a 4,500-foot asphalt aircraft runway. On the islands of Roi-Namur and Ennylabegan, virtually all facilities now in use were constructed since 1960. The wartime buildings had long since fallen to ruin although some Japanese bunkers on Namur are usable for storage space. Roi-Namur and Gugeegue were taken over exclusively by the test-site activity.

Some 50 Marshallese residents resettled from Roi-Namur, mostly to Enniburr, an island three miles south of Roi-Namur. The installation of Ennylabegan occupies the central segment of the island and a few Marshallese families reside on both end segments of the island.

As facilities were erected, technical installation and operating personnel with their families settled into the Kwajalein community. Nike-Zeus contractors and subcontractors included Western Electric Company, Bell Telephone Laboratories (research and development) and Douglas Aircraft Company (Zeus missile). The technical support contract for communications, instrumentation, photography and other range services was awarded to Kentron Hawaii, Ltd. The Project PRESS contractor was MIT's Lincoln Laboratory, with RCA and IBM as subcontractors. The island's population was composed mostly of civilian employees of the technical contractors with a small group of Army personnel [the Pacific Field Office (PFO) of the Zeus Project Office] monitoring the operation. Other residents included personnel of the construction contractor PMZ, monitored by the Kwajalein Area Office of the Honolulu Engineer District, a small Army group, Engineering/Service Test Office (ESTO) making a separate evaluation of the Zeus program under White Sands Missile Range, the civilian Logistics Support Contractors monitored by the Navy command of PMRF Kwajalein, a Navy Search and Rescue

(SAR) detachment, and U.S. Weather Bureau Station which took over weather reporting responsibilities from the USAF in July 1960.

1962-1966: History was made at Kwajalein with the announcement in July 1962 of the first interception of an ICBM by an anti-ballistic missile, a Zeus fired from Kwajalein came within lethal distance of the ICBM launched from Vandenberg AFB, California. Over the ensuing months, numerous other successful intercepts were announced. In September 1964, Secretary of Defense McNamara revealed that the Army's Zeus missile had successfully intercepted a satellite in orbit a year after he directed the Army (in May 1962) to establish such a capability.

The Nike-Zeus missile program, placed under the U.S. Army Missile Command in 1963, was re-designated the Nike-X Project in 1964. On 1 July 1964, command of Kwajalein was transferred from the Navy to the Army as Kwajalein Test Site (KTS), a Class II installation assigned to the Nike-X Project Office at Redstone Arsenal, Alabama. Navy personnel departed the island (except for the SAR detachment, which remained through June 1965). The former Army PFO staff, as the KTS command assumed the additional responsibilities of monitoring the performance of the Logistics Support Contractor, Global Associates and the overseeing the National Range functions of the installation.

With the progress of the missile testing program, certain elements of the Nike-Zeus system were phased out, notably the Zeus Acquisition Radar (ZAR) complex which was deactivated in November 1964. Other plans were made for the construction of more advanced facilities of the Nike-X system at Kwajalein and at Meck Island, approximately 19 miles north. In 1964, PMZ added filled areas on top of the reef at each end of Kwajalein (55 acres at the western end and 35 acres at the northern end) and dredged the Kwajalein inner harbor basin. The lagoon side of Meck Island was also dredged and the island itself cleared and graded in preparation for construction of facilities to support the new Safeguard program.

Because missile operations required evacuation of indigenous residents from some areas in and near Kwajalein Atoll, agreements were made between the United States and the Trust Territory government to provide certain housing facilities for the people. PMZ reorganized as Martin-Zachary Constructors (MZC) and was contracted to construct resettlement housing on Ebeye. In all, 77 four-family concrete houses, basic utility systems and a concrete cistern were built between 1964 and 1967. In 1966, Global Associates built a village of wooden structures on the island of Lib, 30 miles southwest of Kwajalein, for residents who had been moved from the island previously.

An increasing volume of other construction in the atoll began in 1965 to make optimum use of the unique concentration of scientific facilities and talent at the re-entry end of the ICBM range.

Construction of all these projects was accomplished by MZC under contract to the HED. On Ennylabegan, additional telemetry facilities were erected and three trailer quarters installed for operational bachelor personnel. On Roi-Namur, facilities included an observatory building with a 48-inch telescope, additional quarters, buildings warehouses, and sizable technical/administrative buildings and radar antennas for the ARPA project; ALTAIR and ALCOR. On the mid-atoll islands of Eniwetak, Omelek, Gellinam, Legan and (in 1968) Gagan, various instrumentation facilities were added and landing pads were constructed to allow access to the islands by helicopter. These facilities, together with special marine diving equipment, provided the installation with splashdown detection and recovery capability for re-entry vehicles.

1967-1975: In the Kwajalein community area, new facilities completed in 1967-68 included two bachelor quarters building, an addition to the hospital and nine additional housing trailers. Projects in 1968 included major rehabilitation of the Pacific Barracks, construction of three high school buildings, and an elementary school building, plus site preparation and installation of 191 new housing trailers at the northern end of the island.

At the western end of the island, modifications were made in the missile battery complex to accommodate the Spartan missile, successor to the Zeus and construction of the Defense Center Control Building (DCCB) was begun. On Meck, a five-story concrete building housing a Missile Site Radar (MSR) and its computer system was built, as well as a launch complex for Spartan and shorter range Sprint missiles. Support facilities constructed at Meck included a boat pier, aircraft runway, water utility shelter, dehumidified warehouse/operations building, power plant complex and a security/fire/administration building.

HQ, Department of the Army General Order #48, effective 15 November 1967, established the SENTINEL System Organization. The resources and staff of the Nike-X Project office, including Kwajalein Test Site, were transferred to the new SENTINEL System Command. At Kwajalein, the first of many successful launchings of the Spartan missile took place in March and May 1968. On 15 April 1968, Kwajalein Test Site was re-designated the Kwajalein Missile Range. The SENTINEL System Command was re-designated the Safeguard System Command on 16 March 1974. The Safeguard System Command was later re-designated the Ballistic Missile Defense System Command.

A remote launch site for both Spartan and Sprint missiles was built on Illeginni, 17 miles across the lagoon from Meck Island and the Safeguard control complex. From Meck, the remote site missiles were guided to their targets. Construction of major support facilities on Illeginni began in 1970, including a boat ramp, personnel pier and potable water treatment plant. Towards the end of 1971, construction completed on Illeginni included the helipad, sewage system, power plant and substation. Remote launch site facilities included the Operations Buildings, the Eject

Gas Generator Building, the Universal Missile Building and the camera stations. During the early part of 1972, construction was completed on the Remote Launch Equipment Building, the Launch Equipment Building and the launch cells.

In March 1972, a Sprint missile, controlled remotely from Meck was successfully launched from the Illeginni facilities. In addition to remote launchings of Sprint missiles, the weapons system contractors conducted a number of Safeguard missions including salvo firings of Spartan and Sprint missiles from Meck.

A major renovation and upgrading of Echo Pier on Kwajalein began in 1972 and was completed in 1973. Extensive shoreline repair and sea wall/ramp construction on the lagoon shore adjacent to the heavy equipment area was also accomplished.

During this period on Kwajalein, the MZC shops were relocated to new buildings adjacent to the DCCB and their old complex demolished due to deterioration. In addition, a new Marine Passenger Terminal was erected and the old MZC barracks were demolished. An addition was constructed to the USAG-KA/RTS Data Center, doubling the size of that facility. Due to the requirement to upgrade bachelor quarters, a new BQ (the Ocean BQ) was constructed to house security personnel. The old security quarters were converted in 1975 for other usage.

At the end of 1973, with the test programs for Illeginni successfully completed and with no foreseeable future requirements, the facilities at Illeginni were downgraded to inactive status. The equipment was either mothballed or removed to Kwajalein for storage. At the conclusion of the Safeguard Spartan/Sprint program, all related systems and associated equipment were downgraded to inactive status to preserve the option for future firings. By the end of 1975, most facilities on Illeginni were abandoned-in-place.

On Meck, 4.5 acres of fill was added to the lagoon side of the island for construction of facilities in conjunction with the Systems Technology Programs (STP), formerly called the Site Defense (SD) program. This high technology program involved the testing of a sophisticated phased-array radar and data processing complex designed to acquire, track, discriminate and intercept threatening ICBM's. Construction of the Systems Technology Test Facility (STTF) to house the new radar and data processing complex commenced in early 1975. McDonnell Douglas Astronautics Company (MDAC), the prime systems contractor, officially accepted the completed facility in June 1976. Other STP contractors included General Electric, TRW, Control Data Corporation and Teledyne Brown Engineering.

On Roi-Namur in early 1974, a 90-man barracks was constructed by MZC and the Trade winds Theater was moved from the lagoon side of the island to a more convenient site on the north side

where the majority of living quarters are located. On Kwajalein, the National Weather Service transferred its function to the technical support contractor, Kentron Hawaii, Ltd. It ceased to operate on Kwajalein as of June 1975.

The entire HF transmitter complex on Gugeegue was relocated to the west end of Kwajalein. Operational transfer occurred on 1 October 1975 at which time all remaining facilities at Gugeegue were downgraded to inactive status. By mid-1976, all facilities at Gugeegue were abandoned; the Range no longer has active facilities there.

1976-1979: Construction of the Defense Satellite Communications System on Kwajalein was completed in early 1976. The 60-foot satellite antenna (AN/FSC-78) and its associated equipment tremendously improved the quality, reliability and capacity of Kwajalein's communication at the time. A radar complex was installed on launch hill (Mount Olympus) at the west end of the island during this same period. The AN/FPQ-19 is a C-band, metric-tracking radar, utilized primarily as a sensor and data source to supplement the present range system.

Due to the conclusion of various RDTE programs at USAG-KA/RTS and the related reduction in personnel, a number of family trailers were declared excess to requirements and were removed from Kwajalein for use by other government agencies in early 1975.

In 1976, a new Splash Detection Radar (SDR) Facility was constructed on Gellinam. On Kwajalein, the expansion and modification of the Kwajalein Hospital was completed. This expansion consisted of adding an administrative office and a clinical laboratory. Another important addition was the intensive care unit, which includes coronary monitoring equipment. All this was done with a view towards increasing the services available and providing the best medical care possible.

During late 1976 and early 1977, two Super RADOT facilities were constructed, one each on Kwajalein and Roi-Namur. SDR facilities were constructed on Legan in 1977 and a Solid Waste Disposal Facility was constructed at the western end of Kwajalein. The lens well system, which began in 1970, was expanded to decrease or eliminate the requirement for distillation of water during the dry season, subsequently, the BLH distillation plant was deactivated. An extensive project conducted by MZC resulted in the dredging of the Kwajalein harbor to 38 feet. In addition, MZC repaved the runway and parking apron on Roi-Namur.

During late 1977 and early 1978, extensive facility changes took place on Omelek, two new launch pads were built and many modifications were made to old facilities, transforming the island into an active operational element of USAG-KA/RTS range activities.

In early 1979, MZC started construction of the Kwajalein Sewage Treatment Facility, completing it in July 1980. In addition, an extensive system of range-oriented facilities (Multi-static Measurement System and Digital Microwave System) was constructed on Illeginni, Roi-Namur, Gellinam, Gagan and Meck.

