



## Western Washington Repeater Association 1976-2007 HISTORY

### WWRA Pre-Founding History

**1970** Amateur VHF and UHF radio repeaters were practically non-existent in the 1970s. Commercial and municipal repeaters existed but few ham systems. During this decade there was not the proliferation of fine quality VHF and UHF amateur radios on the market that we have today. All radios were ex-commercial vacuum tube rigs retired to amateur use.

- There was one Seattle repeater operating on 146.58 MHz with two input frequencies of 146.340/146.760 MHz.
- The current frequency used by the local 146.880 MHz repeater was one of the input frequencies linked to the systems Seattle repeater's Skyway site.

**1971** FCC issued the rules that allowed the establishment of amateur repeater system.

- The processing time for these new repeater licenses was long, sometimes 6 to 8 months.
- FCC issued special licenses unique WR call signs for repeater stations.

**1975** The Seattle repeater did not provide reliable coverage to the Kitsap Peninsula so local hams began discussing the building of a 2-meter repeater for the Bremerton area

- Members of the Amateur Radio Association of Bremerton (ARAB) began to work on it.
- On 31 May 75, frequency of 146.61 MHz the Western Washington Repeater Association repeater was on the air from East Gold Mountain with the call of **WR7ACH**.
- In November of that year WWRA members had to climb the tower in a blizzard to tie off the broken mast to our antenna.
- WWRA repeater had 11 failures in 1975.

### Founding of the WWRA

**1976** Administratively it was decided to set up a separate organization from the ARAB group to run the repeater. It would be called the **Western Washington Repeater Association** or **WWRA**.

- The Constitution and Bylaws of the Western Washington Repeater Association (WWRA) were drawn up.
  - Non-profit corporation documents were filed with the State of Washington on 15 Sep 76.
  - The first WWRA general organizational meeting was held on 20 Oct 76.
- Also along about this same time the Western Washington Amateur Relay Association (WWARA) was established to coordinate frequency allocations.
- From January through June we replaced masts and antennae on more than one occasion.
- On 20 Mar 76 the WWRA repeater was reported to be causing interference with the Puget Sound Naval Shipyard (PSNS) transportation frequency of 140.820 MHz. This was later to be found not the case.
- The repeater was on and off the mountain for repairs for through 1975 and 1976 with a multitude of problems. It was not on the mountain when lightning struck and ruined other repeaters and had wiped out a 20-foot fiberglass antenna right next to ours.
- During these years there was an ever-increasing number of Technician Class who was allowed to operate on 145-147 MHz.
- WWRA repeater had 19 failures in 1976.

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146.620MHz and 442.650MHz P1 103.5Hz



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**1977** Throughout 1977 WWRA members continued to work on the repeater.

- On 21 Aug 77 the Sinclair Duplexer was installed. This duplexer eliminated all the desense problems that had been occurring earlier.
- On 27 Sep 77 the FCC made known their requirement for the specific licensing of repeaters and allowed them to operate as auxiliary stations to licensed amateur operators.
- WWRA repeater had 10 failures in 1977.

**1978** Throughout 1978 WWRA members continued to groom the repeater.

- The 20 KHz Band Separation plan was established and officially adopted in 1978.
- In June we blew out a 100-watt power amplifier.
- Also in June we installed a Sinclair antenna and band pass cavities.

**1981** This was the year that the WWRA repeater was moved to our current Gold Mountain site.

- On 5 Jul 81 we signed off and removed the WWRA repeater, call sign **WA7FEA/R** from the DNR site.
  - Our original agreement with DNR on East Gold Mountain was tenuous at best and as problems arose with DNR involving prohibitive costs the WWRA found another site.
  - We had been at the Department of Natural Resources (DNR) site but would soon move to Gold Mountain.
  - WWRA was allowed to install the antenna on the main tower and put our gear in the generator room.
  - On 5 Jul 81 WWRA with authorization installed 110VAC power in generator room.
- The WWRA procured 350 feet of 7/8" air dielectric transmission line from Hardware Specialties in Seattle.
  - We ordered the special coaxial connectors for \$56 each.
  - These connectors are no longer available and have plagued us over the years.
  - The new transmission line was 230 feet up the tower to the base of the antenna.
  - VSWR was high so after getting the coax in place we had to climb the tower and fix the solid core N-connector.
    - After they remade the connection and the VSWR test passed.
    - This center connector has been a reoccurring problem with this coax over the years.
  - The transmission line was encased in ABS pipe to prevent ice damage in places where it was vulnerable.
- On 18 Jul 81 we moved to Gold Mountain.
- On 22 Aug 81 the telephone auto-patch on the repeater was up and running.

**1982** The WWRA is assigned a new VHF frequency.

- The WWRA moved from 146.610 MHz to 146.020/.620 MHz on 31 Aug 82.
  - At that time both of these frequencies required no sub audible tones and this is referred to as a clear channel.
  - A clear channel makes it easier for transiting amateurs to access our repeater.

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**1984** The WWRA finds out that the air filled coax needs a maintenance routine.

