Technical Team Frequency Plan Development Process

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Staff 50

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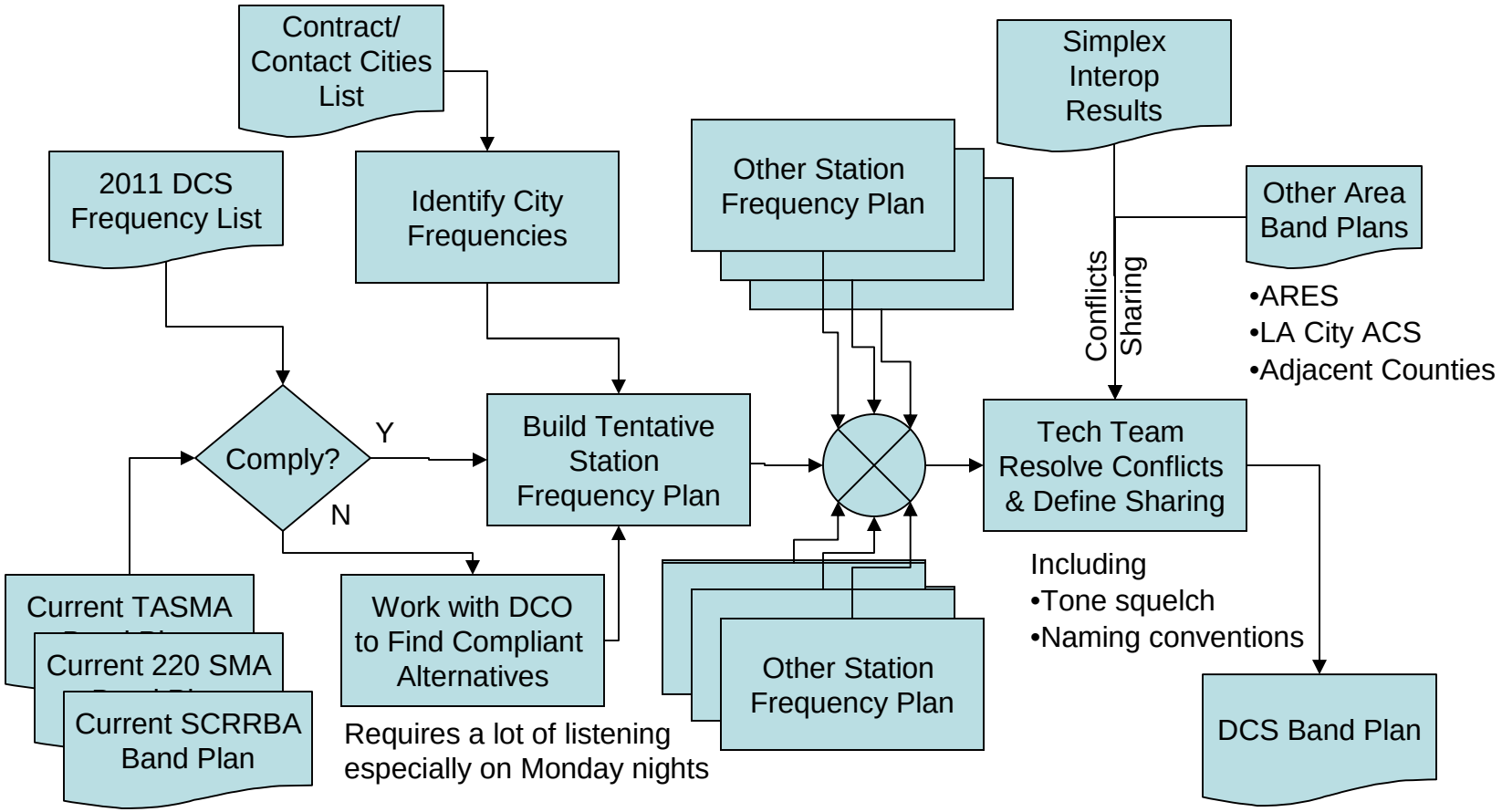
Frequency Plan Development Process



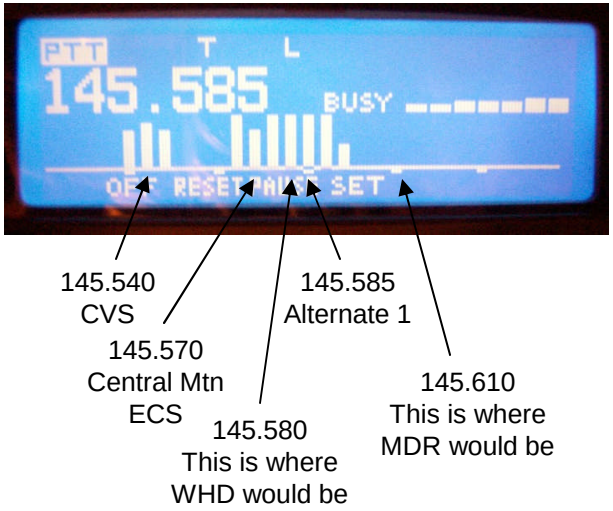
- Each Tech Team Member builds tentative frequency plan for each assigned station
- Start with 2m and then apply to the other bands
- Tech Team as a whole assembles the County-wide plan and resolves conflicts
- Each band to eventually have the standard code plug to be deployed