1980-1986: During 1980, the mothballed MSR on Meck was made available as surplus. The electronic equipment, which contained valuable metal, was salvaged. During 1981-82, modifications were made to the Meck Island Control Building (MICB) and the launch hill complex for the Homing Overlay Experiment (HOE) Program. The runway was also lengthened by 250 feet. The HOE Program was designed to explore technology for optically homing non-nuclear missiles that could be launched from the ground to destroy an enemy's strategic nuclear missiles before they re-entered the atmosphere. Associated contractors for HOE were McDonnell Douglas Astronautics Company and Lockheed Missiles and Space Company under the direction of the BMDSCOM Operations Office. Four test flights were conducted during the period from 1982 to 1984.

History was made again at Kwajalein on 10 June 1984 when a HOE interceptor missile, launched from Meck Island, successfully accomplished the first direct interception and non-nuclear destruction of an incoming dummy missile warhead launched from Vandenberg AFB in California. Infrared sensors aboard the interceptor were used to find the warhead above the atmosphere, relaying the information to an on-board computer. The interceptor locked onto the incoming dummy warhead and unfolded a 15-foot wide umbrella-like frame studded with heavy metal balls, which destroyed the target during the collision. The intercept occurred more than 100 miles above the earth's atmosphere. Army Brigadier General Eugene Fox described the test as an "absolutely tremendous success..." that will contribute to President Reagan's "Star Wars" missile defense program, which is intended to intercept U.S. bound nuclear-tipped missiles before they return to the atmosphere.

The Systems Technology Test Facility on Meck was declared excess and by mid-1984, program materials were transferred to other agencies or otherwise disposed of. With this and the completion of the HOE program, missile testing at Meck was temporarily completed. Deactivation of Meck included the replacement of central air conditioning with dehumidification equipment in the MICB and major support buildings. By mid-August, the Meck Island Power Plant had been secured and temporary generators were used as an interim source of power. Caribou (C-74) aircraft flights to Meck were replaced by helicopter service and the Fire Department and Mess Hall were deactivated. In January 1985, three 250 kW generators arrived and were installed in lieu of the temporary generators.

On Kwajalein, renovation of the second floor of the Ivey School to accommodate a new Dental Clinic was completed in August 1984. It included three operation rooms, an orthodontist and two doctor's offices, a laboratory, sterilizing, waiting and patient-education rooms and two hygiene rooms.

Conservation projects were implemented and included the installation of reflective film on all BQ windows and selected housing units. A project involving the utilization of air-conditioning systems to reclaim heat for heating water was also being considered.

Corps of Engineers' FY-1984 MCA/BMAR projects completed on Kwajalein in 1985 included the construction of a multi-purpose recreation center, photo lab, wastewater treatment facility and marine dry-dock facility. Projects on Omelek included the construction of a missile assembly building, live explosive storage building and restroom facility.

On 1 July 1985, the U.S. Army Ballistic Missile Defense Organization was re-designated as the U.S. Army Strategic Defense Command (USASDC). As part of the USASDC, U.S. Army Kwajalein Atoll became the forefront of Army development in the Strategic Defense Initiative (SDI). The U.S. Army Strategic Defense Command had responsibility for the management of USAG-KA/RTS. The Deputy Commanding General U.S. Army Strategic Defense Command in Huntsville, Alabama, in turn, had been designated by USASDC as the national Range Commander of USAG-KA/RTS. The Commanding Officer of U.S. Army Garrison Kwajalein Atoll is the military commander on site responsible for the management and operation of USAG-KA/RTS and serves as the U.S. Commander-in-Chief Representative to the Republic of the Marshall Islands (USCINCPAC REP RMI).

In 1986, the U.S. Army replaced the fleet of seven C-7A aircraft with four used "Shorts" SD3-30 turboprop aircraft for local transportation. The four aircraft manufactured by "Short Brothers" in Ireland, underwent extensive overhaul in Calgary, Canada, before arriving at Kwajalein.

The Logistic Support Contractor (LSC) completed construction of an ALCOR addition to the KREMS work center and additional lens wells on Roi-Namur. They also completed an extension to the Kwajalein Chapel for the Chaplain's office, a distinguished visitor's lounge in the air terminal, an LSC office complex in the Kwajalein Lodge, a bakery with retail outlet in the rear of the Pacific Dining room and a blood storage lab in the Kwajalein Hospital.

1987-1989: In 1987, the LSC relocated the MPS-36 Radar as well as the Boresite tower and van from Kwajalein to Illeginni, modified a housing trailer to be used as a video retail facility, expanded the Republic of the Marshall Islands' office area in the air terminal and completed a

major expansion of Gimbels, the Roi-Namur main retail facility. Clement Brothers, a Corps of Engineer's contractor, replaced the entire taxiway at Bucholz Army Airfield.

After a competitive solicitation, Pan AM World Services, Inc. was selected as the prime contractor to provide logistic and technical support services for a minimum of three years beginning October 1, 1987. Two options would extend the period an additional four years. Through a major subcontract, Pan Am used the services of DynCorp to accomplish the technical range engineering and transportation support. In May of 1989, Pan Am World Services Inc. became a subsidiary of Johnson Controls, Inc.

In 1988, Meck was once again reactivated for the Exo-atmospheric Reentry Vehicle Interceptor Subsystem (ERIS), High Endo-atmospheric Defense Interceptor (HEDI) and Space Base Interceptor (SBI) programs. The helipad was relocated to a position at the south end of the deactivated runway. Most facilities were reactivated. The saltwater systems, however, were no longer utilized for cooling of utilities. The harbor was modified to provide a renovated pier, barge loading dock and ramp. Additionally, a jetty was constructed to provide for protection of portions of the harbor.

A 250,000-gallon water storage tank was constructed and another Missile Assembly Building (MAB) was constructed for the HEDI program. The power plant was redesigned using five new Caterpillar generators in a fully automated configuration. A series of modifications to the Meck Island Control Building (MICB) now allows simultaneous performance of launch and pre-test missions.

On Kwajalein, a new fixed-wing aircraft hangar was completed in 1989. The hangar was used for maintenance and repair of island fixed-wing aircraft. A liquid nitrogen plant was also completed in 1989 in support of the AOA project.

A housing project consisting of 102 three-bedroom homes and 34 two-bedroom homes was completed on the northern end of Kwajalein. Pacific International, Inc. (PII), a Marshallese company based in Majuro, under subcontract to Morrison-Knudsen, was responsible for clearing the area. The three bedroom homes each have 2 ½ baths and the two bedroom units have 1 ½ baths. Each townhouse is equipped with central air, storage areas, separate utility rooms, carpeting, food disposal, dishwashers, washers and dryers, covered patios and fenced yards. Other projects completed on Kwajalein were the new helicopter hangar, a warehouse for Meck support and two new recreation facilities. The modification of two buildings for the island Child Development Center as well as the construction of the Child Development Administration/Operations Buildings, was also completed.

Two new BQ's were completed in 1989 on the island of Roi-Namur. A maximum of two occupants share each 400 square foot apartment. Each apartment is furnished with a refrigerator, wall-to-wall carpeting, matching drapes and bedspreads, central air conditioning and a centrally located laundry facility on each floor. The apartments have four rooms: a bedroom, a dining room, a kitchen area and a private bath. In addition to the two new BQ's, a recreation hall was also built that provides a lounging area, kitchen facilities and a large storage area.

1990-1991: On 28 January 1991, in the first flight test of the ERIS program at Meck Island, an experimental, non-nuclear Ballistic Missile Interceptor successfully destroyed its target high above the Pacific Ocean.

A new 28,700 sq ft Power Plant, designated 1A, was brought on line in April 1991. The Plant contains three 4000 kW caterpillar diesel engine-generator sets. After several weeks of trouble shooting the cooling systems, control of the island power was switched from old Power Plant 1 to 1A, which included the addition of four more generators. Plant 1 was deactivated after thirty years of dependable service and demolished in 1996.

The Corps of Engineers awarded large maintenance and repair projects exceeding six million dollars to J.A. Jones Construction Company. The projects began in the later part of 1991. They included the renovation of the Surfway Food Storage (Facility 301), the Hospital (Facility 603), the Hospital Generator Building (Facility 669) and the Pacific Dining Room (Facility 703).

The Adult Recreation Center was constructed by FOM crews and opened in September 1991. The center includes two video game rooms, a TV room, a reading room, a sound reduced music room and a grand room with pool and Ping-Pong tables.

Kwajalein Atoll was declared a disaster area in November 1991 due to Tropical Storm Zelda. FEMA supported the atoll with federal relief funds and crews. Surge teams were employed to expedite the storm's damage repairs. See "Climate" (Section III) for historical data on the storm.

The Ivey Gym underwent a major remodeling to upgrade it to a complete fitness center. It is equipped with free-weights and Nautilus equipment and has an area for aerobics. The facility was reopened in December 1991.

DEPMEDS became operational in December 1991. It was a deployable medical unit created to provide services while the hospital was renovated. The unit was christened "MASH 96555" and was dismantled upon completion of the hospital.

Environmental considerations came into focus with the publication of the 1989 USAG-KA/RTS Environmental Impact Statement. The Record of Decision associated with the EIS and signed by the Assistant Secretary of the Army, obligated USAG-KA/RTS to undertake certain actions to mitigate the effects operations were having on the environment and to comply with various regulations stipulated in the Compact of Free Association. Major projects included the removal and disposal of PCBs, friable asbestos and over one million pounds of hazardous waste. These materials were shipped to the United States for disposal at EPA-approved sites. Other actions included the prohibition of open burning, a major cleanup of dumps located on the outer islands, increased water monitoring and installation of a new treatment plant, construction of a hazardous waste storage facility and construction of solvent and POL dispensing areas. A number of policies and procedures were written by the subcontractor to modify operations to comply with environmental regulations.

1992: The second ERIS flight test occurred in March 1992, providing valuable information on the interceptor performance against a target complex. Construction and facility modifications for the Ground Based Intercept Advance Payloads Upgrade of the launch equipment room began following this test, adding an additional 300 square feet and communications and power to the existing facility. Facility modifications and launch pad refurbishment also began in order for the Brilliant Pebbles (BP) and Lightweight Exo-Atmospheric Projectile (LEAP) programs to begin operations at Meck in the summer of 1992. Those facilities previously constructed for HEDI were utilized by LEAP and program operation schedules were adjusted accordingly.

The U.S Army Strategic Defense Command (USASDC) was officially renamed U.S. Army Space and Strategic Defense Command (USASSDC).

Kwajalein received seven new airport shuttle buses to relieve the step vans that were used to provide island transportation. Each bus was christened with a Marshallese name provided by their drivers.

1993: In January, the RMI permitted 527 Chinese refugees to land at Kwajalein. The Coast Guard began receiving distress signals from the Panamanian Ship "East Wood" which set sail in November 1992 from China. Upon locating and boarding the ship, the Coast Guard reported extremely bad conditions and estimated that the passengers would die if not provided refuge. USAG-KA/RTS and the installation contractor joined forces and built "TLC," Temporary Living Center, within the fence of the magazine compound to provide shelter, showers and food to the Chinese nationals. They stayed approximately three weeks before returning to China. The Joint Task Force officially dubbed the entire event "Operation Provide Refuge." As quickly as TLC was built, it was dismantled and all the additional Army personnel departed.

The 84th Engineering Battalion completed the Community Activity Center in January 1993. It provides a stage and auditorium for theater productions and two conference rooms.