- On 7 Jan 84 we had a very high SWR on the transmission line.
  - It turned out the transmission line was full of water, from internal condensation, which had frozen and split the line at the loop, which curves away from the tower toward the building.
  - A hole was drilled in the loop to allow the moisture to drain.
    - This hole was later plugged and the transmission line pressurized with dry nitrogen. This temporarily solved the problem but leaks have been a continual problem.
- In Sep 84 the WWRA purchased a Micro Controls Mk 4 repeater.
  - This unit had a microprocessor controller including speed dial auto patch and synthesized speech.
- WWRA also procured a Falcon 100W T-MOS amplifier.

**1990-1991** In the summers of 1990 and 1991 the WWRA 2-meter repeater was getting prolonged interference from a source, which was unknown but obviously military in nature, due to the voice transmissions.

- It was coming in solid on a frequency of 146.013.
  - It was learned that it was coming from Ft Lewis near Tacoma.
  - Apparently the army had their radios programmed in the ham band for their visiting ROTC units.
  - We contacted the Army twice, once in 1990 and again in 1991 before the problem was finally resolved.

**1992** The WWRA made some advances this year.

- The UHF repeater went on the air on frequency 442.650 MHz with a PL Tone of 103.5 Hz.
- On 20 Apr 92 a second Mk 4 2-meter repeater was installed as a backup repeater.

**1993:** The WWRA made some advances this year.

- On 12 Dec 93, a 100W Micro-Controls power amplifier was installed.
- On 20 Oct 93 we installed a 700 VA UPS.

**1994** The WWRA was not allowed to continue its clear channel frequency allocation.

- In the spring of 1994, we inadvertently learned that the WWARA coordination for the 146.62 MHz repeater had been cancelled due to a WWRA administrative oversight. We attempted to get our clear channel coordination status reestablished. The WWARA would not do it, but rather classified our request as a new coordination and placed a sub-audible tone requirement on us of 103.5Hz.

**1995** The WWRA accomplishes a major administrative reform.

- On 31 Mar 95 the Constitution and By-laws were amended. It provided for 5 officers on the Board and an audit committee elected from the general membership.
- On 13 Jul 95 the call sign **KC7MEG** was assigned to the Western Washington Repeater Association.
- On 25 Jul 95 we also upgraded the UHF system with auto patch capability by converting the spare two-meter repeater, installing a continuous duty amplifier, install of an isolator and two cross-band couplers, which permit the sharing of the transmission line.
- On 5 Aug 95 the WWRA installed a Sinclair 4-bay antenna was installed on the tower.

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**1998** The WWRA received its very own personalized call sign, **WW7RA**.

**1999** The WWRA installed Microphone Encoder (Mic E) transmitter for Automatic Position Reporting System (APRS). This unit provided RELAY for APRS users on 144.390 MHz. This new Digipeater shared the UHF control links dual-band whip antenna on the roof of the generator room, which provided wide area coverage for APRS mobile units in the Puget Sound area. An Alinco DR-135 and Kantronics KPC-9612 TNC were mated to construct this station. A CDI Band-pass cavity was installed on this system.

**2000** The WWRA installed a Weather Station, which was integrated into the APRS.

- The Ultimeter 2000 is a fully operational weather station using a second port on the installed KPC-9612 TNC.
- This new weather station provided barometric, wind speed and direction, inside/outside temperature and rain amounts via APRS.

**2001** The WWRA experiences more problems with the terminal tower N-connector at the high antenna point.

- In January we got a high SWR on the main antenna.
  - We changed nitrogen bottles and purged the system. This nitrogen bottle system and the constant requirement to keep changing them contributed to the overall degradation of the antenna coax and ultimately the performance of both repeaters.
  - It was noted that a trip every 3 months to change bottles was necessary.
  - On 17 Mar 01 WWRA installed an Andrews 40525A Dehydrator Pump in the line and this put a final end to this air coax leaking problem. The pump cycles about once an hour providing 1# over atmosphere pressure continuously.
- On 12 May 01 installed the new Link-Comm RLC-2 controller to the UHF repeater. It stayed on this repeater until Ops staff learned its highly sophisticated programming routines before connecting to the VHF repeater.
- On 12 May 01 concurrent with the controller installation a Digital Voice Recorder (DVR) was installed. This unit will also be connected to the VHF system once the Ops committee becomes familiar with its programming capabilities.
- A new work history dubbed TASK TRACKING was initiated to help Ops Committee keep track of its work effort.
- In October the N-connector fitting at the top of the air filled coax gave out and we had to shift to the lower UHF control link antenna.
- In November it was fixed but gave out three days later.
  - We operated on the lower whip antenna for several months.
- In April the WWRA installed a new Link-Comm RLC-2 Controller on the UHF repeater. This controller would eventually operate both repeater systems.
- WWRA had 1 failure in 2001.