The Corps of Engineers contracted Pacific International, Inc., Wallace O'Connor and H.B. Zachary for special projects. The projects included the rebuilding of several warehouses, two housing units, the construction of a saltwater desalinization plant and an addition to the Power Plant, BQ renovations on Kwajalein and Roi-Namur and the new Dock Security Checkpoint on Kwajalein.

Other major projects for this period included an addition to the administration facility for the security contractor, a temporary dock security checkpoint (which was later converted to the Bargain Bazaar) and a Mini-Mall comprised of the beauty shop, travel office and video rental store. In addition, construction began on Power Plant 1B.

Projects on Roi-Namur included a renovation and addition to Gimbel's retail store, a new dock security checkpoint, renovation to the terminal building (Facility 8035), construction of a new beach pavilion and bicycle/hobby shop as well as renovation of a Trade winds Theater.

Early in 1993, Raytheon Range Systems Engineering was awarded the Integrated Range Engineering (IRE) contract with a start date of 1 October 1993 and subsequent Radar Engineering Development and Research (REDAR) phased in October 1994.

1994-1995: After competitive bid solicitation, Raytheon Range Systems Engineering was selected as the prime contractor to provide Logistic Support Services and began providing services on February 15, 1995. Under the Raytheon contract, Marriott was contracted to accomplish the Food Services and Raytheon Aerospace to accomplish the Aviation Services.

Environmental issues were again addressed in the publication of the USAG-KA/RTS Environmental Standards. These standards are unique to USAG-KA/RTS and were negotiated with the RMI. In many respects, they differ from U.S. standards. They were framed to protect the fragile environment found at Kwajalein. Implementation of the standards is a joint USAG-KA/RTS effort supported by the subcontractor.

Wallace O'Connor, under contract to the Corps of Engineers, completed the renovation of Zeus, Apache, Ajax and Sprint BQ's on Roi-Namur.

On Kwajalein, construction of Power Plant 1B, that began in September of 1993, was completed in August 1995. The construction incorporated the existing Plant 1A with the new plant to create one structure. Power Plant 1A has three diesel powered Caterpillar engines with Kato

generators, which have a generating capacity of 12 megawatts, while the capacity of Plant 1B, with four similar units, is 17.6 megawatts. The precast concrete structure replaces Power Plant #1, constructed in 1961, which was demolished in 1996.

Construction began in October 1995 on Facility 993. The 73,248 square foot Controlled Humidity Warehouse was complete in June 1996. The primary purpose of this facility is to store commodities for provisioning and merchandising in a controlled temperature environment.

Facilities completed during 1995 include the Document Control Building, the Post Office, the Koenig Jabar Tennis Courts, the Defense Mapping Agency (DMA), the Automotive Building, the Fresh Water Production Facility, the Religious Education Building and the Dock Security Checkpoint. The Shell BQ was renovated and the Tropics BQ, which is handicapped accessible, was built.

Also in 1995, the Syncrolift (Facility 630) which provides the Marine Department with the ability to lift a 175'x42' 1,000-ton vessel out of the water for service was completed as well as Facility 632, a building that can house restrooms, shower rooms and locker rooms for the Marine Department shop personnel and SLEC Marine personnel.

1996: Two pest control facilities (Facility 1542 and Facility 8255) were constructed, allowing daily operations to function more efficiently and providing compliance with existing regulations. This facility allowed USAG-KA/RTS to meet existing and future requirements and guidelines for the operations, handling and storage of pesticides and herbicides.

The Surf BQ (Facility 501) renovation was completed and contains 89 rooms with private baths, which can be utilized as one or two person rooms. The Shell BQ (Facility 562) was also renovated. On Roi-Namur, H.B. Zachary Company renovated the Spartan and Nike BQs.

The Meter High Radar (MHR) Doppler weather radar (Facility 1135) was built. The project included a new 16'x28' building used to house the radar transmitter and auxiliary equipment, together with a 50-foot antenna tower and 38-foot radome. The MHR 27-foot antenna replaced the previous 12-foot weather radar antenna.

Facility 993, Controlled Humidity Warehouse (see description above) was finished in June 1996.

Consolidated Radar Facility, MPS-36 (Facility 1056) provides 3,840 square feet to house the consoles and transmitter of the two MPS-36 radar systems and was started in July 1996 by a summer deployment from the 84th Engineering Battalion.

June 1996- June 1997: the 23rd Engineer Company, Special Troops Battalion from Ft. Richardson, Alaska, completed a new Marshallese Cultural Center (Facility 675). The 23rd also completed the 4,000 square feet addition to Macy's West (Facility 729) and a 5,600 square feet warehouse on Roi-Namur (Facility 8233).

J.A. Jones, Inc. of Charlotte, NC, completed construction of Facility 1499 to house the Ground Base Radar Prototype (GBR-P). Made of reinforced concrete, this antenna mount serves as the support platform for the 1.2 million pound antenna and the drive assembly for this new radar. The antenna array is enclosed by a radome 85 feet in diameter. The GBR-P is the ground sensor for the National Missile Defense weapon system and provides surveillance, acquisition, tracking, classification, kill assessment and fire control support. Three other facilities associated with the GBR-P are an Anemometer Tower (Facility 1495), a Fire Pump Building (Facility 1496) and Anemometer Tower #2 (Facility 1497). Also completed by J.A. Jones was the Saltwater Intake (Facility 8257) on Roi-Namur. The saltwater intake replacement had a mission-critical priority because of the necessity to cool the Kiernan Reentry Measurement Site (KREMS) missile-tacking radar.

In April 1997, H.B. Zachary Company completed renovation of two, two-story BQ's on Roi-Namur; the Spartan (Facility 8115) and Nike (Facility 8114); and one three-story BQ on Kwajalein; Sands (Facility 565). H.B. Zachary Company also completed installation of three new waste oil containment tanks in the Kwajalein Fuel Farm, Facilities 841, 842 & 843 and a new high and low pressure alarm system for the Kwajalein Fuel Pier (Facility 965).

A new Waste Incinerator (Facility 5112) was constructed on Meck. Renovations were made to the fuel containment areas on Kwajalein, Illeginni, Meck, Legan and Gellinam islands.

The U.S. Army Space and Strategic Defense Command (USA-SSDC) was officially renamed U.S. Army Space and Missile Defense Command (USA-SMDC).

1998-1999: FOM Shops installed central air conditioning in the two-story 200 series homes and several of the 400 series homes. Also completed was the renovation of the first floor of facility 704 for the Bank of Guam, Snack Bar and Macy's Store. The renovations of six family houses (Facilities 490, 491, 492,493, 494 and 495) and construction of four of the GBR/NMD trailer additions (Facilities 600, 756, 841 and 845) were completed.

San Juan Construction of Honolulu completed renovation of the second and third floors of the Macy's Building (Facility 704) resulting in 72 new single rooms with private baths for TDY personnel. Renovation of the Coral BQ (Facility 563) was also completed.

Major construction projects included paving of Roi-Namur roads and replacement of the airfield lights. The new Ten-Ten storage (Facility 774) was built which provided larger aisles and increased freezer and refrigerator space. Also completed were the X-Ray addition to the Hospital (Facility 699) and the replacement of the water tank on Roi with a pressurized system. A Sub-Contractor completed roof repairs to the DCCB (Facility 1500), Kwajalein Lodge (Facility 701), Freezer (Facility 612) and Super Radot (Facility 1519).

Ongoing projects were the Force Main construction on Roi and the Nursery Botanical Garden on Kwajalein. Current Title X Troop Construction projects were the Enniburr School/Clinic and Ebeye School.

1999-2000: FOM completed five additions on trailers 2791, 2748, 2636 and 2624 in support of the NMB testing program and installation of central air conditioning on the 400 series houses continued. Other projects completed were the paving of Kwajalein and upgrades to sewer and communication lines and the Beautification of Downtown.

Epic Energy, a sub-contractor of J.A. Jones completed lighting upgrades on 18 facilities. The 164th Engineering Battalion completed the Gugeegue School, a Title X Troop project.

The NMD/EKV program launched from Meck in October 1999, January 2000 and July 2000.

2000-2001: Several projects were completed by outside contractors including the Roi Power Plant complex (Facilities 8346-8350) by J.A. Jones and on Meck Island the NMD/BMDO launch silos (Facilities 5130 & 5131), an electrical substation (Facility 5128) and an addition on the MAB (Facility 5098) by Dick Pacific. The NMD construction on Meck was BMDO funded and on Kwajalein, the remodel of the Reef BQ by San Juan Construction was completed as well as fifteen Dome Homes (Facilities 150-164) on north point in conjunction with Dome Homes International and Dick Pacific subcontractors.

KLS completed the new Gas Station (Facilities 837-840), kitchen and bath modernizations on quarters 460 and 462, as well as the completion of the 400 series central A/C upgrade, Kwajalein Paving Phase II and the Meck paving project. FPQ-19 a Kwajalein icon was dismantled from Mt. Olympus and shipped to Barking Sands in Kauai. Utilities completed OSCR Phase I and Phase II. The major replacement and upgrade of the Kwajalein underground communication lines was completed.

Troop Projects included the Space Surveillance Center and the TM Center both located at Facility 1010 and the Self Help/COOM (Facility 760).

Two Sprint launch silos (Facilities 5057 and 5058) were demilitarized in accordance with treaty regulations to accommodate the new NMD/LSI silos.

The name of Range Command, Facility 1010 was officially changed to the Ronald Reagan Ballistic Missile Defense Test Site at Kwajalein Atoll on 15 June 2001.

2001-2002: KLS completed the revitalization of housing units 465, 413, 420, 464, 488, and 489 with 3 more in progress, completing one a month in a leapfrog manner. On Meck, the Fire Water system upgrade (Facilities 5119-5123 and Facility 5980) and the Water Treatment Plant (Facility 5014) were completed. Meck now has the only potable water fire system on the atoll. Meck paving project was completed and the roads on Kwajalein were sealed. All 23 of the Oceanside Temporary Trailers (aka Alabama Trailers) were removed. Lens wells #11 (Facility 669) and #12 (Facility 784) provided the ROWPU's (Reverse Osmosis Water Purification Unit) with low salinity water. The Desalination Plant was abandoned due to a high maintenance costs and low production rates.

Troop projects completed for the year were the addition on SR1 (Facility 1721) and the Carlos School.

The Central Identification Laboratory Hawaii (CILHI) team spent several weeks on Kwajalein excavating the south end of the island in hopes of finding the remains of the WWII soldiers that were declared MIA on Kwajalein.

2002-2003: SMDC awarded the technical/logistics contract to Kwajalein Range Services (KRS). Housing revitalization continued to move forward Construction was completed on quarters 428, 429, 441, 442, 467, 469,471, 473, 475, 477, 479, 481, 222, 224 and 226. Secondary feed projects and OSCR Phase II were upgraded to meet current security standards.

Title 10 funds constructed a new multi-purpose community facility on Ebeye.

2003-2004: Housing revitalization continued with renovations completed on family quarters 106, 205, 215, 217, 218, 223, 227, 228 and 229. The renovated quarters had a second bathroom and half-bathroom added, new kitchen cabinets, all new floor covering, electrical rewiring of the complete facility, all new sanitary sewer piping installed, new windows, dishwasher and garbage grinder installed.

All 14 of the temporary trailers (Facility 650 A-N, aka Alabama trailers), which were located by Brandon ball field were removed and disposed. These trailers were set up in 1993 to house residents of the BQ undergoing renovations.

Under a government IDIQ contract, San Juan Construction Company completed the renovation of the Ocean BQ. This renovation also included a reconfiguration of the floor plan adding separate bathroom facilities to each room and a separate sitting area, three additional rooms were added for a total of twenty-three rooms.

San Jan Construction Company, again under an IDIQ contract, removed the building eyebrows, which were in an unsafe condition due to concrete spalling problems and repaired the installed External Insulating Finished System (EIFS) to the Palm, Coral and Shell BQ's.

Dick Pacific Construction Company, under a Military Construction Army program completed the construction of the new 22,388 square foot Cold Storage Facility. This new facility allows forklift operations into the storage rooms greatly reducing man-hours in loading and unloading frozen foods. The new Cold Storage Facility replaces Facilities 610, 612, and 701, which had a total of 17,520 square foot. The old facilities were demolished under the same contract.

Dome Homes International continued with eight additional dome homes (Facilities 165-173). These new dome homes are located on the north end of the island, oceanside, adjacent to the 15 dome homes built in 2001.

The 1960's vintage trailers continued to wear out and several were removed and demolished. Trailer 779, 764 and 666 were all removed from service.

A 10-ton back-up air conditioning system was installed for the Information Management Department server room in Facility 806 to protect the vital communications equipment if the main air conditioning system were to be down for maintenance or repair.

The interim repairs were completed to the Roi fuel pier. These repairs consisted of replacing whalers and drove several new piles to extend the life of the pier another few years.

2004-2005: Housing revitalization continued with renovations completed on Family Quarters 203, 207, 210, 212 and 211. The renovated quarters had a second bathroom and half-bathroom added, new sanitary sewer piping installed, new windows, dishwashers and garbage grinders installed.

Under the direction of reducing footprint, twelve silver residential trailers were removed from various spots around the housing area due to their deteriorated condition. Residential quarters 401 and 403 were demolished along with the following Facilities: 688 Terminal Atoll Building,

1142 Animal Control Building, 1402 TV Repair Shop, 1091 Animal Impound Shelter, 8313 BQ Man Camp on Roi and 8025 Roi Chapel.

The first of three street light circuits were replaced. The existing constant current “A” circuit lights were replaced with modern, sustainable light fixtures.

The Trade winds Theater on Roi completed a major renovation with a new roof and roof supporting system, along with painting of the entire facility.

Two new water tanks were built on Roi-Namur.

Dome Homes International continued with 16 additional dome homes. These dome homes are located on the north end of the island formerly called Silver City due to the placement of the silver trailer in the 1960’s.

KRS converted Facility 905 to an archive for the Staff Archeologist. This is the repository for all artifacts small enough to be kept in a climate-controlled environment.

Dick Pacific Construction Company under a Military Construction Army Program completed the construction of the new Cold Storage in 2003 and Facilities 610, 612, and 701 (old cold storage) were demolished under this same contract. A green belt was established where the old cold storage facilities existed on Lagoon road.

Under a Defense Energy Support Center (DESC) project administered by NAVFAC, the Kwajalein fuel pier was completely rebuilt. This included major repairs of the underway pilings supporting the pier and replacement of the pier surfacing material.

The asphalt roads on both Roi-Namur and Meck were fog-sealed to preserve the life of the asphalt roads.

On Meck Island, five mission-essential electrical distribution vaults were air conditioned to provide environmental control.

Meck Facilities 5037, 5103 and 5048 were demolished, as were the two 200,000-gallon fuel tanks, Facilities 5033 and 5032, which were no longer in use, as part of the effort to reduce footprint.

A concrete beam was built on Meck at the connection end of the new double wall fuel tanks to satisfy environmental and fire protection containment requirements.

The Meck power plant was upgraded with improved auxiliary room air conditioning and a second battery bank was added to support the plant distribution controls and feeder protective devices. This eliminates a single point of failure. Non-functioning double wall fuel lines were repaired and placed in service, an unsafe demising wall removed and branch circuit panels were upgraded.

The Meck Dining Hall air conditioning project is underway and the windows replaced with double pane, insulated windows to help seal the building envelope.

Additional air conditioning equipment was installed in the mission control room at GMD program request.

A desiccant wheel dehumidifier was installed in the Missile Assembly Building, Facility 5098, to meet program requirements.

PCB- laden klystron were removed from Facility 5050 and new bathrooms have been designed to be installed in this hardened take cover area.

2005-2006: As part of the program to reduce the footprint on Kwajalein, 29 deteriorated facilities including residential trailers and various other facilities were removed from different locations around the island.

The second of three street light circuits were replaced. The existing constant current “B” circuit lights were replaced with modern, sustainable light fixtures.

Dome Homes International completed 17 dome homes. These new dome homes are located on the north end of the island replacing twenty 1960 vintage trailers that were well beyond economical repair.

San Juan Construction Company under a Military Construction Army program began the construction of the new Automotive Paint and Prep Facility (Facility 856) and plans for the demolition of the old vehicle spray paint booth (Facility 826).

Under a Defense Energy Support Center (DESC) project, several projects in the Kwajalein fuel farm were completed. These include API inspection of fuel storage tanks, inspection and preventive maintenance on the Oil/Water Separator and pipeline, installation of Geo-Domes on Tanks 8 and 9, construction of new electrical vault and general maintenance on pipelines, pumps house and painting of pipelines and tanks.

Pacific Bachelor Quarters (Facility 708) was vacated with personnel being relocated to various facilities in preparation for the pending demolition of the structure. KRS Public Works personnel completed the in-house demolition which included removal of all inside material such as ceiling tiles, plumbing fixtures, lights, air conditioning ducting, windows and doors; removal of the entire built up roof removal and demolition of 3 auxiliary equipment vaults; removal of hazardous materials (ABC tiles and mastic) and transit panels; re-routing of utility lines and removal of temporary shoring. This took the facility to a “concrete shell” ready for final take down by Army troop personnel or a subcontractor.

The USAG-KA/RTS Range Director’s house (Facility 225) was renovated. The renovation project included the addition of a central air conditioning system, roof repairs, new kitchen cabinets and installation of carpet throughout the house. In addition, painting and other maintenance was completed during the renovation.

Facility 1517 the Liquid Nitrogen Building (LN2) was decommissioned during the year and the asphalt plant was removed and sold.

The Job Corps relocated to Hawaii during the year, which provided extra administrative facilities (Facility 1054) for use.

A new bathroom facility was added in the hardened area of Facility 5050 on Meck which included both toilet and shower facilities. In addition, the personnel piers had fendering replaced and major work was done on the dolphin piers.

Meck Island Operations were reduced to a phase down, stand by status during the year. The core facilities (power, water/wastewater and fuel storage) stayed on a 24-hour operational basis and environmental conditioning was provided to designated facilities. Basic operations were reduced to a two day per week caretaker status. Mission essential facilities are being maintained appropriately while non-essential facilities were taken off line.

Considerable work was performed on Omelek (launch pad, auxiliary facilities, etc.) in support of the Space X project, which had their first launch during the year.

On Roi-Namur, a new pavilion/shelter was built at the pier to accommodate personnel waiting for the ferry to Enniburr.

The historical structure known as the Japanese Sea wall on Roi-Namur was repaired during the year to prevent further deterioration of this area.

The Roi-Namur runway lights were upgraded with new light fixtures and wiring and the existing pilot approach lights were converted from the VASI type to the PAPI type lighting improving capability and ease of maintenance.

2006-2007: as part of the program to reduce the footprint on Kwajalein and Roi-Namur 50, deteriorated facilities including residential trailers and various other facilities were removed from different locations around the island.

San Juan Construction Company, under a Military Construction Army program, completed the construction of the new Automotive Paint and Prep Facility (Facility 856) and demolition of the old vehicle spray paint booth (Facility 826).

As part of the KRS Quality of Life program to enhance community facilities the Emon Beach, revitalization project improved drainage around Pavilion No. 1 (Facility 1880), provided lighting at the Playground (Facility 1888), installed brick pavers along the existing dirt road and built two decks on the beach with patio pavers. The Small Boat Marine floating piers (Facility 785 and 793) were renovated due to severe structural deterioration.

Quarters 241 the Base Commander's house was renovated to include the addition of the new windows, installation of a new hydro-stop roof system, new kitchen cabinets and installation of carpet in the living, dining rooms and master bedroom. In addition, painting and other maintenance was completed during the renovation.

Several new projects started in 2006-2007 are expected to be completed in the fiscal year 2008. Included in the list of projects is the Bank of the Marshall Islands, a new Incinerator Plant, Mission Intelligence Facility, Tactical Operations Center and Emergency Operations Center.

Meck Island Operations continued its stand by status during the year. The core facilities (power, water/wastewater and fuel storage) stayed on a 24-hour operational basis and environmental conditioning was provided to designated facilities. Basic operations were reduced to a two days per week caretaker status. Mission essential facilities are being maintained appropriately while non-essential facilities were taken off line.

2007-2008: Efforts to reduce real property inventory and the USAG-KA/RTS footprint continued with the reduction of 41,217 square feet. This reduction was a result of either consolidation or demolition for new construction (i.e. MILCON and MDA projects), because of facilities being declared excess, (deteriorated beyond economical repair). Plans to remove one

hundred and forty-five deteriorated residential trailers on Kwajalein will account for a 96,360 square feet reduction through FY09.

Facility 502, Yokwe Yuk Club, was shutdown/abandoned in place. Quarters 422, (four family units) was demolished this year as a result of aging infrastructure, failing major building system components that have passed their useful life expectancy and severe structural deterioration caused by the extreme environmental conditions on Kwajalein.

San Juan Construction Company, under a Military Construction program, completed the construction of the new Emergency Services Facility on Meck Island. The 7,705 square foot facility was designed to provide new emergency capabilities critical to mission operation on Meck Island.

At the Kwajalein Hospital, electrical power upgrades were accomplished to provide conditioned electricity capabilities for existing medical equipment and new X-Ray machine.

Army and Air Force Exchange Service (AAFES) came to USAG-KA/RTS. AAFES construction workers arrived on Kwajalein in May 2008 and started the facility remodeling in support of the AAFES mission to provide products and services to the USAG-KA/RTS community. AAFES services include a Main Street Food Court, PX and Pextra, Shoppette and retail store at Gimbles on Roi-Namur.

A new incinerator at the Kwajalein landfill went into operations in May 2008. The new incinerator burns approximately 23,000 cubic yards of trash annually and requires 60% to 70% less fuel than the old incinerator.

2008-2009: Footprint reduction plans at USAG-KA/RTS continued with the demolition of Family Quarters 202 due to severe deterioration of the building's concrete foundation, walls and roof structure; repair/rehab of the family housing structure under USAG-KA/RTS's housing revitalization program was deemed economically unfeasible. In December 2008, the last trailer resident was relocated to another family housing accommodation in support of USAG-KA/RTS's housing trailer removal program. At that time, there were 145 trailers located in the residential zones, 74 of which have been removed leaving 71 trailers in the area.