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## Western Washington Repeater Association 1976-2007 HISTORY

**2002** A new VHF repeater was installed and connected to the Link-Comm RLC 2 Controller.

- Installed KPC-3 Plus TNC for Microphone Encoder operations on VHF repeater.
- In October the WWRA got permission and installed a second coax to be used for the UHF repeater leaving the air filled coax for VHF repeaters exclusive use.
  - Now the WWRA had the option of using either coax for both repeaters if in the future one of the coaxes became a problem.
  - The terminal connectors on the VHF coax cannot be replaced due to parts unavailability so it is anticipated that at some future time both repeaters will end up on the foam filled coax that the UHF repeater currently resides on.
  - The WW7RA had a manufacturer's problem with UHF wiring in 2002 but 0 repeater failures.

**2003** In March the RLC 2 controller suffered lightning problems and a more robust Polyphaser commercial lightning arrestor was installed on the terminal end of both UHF and VHF coaxes.

- Microphone encoder capability installed on both UHF and VHF repeater.
- In June weather voice reporting was activated on the VHF repeater.
- A final inventory of all WWRA was completed and posted on the website.
  - This was accomplished over time only after getting previous members and officers to turn in WWRA property.
  - Provisions were made to keep all WWRA property including important papers and test gear in containers at the site.
  - Sign out Custody Receipts for WWRA property was implemented.
- In August ECHOLINK was installed, tested and activated on the UHF repeater.
  - Node number assigned to WW7RA on Echolink is **121776**.
- In December the RLC 2 once again suffered some problems when electrical storms passed through the area and affected the telephone lines. This shutdown the whole system and the alternate VHF repeater was brought online.
- A repair was quickly made and UHF was returned to operations.

This was the 1 failure for 2003.

**2004** In January a new Link Comm RLC Club Deluxe II with a more expanded capability, which included six functioning repeater ports, was procured to replace the RLC 2. The RLC 2 controller was repaired by the operations committee, the software re-programmed by the operations committee, is now working 100% and is kept in standby as the backup repeater system controller. This in addition to the VHF Alternate VHF repeater, which has it's own controller.

- This Club Deluxe II controller is designed specifically for repeater groups such as the WWRA.
- The Club Deluxe II will afford greater flexibility for future advancements in repeater operations such as the recently installed Echolink.
- Polyphaser lightning arrestor system installed on telephone lines.
- RLC Club Deluxe II put into operation on March 5<sup>th</sup>.
  - The Alternate VHF repeater provided service from December through March for all the users while the new RLC Club Deluxe II controller programming was learned, installed and tested by the operations committee.

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- An important earth ground cabling system was installed on the new controller.
- Final in VHF transmitter went out and was repaired.

There was 1 failure in 2004.

**2005** In May the PA-100 amplifier went out on the VHF repeater. After some research it was discovered that the cable harness circuitry that connects the amplifier to the controller were coiled up inside the amplifier. The current ops team did not know how long the amplifier had been operating in this fashion. The end result was that the amplifier was always on instead of activating when the repeater activated. This setup would definitely short the life span of the amplifier. The repair was made and the amplifier was re-installed correctly.

There was 1 failure in 2005.

### 2006

- February: The DVR-8 failed and it was returned to the manufacturer for repair. After several weeks of waiting the manufacturer were contacted several times and they finally in June sent the WWRA a new one that worked fine.
- May: The PA-100 Unit B amplifier failed on the VHF repeater.
- June: The operations committee procured the necessary spare parts and overhauled units A the old amplifier and B the new one. Some tips from the manufacturer were incorporated in repairs during the overhaul.
- August: PA-100 A unit's coil blew a fuse and simultaneously the UPS battery failed bringing down the whole system. Two hill trips were necessary to first restore power and then install B unit amplifier in service. Repeater system was down during night hours and early morning for about 7.5 hours but returned to normal operations by 9am.

There were 2 major failures with several pieces of equipment needing repairs or overhauls in 2006

### 2007

- This was the year of the Uninterrupted Power Supply (UPS). As noted in the 2006 comments we suffered a failure with the old UPS that was purchased in 1988. It had been a workhorse for years but became unstable in maintaining power to the system. What we did not realize was that the UPS we had did not get along well with generators. Whenever our host would test run, run the generator for maintenance checks, check generator loads or experience an actual loss of power the UPS would handle the WWRA system for a long time but it was a 50/50 chance that the power signal coming from the generator would cause the switching electronics in the UPS to fail and it would randomly cause it to stay on battery backup power. This caused a failure with the repeater system when the battery became low. The repeater system would float along until it needed to provide power to either UHF or VHF transmitters. Once both repeaters failed simultaneously. We are only aware of a few shut downs as when the system went down it apparently would recover without further incident, however not always. A new UPS was installed in December.
- An Electrical Distribution Panel was installed on the outside of the transmitter cabinet. The electrical wiring on the inside of the cabinet had been disturbed during movement of the cabinets within the generator room so this panel will organize the 12VDC power distribution.
- Testing of a Fingerprinting capability in November was started and has proved to be an effective tool in managing the repeater system.

There were several shutdowns of the system in 2007 and we owe it all the old UPS!

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