In December 2008, sudden tidal surges within the Kwajalein Atoll resulted in high wave conditions at Roi-Namur. As a result, Roi-Namur and its residents experienced severe flooding conditions, saltwater contamination of the freshwater well, closing of the Roi airfield, substantial building and structure damage and shoreline devastation beyond incidental repair capabilities. Emergency assistance was required from the Pacific Command to utilize Reverse Osmosis

Portable Units to produce sufficient potable water for island residents. Recovery from this event continued into 2009.

Construction of a 7,700 sq ft Emergency Services facility on Meck was completed by San Juan construction Company in 2008. The new facility provides Meck fire personnel with state-of-the-art fire and medical services capabilities.

As part of KRS Quality of Life program to enhance community facilities, the Family and Adult pools on Kwajalein were extensively refinished and painted. Removal of several layers of old paint through aggressive sandblast methods was performed to provide the best possible finish the saltwater pools have had in over a decade. Playground equipment at the George Seitz Elementary School was refurbished and put back into service for Kwajalein kids to enjoy.

Several projects started in 2006 and 2007 were completed in 2008 and 2009. Included in this list of projects is the Military Intelligence Facility and Tactical Operation Center. Beneficial occupancy of the Tactical Operations Center was April 2009. The USAG-KA/RTS commander and his staff occupy the new facility.

The new emergency Operations Center (Facility 1071) was constructed under a KRS subcontract.

Substantial upgrades were completed by the Missile Defense Agency to the Launch Facilities on Meck for a new program called the Flexible Target Family.

In June of 2009, the US Army Corps of Engineers (USACE) residential office ceased operations at USAG-KA/RTS due to the lack of major construction projects. The Kwajalein USACE office was closed and personnel reassigned.

2009-2010: Between 1962 and 1968, 454 aluminum [silver] trailers were installed for housing at Kwajalein. In April 2010, the last of the aluminum trailers were removed from their residential housing location in support of USAG-KA/RTS's housing trailer removal program. For over forty years, the aluminum trailers provided Kwajalein families, unaccompanied/TDY personnel and island visitors with a place to live while at Kwajalein. The term "Silver City" was used to describe the northern end of Kwajalein that was built-up in 1968 with 38-acres of fill to accommodate 182 of the 454 aluminum trailers placed at Kwajalein in the 1960's.

Construction of the 2,500 sq ft Launderette near the Dock Security Check Point (DSC) started in March 2010 and was completed in July 2010. As part of USAG-KA/RTS security profile, the launderette was designed so that patrons using the facility no longer require access to USAG-

KA/RTS through the DSC. The facility has twice as many washers and dryers as the old laundry. The new Launderette is equipped with restrooms, folding tables and open lockers. The Launderette is operated by AAFES.

In September 2009, rehabilitation and modernization of Family Quarters 208, 209 and 214 was completed. The housing revitalization program included kitchen modernization, addition of second bathroom, new interior fixtures, floor covering, windows/doors and construction of an open patio cover.

At Roi-Namur eight rooms in the Ajax BQ were converted to four BQ suites to offset removal of UPH trailers historically assigned to married couples and qualified single status contract workers living on Roi-Namur. The BQ room conversion project included the installation of additional countertops, a larger sink unit, electrical modifications and installation of a lockable pass-thru door between the adjoining rooms.

In August 2009, replacement of the SATCOM radome commenced with General Dynamics SATCOM Technologies (GDST) project management oversight. GDST subcontractor ESSCO and KRS Public Works removed the existing radome and installed the new radome. The decision to replace the SATCOM radome was in response to a Project Manager Defense Communication and Army Transmission System (PMDCATS) Director for readiness assessment of the existing 93-foot radome at the Kwajalein Satellite Communication Station.

In December 2009, KRS Public Works assisted TYCO Telecommunication to install the undersea fiber-optic cable at the southwest end of Kwajalein Island. The new fiber-optic cable provides USAG-KA/RTS with high speed, broadband fiber-optic telecommunication services connecting Guam with Kwajalein and branching segments to Pohnpei, Federated States of Micronesia (FMS) and Majuro. Over 2,100 miles of undersea cable was placed in support of the Micronesia Cable System.

2010-2011: San Juan construction was awarded the USAG-KA/RTS IDIQ contract to repair the Kwajalein Hospital. The project scope included interior and exterior concrete spalling and column repairs, Hydro-Stop roof overlay and exterior painting. San Juan Construction arrived on USAG-KA/RTS in March 2011. The Hospital was last renovated in December 1991. The San Juan Construction repair project is expected to be completed in September 2011.

A second IDIQ contract was awarded to San Juan Construction to replace Facility 8030 on Roi-Namur. Facility 8030 is a 4000 sq ft steel frame metal siding structure assigned to the Public Works Roi-Namur Operations Carpenter and Plumbing shops. The original structure was built in 1961 and due to its deteriorated condition, is being replaced. Unspecified Minor Military

Construction (UMMC) funds were appropriated to replace the existing facility. Construction of the new facility started in October 2011.

In July 2010, the George Seitz Elementary School got a new gym floor. New easy to install inter-locking rubber floor tiles were installed.

In August 2010, the Café Pacific repair project started. The \$2.4M project included 100% remodel of the Bakery retail and kitchen areas, replacement of the Café Pacific refrigeration systems, electrical and plumbing upgrades, air conditioning system replacement, installation of a new dishwasher, replacement of all exhaust hoods and associated fire suppression systems, installation of a fire alarm detection and reporting system, interior/exterior concrete spall repair and roof replacement with new Hydro-Stop roof system was completed June 2012. In January of 2013, it was dedicated and renamed the Zamperini Dining Hall.

2011-2012: San Juan construction was awarded the IDIQ contracts to repair USAG-KA/RTS facilities and structures. On Kwajalein, \$5.7 million was allocated to repair the Barge Slip Ramp (BSR) structure, and \$5.8 million was allocated to replace the fire detection/suppression systems in the fixed and rotary wing hangers. On Roi-Namur, \$13.9 million was allocated to repair the fuel/cargo pier and \$2.4 million was allocated to repair the sewer outfall. In addition, \$5.8 was allocated in Unspecified Minor Military Construction Army (UMMCA) funding to replace the 100,000 gallon treated water storage tank and carpenter/plumbing shop on Roi-Namur. Another \$3.4 million in Military Construction Army (MCA) funding was awarded to San Juan Construction to demolish five fuel storage tanks on Kwajalein.

In October 2011, USAG-KA/RTS collaborated with the RMI to discontinue the use of the Carlos Power Plant. In addition, KRS Public Works designed and installed an alternate power solution for the communication receiver building on Carlos.

In December 2011, USAG-KA/RTS received \$2.6M of Sustainment, Restoration and Modernization (SRM) funding; \$1.3M to replace 35 Navy family housing roofs and \$1.3M to replace the Roi-Namur Power Plant exhaust stacks. The SRM funds were provided to Kwajalein Range Services (KRS) to design and execute the work.

During the period May to July 2012, KRS underwent formal certification training for the Department of the Army's General Fund Enterprise Business System (GFEBS). This activity supported the 01 July 2012 implementation of the GFEBS Real Property business module at USAG-KA/RTS.

In support of facility sustainment, KRS Public Works replaced 53,000 square feet of shingled roof systems that have exceeded their useful life. Facilities included George Seitz Elementary School buildings, AAFES retail facilities, Ocean View Club facility and the Adult Recreation Center (ARC).

2012-2013: San Juan Construction was awarded Indefinite Delivery Indefinite Quantity (IDIQ) contract to repair USAG-KA/RTS facilities and structures. On Kwajalein, \$1.8 million to repair wastewater-drying beds, \$4.1 million to replace the skin and structural membranes of water plant facilities and \$5.7 million to upgrade the barge slip ramp. On Roi-Namur, \$13.9 million was allocated to upgrade the Roi fuel cargo pier.

In 2012 and 2013, KRS Logistics and Mission Operations successfully supported the Missile Defense Agency (MDA) FTI-01 and FTO-01 flight tests at USAG-KA/RTS. In doing so, KRS completed several large infrastructure projects on Kwajalein, Roi-Namur, and Meck Island. On Kwajalein, KRS provided power to TTS-3 & TTS-4 antenna systems; on Roi-Namur, construction personnel prepared AN/TPY-2 radar and BC/SATCOM sites; on Meck, the dining hall was reopened, the Meck pier repaired and the construction of a 150 personnel man-camp was completed.

In October 2012, USAG-KA /RTS received \$23.8 million of Sustainment, Restoration and Modernization (SRM) funding KRS \$2.3 million to replace 36 Navy family housing roofs, \$1.3 million to replace doors and windows in Navy family housing, \$890k for electrical distribution upgrades, \$135K to replace post office boxes and roof, \$1 million to upgrade outer island power, \$8.1 million to replace one engine and to perform one engine overhaul, \$7.2 million to renovate Yokwe Yuk Club Facility and \$2.9 million to make structural repairs to Facility 704.

In February 2013, KRS subcontractor Defense Acquisition, Inc. (DAI) performed structural assessments and concrete core sampling at four USAG-KA/RTS facilities: Building 901- Main Terminal and USAG-KA/RTS Headquarters, Building 703 - Zamperini Dining Facility, Building 704 - Macy's, and Building 502 - Yokwe Yuk Club. DAI structural assessment and concrete core sampling results determine Buildings 901 & 703 (kitchen section) are severely deteriorated with no usable life remaining. Buildings 704 & 502 are structurally repairable.

In March 2013, KRS implemented its Facility 901 relocation plan in accordance with DAI's structural assessment recommendation for the facility, and moved the USAG-KA/RTS third floor occupants from Building 901 to Building 1010 – Range Command. Included in the relocation was the USAG-KA/RTS Directorate of Public Works (DPW), Director of Logistics

(DOL) and Director of Community Activities (DCA). Kwajalein Police Department (KPD) relocated to Building 835 - KPD/Provost Marshall Facility.

In August 2013, KRS started renovation work on Buildings 687 - Airfield Training Facility and Building 902 - Berry Aviation Operations in support of the USAG-KA/RTS approved Building 901 relocation plan to convert buildings 687 and 902 into temporary passenger arrival and departure terminals. The new temporary passenger terminals were put into service in April 2014.

2013-2014: U.S. Army Corps of Engineers (USACE) awarded \$14.7 million of infrastructure work at USAG-KA/RTS to San Juan Construction and NAN Inc. The Kwajalein Sludge Drying Bed Replacement and Hospital HVAC and Electrical Outlet Replacement projects were awarded to San Juan Construction. Both projects completed in August 2014. NAN Inc. was awarded the Install Solar PV System and Repair/Replace Water Treatment Plant on Kwajalein. The NAN Inc., projects were completed in October 2014 and January 2015 respectively.

In 2013 – 2014, KRS completed several U.S. EPA Notice of Deficiency findings on Kwajalein and Roi-Namur. The Small Boat Marina underground fuel tank was replaced with an above ground fuel tank, secondary tank bottoms were installed on the Kwajalein Power Plant diesel tanks at Facility 1037; a secondary spill containment was installed at Facility 1037 on Kwajalein and Facility 8341 on Roi-Namur and Facility 8046 tank bottom repair on Roi-Namur was completed.

October 1, 2013 USAG-KA/RTS was transferred from the U.S. Army Space and Missile Defense Command to the U.S. Army Installation Management Command. The Uncasing of the Colors Ceremony was held in the Kwajalein Fixed Wing Hangar.

In December 2013, KRS started the construction of the new Optics Building on Gagan. The new building replaced the forty-five year old cement block structure that exceeded its useful life. The new facility is a 1,500 sq ft open beam cement block structure. It is a closed facility designed to support USAG-KA/RTS outer-island mission protocols. Planned construction completion is December 2014.

In December 2013, KRS developed subcontract scope-of-work to repair the reinforced thermosetting resin plastic (RTRP) distribution manifold at Facility 8257 – Seawater Pump House, to avoid catastrophic failure of the seawater manifold that supports the ALTAIR antenna seawater cooling systems. The RTRP manifold repairs were accomplished within three (3) days of the subcontractor arrival Kwajalein.

In May 2014, KRS started the Navy Housing window and door replacement project. Project scope included replacement of front windows, front and back doors, exterior concrete spalling

repair and painting. Sixty-eight (68) Navy family housing quarters are scheduled for new windows and doors.

In May 2014, because of a significant weather event, the Facility 1202 (electrical substation) roof failed and water leaked onto the utility switchgear inside the vault . As a result, 20 Navy Housing quarters went without electrical service for nearly 12 hours while KRS installed a 200kW backup generator to provide electrical service to the family quarters. Due to extensive structural deterioration of the electrical substation, KRS constructed a new building to house the new switchgear equipment that failed beyond repair.

In May and June 2014, KRS completed major repair work at the Family and Adult pools on Kwajalein. Project scope included concrete crack repair inside the pools, replacement of the concrete pool decks, repair of the saltwater supply and discharge lines, pool painting, and landscape work at the Adult pool.

In June 2014, KRS completed construction of new power plant facilities on Legan and Gagan islands. The new power plants provide 1,200 sq ft of covered area designed to accommodate an enclosed storage area, employee day/overnight room, generator control room, and equipment room for two (2) new 80kW Kohler generators. The new power plant buildings are 50% larger to accommodate the enclosed storage area and employee day/overnight room. The addition of the employee day/overnight room on Gagan, supported the disposal of the trailer (Facility 7522) used to support generator personnel during overnight stays on the islands.

At the Kwajalein Power Plant, KRS subcontractor Hawthorne Power Systems completed a Unit 5 generator replacement and Unit 3, 4, 6, & 7 generator overhauls/conversions. At the Roi-Namur Power Plant, KRS self-performed the work and completed overhauls on generators: 1, 2, 3, 5, 7 and replacement of all nine engine-cooling radiators.

KRS replaced fifty-three (53) failing built-up roof systems on Navy housing facilities with the Hydro-Stop Cool Roof systems. The newer energy efficient Hydro-Stop roofs are fully reinforced with a tough nonwoven polyester fabric that is flexible and UV resistant. The Cool Roof system is safe to handle and requires no special equipment to install.

2014-2015: With support from Navy Seabees, KRS completed several projects and improved the quality of life for the USAG-KA/RTS community and workers. Although confronted by the challenges of deployment to a remote area, the Seabees prevailed and completed the following projects:

Constructed the “Haz-Mat Restroom/Shower” facility to support KRS workers at the Kwajalein Recycle Center and Landfill. The construction design for the new facility included bathroom facilities, showers and laundry appliances for workers to use before returning home to Ebeye.

At Emon Beach, Navy Seabees built a new “Lifeguard Shelter” from the ground up. The new shelter (designed by Seabee personnel) included an extended overhang in front to protect lifeguard personnel from the afternoon sun.

The Camp Hamilton and Coral Sands beach pavilions (built in 1962 & 1963 respectively) were torn down and replaced with 58’ x 18’ octagonal pre-engineered pavilion structures. The construction design for both pavilions included lighting, a food prep area & BBQ grill. At Camp Hamilton, the construction design included new restroom facilities. Additionally, multiple drainage issues related to area flooding were taken care of.

With Seabee assistance, KRS demolished two 4,000 sf. steel warehouse structures. Due to the large structural components used to construct the warehouse facilities both Seabee and KRS personnel worked together as a team to take the warehouse structures down safely.

In family housing, the Seabees replaced spalled and broken concrete patio slabs. Due to concrete settling over time the existing patio slabs created unsafe conditions for residents. Additionally, the new patio slabs corrected drainage problems behind resident’s quarters.

At the Religious Education Building (REB), the Seabees replaced an existing sidewalk that was buried and damaged during the construction of the facility in 1995. The new sidewalk located on the south side of the REB provides a safer walk-up to the facility from the parking lot.

In June 2014, Lockheed Martin won the \$914M contract to engineer, manufacture and deploy the Space Fence radar system at USAG-KA/RTS. Work started with the construction of the 250 person man-camp (adjacent to the Coral Sands beach pavilion) for the workers that will live on Kwajalein for the next 2 ½ years to build the Space Fence operations center and install the S-band ground base radar system. In conjunction, construction workers will construct the new power plant annex to provide electricity to the new Space Fence complex.

In March 2015, KRS started construction on the Air Traffic Control Tower (ATC Facility 1276) support system for the relocation of ATC operations from Facility 901 to a location next to Facility 1659 (Tacan Facility). The ATC support system for the government furnished 7A tower cab consisted of four 8’ x 20’ Connex containers stacked two high on top of a pour in-place concrete foundation. Project design included an aluminum framed 20’ x 20’ platform structure secured on top of the stacked containers, exterior stair structure, electrical grounding system, communication pathways and electrical service from Facility 1659 and air conditioning for the government furnished mobile 7A tower cab.

On March 11-12, 2015, Tropical Storm Bavi came within 300 nautical miles of Kwajalein producing 10.65 inches of rain and tropical storm strength winds. This storm caused flooding, damaged roofs causing leaks, and caused parts of roofs and siding to come loose and blow off.

In April 2015, demolition started on several facilities to clear land for the new Space Fence complex. The Facilities selected for demolition were 1505 (Antenna), 1506 (Antenna), 1508 (Antenna), 1510 (Antenna, UHF/VHF Tower), 1511 (Antenna, UHF/VHF Tower), 1512 (Antenna, Tower), 1513 (Antenna, Vertical Log Periodic), 1519 (Radot Building), 1525 (Antenna, High Frequency) and 1527 (Concrete Batching Plant). Over 6-acres of land was cleared for the Space Fence complex.

On May 11-12, 2015, Tropical Storm Dolphin, with a significant wave height of +18 feet at the storms origin, caused major wave damage to the Kwajalein Atoll. Tropical Storm Dolphin was centered 386 nautical miles WSW of Kwajalein. The significant wave height generated a rare western swell with very large waves breaking onto the unprotected west facing shoreline of Kwajalein over a period of 48 hours. The storm caused major damage to the Marine and Small Boat Marina floating piers.

September 2014, the \$17M Multiple Award Task Order Contract (MATOC) to repair Facility 602, Shipping & Receiving General Purpose Warehouse at USAG-KA/RTS was awarded to San Juan Construction. The project scope consists of but not limited to selective demolition of the existing roof and replace with new construction of first floor offices for Shipping & Receiving operations and renovation of second floor offices for general administration services. Phase 1 work (structural demolition) started July 2015.

At the Kwajalein Power Plant KRS subcontractor Hawthorne Power Systems completed the #4 generator overhaul in October 2014 and #8 generator overhaul in March 2015. Generator #6 overhaul is scheduled for 2016 and generator #9 overhaul for 2017.

2015-2016: KRS subcontractor AIC Construction Inc., started the Facility 704-repair project. The repair scope of work includes removal of the building's exterior insulation and finish system (EIFS), exterior repairs of columns and beams, interior structural repairs in the Community Bank, AAFES Food Court, and Army Lodging rooms, and painting. KRS Architectural & Engineering (A&E) subcontractor, TYLIN International, designed the building repair plan to extend the useful life of the facility 5-7 years. AIC Construction Inc. will complete the repairs in 2017.

In April 2015, demolition started on several antenna facilities to clear land for the new Space Fence complex. In July 2016, KRS completed the demolition of the remaining antenna structure

(Facility 1505) and assisted with the installation of three new antennas (Facilities 1569-1571) adjacent to the DCCB and GBRP facilities. In preparation for the new antennas, KRS built a new transmitter/equipment room inside the DCCB automotive area.

In May 2015, KRS completed the construction of the new Optics Facility on Gagan Island. The new 2,200 square foot Facility 7505 replaced the old facility built in 1972. The old facility closed due to severe concrete spalling deterioration.

In July 2015, the Illeginni Power Plant closed permanently due to fire damage (Facility 9035). Following the fire incident, KRS installed temporary generators to provide power to the island while its Public Works engineers designed a new power plant facility for Illeginni Island.

In September 2015, KRS completed construction on the new Gagan Power Plant (Facility 7595). The new power plant (an enclosed concrete block structure) replaced the existing steel frame and metal siding structure that was open to the environment. The new facility is equipped with an enclosed generator room, air conditioned equipment and control room, and an employee area designed to sleep generator personnel in support of overnight missions.

In June 2016, U.S. Army Corps of Engineer (USACE) contractor San Juan Construction is awarded the Echo Pier MILCON project. Project scope is to replace 5,280 SF of existing Echo Pier and pile supports and 16,268 SF marine warehouse. San Juan Construction started the Echo Pier project in June 2017.

In July 2016, construction on the new Illeginni Power Plant started. The new power plant is approximately 2,200 square feet with a floor plan configuration similar to the recently built Legan and Gagan power plants. New power plant construction is due to be completed in 2017.

2016-2017: Critchfield Pacific, Inc., (CPI) is awarded the KRS subcontract for the Kwajalein Power Plant seawater cooling and discharge system upgrades. Project scope-of-work includes replacing all existing seawater cooling supply and discharge piping inside and outside the power plant. In addition, a new secondary seawater discharge line is being added to support seawater discharge redundancy within the power plant. The project is scheduled to be completed in January 2018.

November 2016, KRS takes down the 132 LF, 100,000-gallon Non-Potable Water Tower, Facility 864. The tower structure was installed on Kwajalein in 1961 and demolished due to the severe structural corrosion condition of its steel frame.

January 2017, Roi 3 MS Tower Replacement project complete. New Facility 8440 tower erection was complete by Sabre Industries subcontract replacing Facility 8131.

KRS performs alterations to Facility 712 (Kwajalein Mini-Mall) for RMI Host Nation relocation from Facility 901, Main Terminal Facility. Due to the deteriorated structural condition of Facility 901, the facility is permanently closed and waiting demolition.

After nearly 30 years of use the Corlett Recreation Center (CRC) gym gets a new athletic floor system to support the indoor sports activities the Kwajalein Schools and Community have enjoyed since CRC construction in 1986.

March 2017, at the south end, ocean side of the runway, the Seabees poured a new concrete pathway alongside Zeus Boulevard road. The new concrete path provides a safer walking or biking surface along this stretch of deteriorated road.

April 2017, official dedication and naming of DeMeo Field, in memory of Lt. Paul M. DeMeo, a long time “Kwaj Kid” and graduate of the US Military Academy, who passed away while serving at Fort Bragg, North Carolina. Up to this point, the athletics field has never received a memorial distinction.

May 2017, USAG-KA dedicated “Lippwe Lane” in honor of Sgt. 1st Class (Ret.) Akino Lippwe, who passed away from natural causes in May 2016. Akino retired from the Military Police Corp after 22 years of service, and served the Kwajalein community for 15 years.

June 2017, KRS begins construction on the new Roi-Namur Paint/Weld Shop Facility 8247. The new 4,000 SF Facility replaces the Paint/Weld Facility 8032, built in 1961. Planned completion is January 2018.

September 2017, KRS completes the Roi Power Plant three year project for major overhaul of all nine Diesel Engines, directly contributing to longevity of operation and continuity of power production reliability in Roi-Namur.

In Family Housing, the Seabees replaced spalled and broken concrete patio slabs. Due to concrete settling over time, the existing patio slabs created unsafe conditions for residents. Additionally, the new patio slabs corrected drainage problems behind resident quarters.

2017-2018: Williams Electric Company under USACE on the Army Metering Project installed water and electric meters in more than 90 facilities across the atoll. All new meters installed will have the ability to send data as required to the Enterprise Energy Data Reporting System

(EEDRS), which exports to the remote centralized Meter Data Management System (MSDS). The project intent is to fulfill the requirements of the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007.

October 2017, Lockheed Martin began the commissioning of both Space Fence Power Plant Annex (PPA) and Sensor Site. The Sensor Site began initial radiating in December 2017. The Power Plant Annex came on line for the first time, supplying power to the Sensor Site in February 2018. IOC is currently set for May 2019, when the PPA transfers to Army Garrison control.

November 2017, KRS completes the project to tear down nine decommissioned antenna towers on Ennylabegan (Carlos) Island.

November 2017, Facility 9097 and Facility 9101, the new Illeginni Power Plant and Fuel Tank, are complete and accepted into the Real Property Record.

November 2017, USACE contractor, San Juan Construction, completes the \$17M Multiple Award Task Order Contract (MATOC) to repair Facility 602, Shipping & Receiving General Purpose Warehouse.

December 2017, KRS begins the Fueling Station demo and installation of the new fueling station and associated tanks. The project was halted through the contract transition to DynCorp International who in June 2018 resumes the demo and installation. Completion is set for September 2018.

USACE contracts ASRC for demolition of Facility 5011 and Facility 5012 warehouse on Meck that are abandoned due to structural failure and severe deterioration.

January 2018, KRS replaces the marina and small boat marina floating docks. The original floating docks were significantly deteriorated following damage from the 2015 Tropical Storm winds to the Lagoon side of Kwajalein.

In February 2018, SMDC exercises a 6-month contract extension under KRS for services to Mission Facilities and Operations. MCOM was spilt from the umbrella contractor KRS and awarded to DynCorp International under LOGCAP IV. Later in June 2018, NETCOM is awarded to Tribal Company.

In February 2018, Facility 803, Vehicle Maintenance Building, which initially was a power plant on Kwajalein Island, is awarded a rehabilitation contract to the USACE subcontractor San Juan Construction. Work on the structure started May 2018 and is due to be complete February 2020.

Johnson Controls Inc. (JCI) commences a 25-year contract associated with the Energy Savings and Conservation Project. JCI took over the large Living Support Area under Lockheed Martin, who is demobilizing post completion of Space Fence Project construction. JCI commences Phase 1 of ESCP including installation of a photovoltaic system and 3MW battery storage on Meck Island, facility envelope improvements, lighting upgrades, and installation of split units in facilities across the atoll.

March 2018, San Juan Construction, under USACE, began onshore construction of the new warehouse for the Echo Pier Project. Completion is estimated to be 2020.

March 2018, the Seabees of Naval Mobile Construction Battalion Eleven complete construction of a water catchment on Bigej.

April 2018, Richardson Outdoor Theater partially collapses overnight from strong prevailing winds. The structure was demolished shortly thereafter due to health and safety of the public. The theater was an iconic location on Kwajalein, built in 1945.

April 2018, USACE subcontractor San Juan Construction started work on the Fuel Farm Tank Replacement Project. The \$62 Million dollar subcontract includes removal of 10 fuel tanks installed in 1954, installation of 8 new tanks, demo of the existing Facility 777, POL Operations Building, constructing of a new POL Operation Building and installation of a new pumping station off the Fuel Pier.

May 2, 2018, Storm “Invest 96W” results in 10.97 inches of rain in less than 24 hours. Result was flooding in 15 facilities, closure of the Kwajalein Airfield, and overflowing of the Kwajalein Waste Water Plant.

May 2018, USACE contractor, ASRC completes installation of a new control system, EASYGEN at Meck Power Plant. The upgrade allows for automatic operation of the power plant for the first time since its installation in 1968.

May 2018, DynCorp International demolishes condemned structure Facility 5091, Camera Tower, on Meck to make way for the JCI PV array project, associated with the 25-Year Contract Energy Savings and Conservation Project

June 2018, the MATOC Non-Potable Water Tower Project commenced on the site of the old tower that was demolished in 2017. The new tower completion is set for April 2019.

June 2018, DynCorp International replaced the Brandon Field lights and supporting control system. Old lighting, poles, concrete bases and control system were all demolished.

July 2018, DynCorp International along with support from KRS, installs new domes on Facility 1062, CTT Station Antenna and Facility 1011, Range Safety Center. Original domes were installed in 1978 and were in need of replacement due to deterioration.

July 2018, DynCorp International begins the replacement of the Kwajalein Incinerator. Both grapplers are to be replaced. The fuel system will be replaced at a later date. Completion of the new incinerator is set for September 2018.

July 2018, MWR completes a project to upgrade Facility 634, the Tennis Courts.

2018-2019: The Space Fence project is complete and going through a testing phase. It is will be transferred to USAG-KA Real Property records in November 2019 and due to be fully functional.

MWR constructed workout stations in and around the Northpoint of Kwajalein.

In October 2018, a joint U.S. Navy-led team successfully completed a historic oil removal operation on the sunken World War II vessel, ex-USS PRINZ EUGEN, located in Kwajalein Atoll at Carlson Island. The team successfully removed more than 228,000 gallons of oil from the vessel's 173 fuel tanks. The main objective of this operation was to eliminate the potential for a major release of oil from the deteriorating wreck since such an event could adversely impact the marine environment, as well as the surrounding human population and U.S. Army property. The Prinz Eugen was originally commissioned by Germany and used in combat during WWII. In May 1945, upon the conclusion of the war, the Prinz Eugen was surrendered to the British and transferred to the U.S. Navy for use in Operation Crossroads nuclear tests. After surviving two tests and subsequent towage to Kwajalein Atoll, the vessel began to take on water due to sea valve and rudder damage and ran aground settling in a capsized position off the coast of Enubuj Island (Carlson).

October 2018 started the Shoreline Metals Removal initiative, formerly known as the U.S. Navy Dump Removal initiative and is slated for completion September 2019. This initiative has seen approximately 2.5 million pounds of metal (military equipment and scrap) pulled from the former dump and sent to the U.S. for recycling. The final barge in September is expected to

remove another 2 million pounds of metal. Short-arm excavators pull the debris off of the shoreline and load it into waiting dump trucks. The dump trucks take it to a staging area where it is sorted to remove the metal and larger material and then sampled for contaminants to determine if it can be reused on-site, can be placed in the Kwajalein landfill or has to go off-site to the U.S. for disposal. After the metal and the dump material is removed, a rock revetment is installed to protect the shoreline and the runway from erosion. The revetment is a process of placing large keystones into slots cut out of the reef flat and then filling behind those keystones with multiple layers of additional stone. This forms a strong base so that a back wall can be installed by laying down geotextile fabric, placing smaller bedding stone on the fabric, and then covering it with layers of larger revetment rock. The overall height will be approximately 12 feet above mean sea level. With the project occurring on the site of a former battlefield, it was inevitable that unexploded ordnance would be found. A 100 pound bomb, a five-inch naval shell and some smaller mortar shells were found and destroyed. FN 1103 – Garbage Dump Ramp was demolished in the process and replaced with riprap.

In November 2018, the Kwajalein Landfill Source Metal Removal Action Memorandum (RAM) was initiated to remove debris and materials that provide an ongoing source of contamination affecting the Atoll environment. This project clears out the accumulation of scrap metal in the active landfill. To this date, 15 million pounds of scrap metal have been loaded onto the barges heading to the U.S. for recycling. The active landfill is programmed to be closed, by complete removal, starting in 2022.

In FY19, this project saw the removal of all the old silver trailers and the following facilities: FN 1046 – Heavy Equipment Flam Mats Warehouse, FN 1145 – AN/FPN Air Surveillance Radar, FN 1146 – AN/FPN-66 Equipment Shelter, FN 1544 – Screening Area, FN 1643 – Observation Tower, FN 1021 – Potable Water Tank and FN 8214 – Tacan Tower on Roi.

January 2019 the Terminal High Altitude Area Defense (**THAAD**) mission started on Kwajalein and Roi-Namur. It was successfully completed in August 2019. FN 1504 – Vert Log Periodic Antenna was demolished on Kwajalein to make room for the THAAD launch site. All of the equipment was removed from both islands after the completion of the mission. This site will remain improved with electricity and gravel roads for future missions.

May 2019 FN 524, Non-Potable Water Tank was completed by San Juan Construction, a subcontractor for USACE, and transferred to USAG-KA.

To reduce the USAG-KA footprint, mandated by IMCOM, the following abandoned facilities were demolished in FY19: FN 110 – Playground, FN 115 – Playground, FN 567 – Handball Court, FN 802 – Skateboard Park, FN 1048 – Fuel Farm Personnel Building, FN 1117 – Warehouse, FN 1049 – Pacific Club, FN 662 – Projection Booth for Richardson Theatre, FN 663

– Storage Shed, FN 1881 – Kayak Shack, FN 922 – Slop Fuel Tank, FN 8376 - Warehouse on Roi, FN 8266 - Trailer on Roi.

The Echo Pier Project is still under way. FN 605 – Marine Warehouse, FN 620 – Electrical Substation and FN 621 – Echo Pier Restrooms were demolished early FY19.

June 2019 the Vet Clinic was moved into FN 566 and the Physical Therapy Office moved to the hospital, FN 603. Both were moved from converted housing units FN 424. FN 424 will convert back to housing in FY20.

The new Automotive fueling station is due to be completed by DynCorp International in January FY20. FN 837-840 are replaced by FN 1239-1241.

DynCorp is due to complete the Incinerator - FN 1531 - Restoration project in FY20. Chambers #1 and #2 are being replaced.

XI. ORGANIZATIONS ON-SITE

2nd Space Operation Squadron

15th Wing

21st Space Operations Squadron

30th Signal BN AUG

50th Network Operations Group

50th Space Wing

311th MI BN

413th Contract Support BDE

500th Military Intelligence BDE

516th Signal Brigade

735th Air Wing

921st Contracting Battalion

a.i. solutions

Air Force Research Laboratory (AFRL)

Air Marshall Island (AMI)

Air Transport International (ATI)

Alutiiq

Army Network Enterprise Technology Command (NETCOM)

Army & Air Force Exchange Service (AAFES)

Atmospheric Science Technology (AST)

Bank of America Community Bank

Bank of Marshall Island (BMI)
Berry Aviation, Inc.
Calibre
Defense Logistics Agency (DLA)
Defense Logistics Agency Energy (DLA-E)
DynCorp International
Global Positioning System (GPS)
Government of the Republic of the Marshall Islands (GRMI)
High Dynamic Range (HDR)
Infinity Systems
International SOS (ISOS)
Johnson Controls Incorporated (JCI)
Kwajalein Integrated Installation Systems and Support (KIISS)
Lawrence Livermore National Laboratory (LLNL)
Lockheed Martin
LOGCAP
Massachusetts Institute of Technology Lincoln Laboratory (MIT/LL)
Missile Defense Agency (MDA)
Nan, Inc.
National Aeronautics and Space Administration (NASA)
National Marine Fisheries Service (NMFS)
National Oceanic and Atmospheric Administration (NOAA)
Naval Undersea Warfare Center
Oasis
Pacific Architects & Engineer (PAE)
PEO (Aviation) Light Helicopter Product Office (LHPdO)
Planate
Raytheon - Ground Based Radar Prototype (GBRP)
RGNext
San Juan Construction
Space Fence Systems
Steady Flux
Texan Power
Torch
Tribalco
United Airlines
US Army Aviation and Missile Command (AMCOM)
US Army Aviation Field Maintenance Directorate (AFMD/AMSAM)
US Army Corps of Engineers (USACE Honolulu District)

US Army Garrison-Kwajalein Atoll (USAG-KA)
 US Army Space and Missile Defense (SMDC) Reagan Test Site (RTS)
 US Coast Guard (USCG Honolulu)
 US Department of Energy (DOE)
 US Fish and Wildlife (USFWS)
 US Navy Seabees
 USS Michael Murphy (DDG-112)
 USS Oliver Berry (WPC-1124)
 Williams Electric Company

XII. POPULATION- KWAJALEIN ATOLL

Personnel

As of August 17, 2019, the persons residing within the Kwajalein Atoll are distributed as follows:

<u>By Personnel Status</u>		<u>By Island</u>	
Military Personnel Status	34	Kwajalein	1,173
Civil Service Employees	77	Roi-Namur	124
Civilian Contractor Employees	707		
Dependents	479		

Marshallese Citizens in Kwajalein Atoll

Approximately 12,000-15,000 Marshallese live on Ebeye, an islet three miles north of Kwajalein Islet (Kwajalein is the name of both the islet and the atoll). Other populated islets within Kwajalein Atoll are Enniburr (Third Island) with an approximate population of 900, Majetto with approximately 450 residents, Ebadon with approximately 100 residents. Ennylabegan (Carlos) with an approximate population of 100 residents and Ennibuoj (Carlson) with approximately 60 residents. Approximately 75 Marshallese contractors/RMI government employees and their families also live on USAG-KA/RTS due to various conditions of their employment.

The approximate total of all Marshallese in Kwajalein Atoll is over 15,000. Approximately 1,064 Marshallese are regularly employed on USAG-KA/RTS as employees for DynCorp International, as well as other contractors and sub-contractors, authorized Marshallese government agencies, businesses and as contracted employees for permanent residents.

XIII. ON/OFF ATOLL COMMUNICATIONS

Communications with Hawaii and CONUS are provided by means of fiber optic cable, satellite and high frequency radio communication links. The Kwajalein Cable System (KCS) fiber optic cable provides the primary off atoll services with interfaces to the Defense Switched Network (DSN), commercial telephone services and the Defense Message System (DMS) for record message traffic. Commercial telephone services extend global-wide by interface to civilian telephone systems in CONUS, via the fiber optic cable. Fiber from Guam to CONUS is via two diverse paths, one running through Hawaii the other is through Japan to CONUS. If both fiber paths and the path from Kwajalein to Guam would fail, then limited communication (telephone, email, and internet) would still be possible using satellite connections. In the event of a satellite link failure, high frequency radio communications can provide emergency voice communications with military facilities in Hawaii and CONUS.

Residential Internet: The USAG-KA/RTS residential internet system accesses Internet service procured from MINTA over a 500 Mbps circuit to Guam on the Kwajalein Cable System (KCS) sub-marine fiber cable. The internet service to homes is provided by DSL connections that pass from DSLAM routers in communications facilities, through telephone lines, to filters and DSL modems in the residential quarters. Filters and DSL modems are provided to subscribers at no cost to support consistent service and to minimize maintenance requirements. The service is available to all residential quarters on a subscription basis.

Telephone System: The USAG-KA/RTS telephone system is a five digit dialed network consisting of 12,000 line capacity AT&T Definity G3R switch on Kwajalein Island, a 5,000 line capacity switch node on Roi-Namur and a 2,000 line capacity switch node on Meck Island. The Kwajalein Island switch provides service to Ennylabegan, Legan, Illeginni and Gagan Islands. The USAG-KA/RTS telephone system handles thousands of calls per day, supporting nearly 5,000 active telephone extensions throughout the atoll. Long distance direct dialing is provided to residences and offices. Call accounting is accomplished with personal and official authorization codes. A commercial 355 prefix, in the 805 area code, allows direct dial, long distance phone calls to the local numbers. Commercial, Pacific DSN and CONUS DSN services are available from Kwajalein.

Intra-Atoll Communication System: The Intra-Atoll Communications System (IACS), provides the required interfaces between the USAG-KA/RTS telephone systems, sensor sites such as radars, telemetry, photo optics and weather, digital network subscribers and range user systems to the atoll fiber optic transmission system. The IACS is comprised of analog and digital

multiplexing units, modems and fiber optic interfaces that provide data and voice transport capabilities.

Intra-Atoll Optical Transport Network (OTN): The OTN is comprised of approximately 130 miles of armored undersea fiber optic cable and electronic communications equipment to interface with the IACS. This system connects ten (10) islands of which six (6) are active with OTN electronic communications equipment and one (1) with point-to-point communications interfacing with the IACS. The intra-atoll OTN is a Dense Wavelength Division Multiplexed (DWDM) communication system utilizing two (2) of twelve (12) fiber strands in a two (2) ring topology. The OTN is capable of 40 independent wavelengths of which six (6) are currently accessible and in use at the six (6) islands. The OTN is capable of expanding from the forty (40) independent wavelengths to eighty (80) independent wavelengths if necessary over the same two (2) SFOTS fiber stands. The wavelengths are duplicated over both rings and travel over the SFOTS in opposite directions for redundancy. Wavelengths can be added, dropped or passed through each OTN node depending on requirements. One (1) of the wavelengths is used to transport legacy T-1, DS3, OC-3 and low bandwidth Ethernet over Synchronous Optical Network (SONET). The remaining five (5) active wavelengths are used to provide OC-192 / 10-gigabit transmission paths for the DREN (.mil), Biz Net, DOT com (.com) and Residential Internet. Planned improvements to the OTN include increasing the deployment of state-of-the-art Time Division Multiplexing capabilities to all six (6) OTN node locations, and adding bulk encryption to unclassified data at the optical level. Other improvements and additions include multiple range asset modernization projects and the transition of legacy communications from the IACS directly on to the OTN.

XIV. BASE SUPPORT COMMUNICATIONS

Mobile Radio Communications: Several line of sight VHF networks, having fixed station, vehicle mounted, hand-held radios and paging services are used at USAG-KA/RTS. They service emergency response functions, marine operations, facility services and maintenance crews.

Aircraft Communications: The Airport Base Operations Facility 902 is equipped with VHF and UHF radios. All USAG-KA/RTS fixed and rotary wing aircraft are equipped with compatible radio systems. Aids to aircraft navigation at USAG-KA/RTS are a non-directional radio beacon at Kwajalein and onboard GPS. Berry Aviation maintains the aircraft mounted equipment and RGNEXT maintains the ground station assets.

Marine Communications: The Kwajalein Marine Tower is equipped with VHF marine radio telephones and HF radios. The tower is manned 24 hours a day. All USAG-KA/RTS watercraft

are equipped with VHF radiotelephone. Ocean-going vessels are equipped with HF and INMARSAT radios for long distance communications.

Information Services: The American Forces Network Kwajalein (AFN-Kwajalein) officially broadcasts 12 television channels and 3 FM radio channels. Programming for television and radio are compiled from two receive-only satellite dishes located on Kwajalein. The ATSC weather station provides additional television video for Channel 14-2 (the Weather Channel). The AFN broadcasts are 24/7. Although in operation 7 days a week, staffing is only present during a normal 40-hour workweek.

XV. TRANSPORTATION

Air Service - Long Distance: Commercial jet service is available from Kwajalein, east and west, connecting with other international routes. United Airlines (UAL) operates Boeing 737-800 aircraft through Kwajalein consisting of three eastbound flights and three westbound flights weekly. The east and westbound “Island Hopper” flights originate in either Guam or Honolulu with stops in Majuro, Kwajalein, Kosrae, Pohnpei and Truk (Chuuk) or the reverse. At times, during peak travel seasons, UAL may add direct leg flights from Guam to Kwajalein to Honolulu and the reverse based on flight booking (check local schedules). The Air Force, Air Mobility Command (AMC) operates a C-17 transport once a month and a 757-200 contract flight twice a week between Hickam AFB, Hawaii and Kwajalein. This service provides airlift of authorized and ticketed passengers and critical cargo. Airline of the Marshall Islands (AMI) also operates through Kwajalein to other islands within the Marshall Island Group, utilizing turboprop aircraft. Currently they operate one Dornier 228 and one DeHavilland Dash-8 aircraft on an irregular schedule based on customer requirements and aircraft availability.

Air Service - Local: Two contractor-furnished Metroliner airplanes and four Army furnished LUH-72A Helicopters, provide space required flight services to Roi-Namur and the instrumented landing sites within the Kwajalein range complex. Berry Aviation, Inc. operates these aircraft. There is limited space-available transport to/from Kwajalein and Roi-Namur for recreation travel on the Metroliner, based on military direction and contract requirements. There is no space available transport permitted on Government furnished helicopters.

Water Transportation: Ocean cargo service is provided to USAG-KA/RTS by container ship leased by the Matson Navigational Company arriving at Kwajalein approximately every 21 days from Honolulu. MSC chartered tankers, making an average of one call every eight weeks, bring liquid fuel. Local water and transportation of cargo and personnel (Kwajalein Atoll and vicinity) is provided by approximately 13 Government-owned vessels operated various contractors. The

USAG-KA fleet includes one missile range safety, one sensor ship (*KMRSS Worthy*), one harbor tug (*M/V Mystic*), one LCU 2000 class vessel (*USAV Great Bridge*), two High Speed Catamaran Ferries (*PVT SORENSON and PVT ANDERSON*), two cargo LCMs (*8609 and 8605*), one barge (*fuel barge 1906C*), four Subchapter T ferry boats for passenger service to Ebeye and Ennubirr, and an additional smaller harbor work boat. The *M/V Patriot* is the dedicated dive vessel for the Marine department underwater operations. The *USAV Great Bridge* left June 2018 and returned to Kwajalein April 2019 after a major overhaul.

Vehicles: The U.S. Government, RMI or other on-site subcontractors own all motorized and electric powered vehicles on Kwajalein. Privately owned vehicles are not allowed on USAG-KA/RTS. Bicycles are the main mode of transportation by persons of all ages. The Shuttle Bus provides transportation services around Kwajalein and Roi-Namur during normal work hours, 6 days a week. The bus transports employees to various work sites along its route from the downtown area, dock security checkpoint, airport and industrial areas; from one end of the island to the other. The shuttle bus also supports the school by making two morning trips from the Harbor Dock to the school as well as two trips in the afternoon from the school to the Harbor Dock.