Some Background

- In practice, strong FM signals whose carriers are closer than 20 kHz present a problem
- Why? The approximate occupied bandwidth of an FM signal from Carson's rule is at least 16kHz
  - *CBR* = 2(Δ*f* + *fm*)
    - where Δ*f* is the peak frequency deviation, and *fm* is the highest audio frequency modulated
  - ± 5 kHz peak deviation, and a maximum audio frequency of 3 kHz, requires an approximate bandwidth 2(5+3) = 16 kHz
    - Any modulated signal has an *infinite* number of sidebands, but 98% of the power is within the bandwidth defined by Carson's rule
    - Setting the arbitrary definition of occupied bandwidth at 98% still means that the 2% of the power outside the band is ***only about 17 dB*** *less* than the energy inside $10\log\left(\frac{0.02}{0.98}\right)$
- Also Carson's rule does not apply well to digital signals

LMT Alternate 1 Spectrum
~1940 Monday, 24 October 2011

- Here are some spectrum shots when operating
- Granularity of display is 5 kHz steps
- Neither MDR or WHD seemed to be operating that night
- San Bernardino ECS has a net from the Running Springs area on 145.570. They can be heard very well.
- Strong signals 15 kHz apart would work only with decent geographic separation
- Smaller spacing between TASMA channels is really asking for trouble



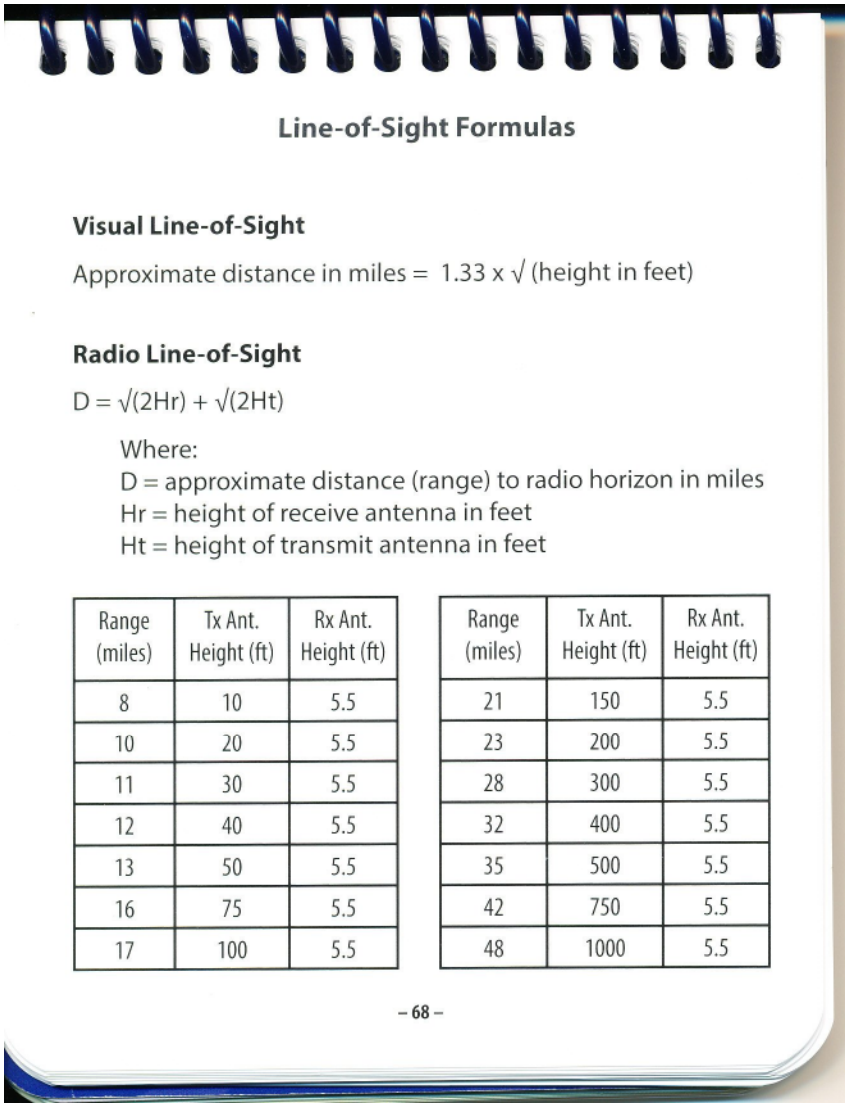
Some TASMA Coordinated Simplex Freqs

145.510
145.525
145.540
145.555
145.570
145.585
145.600
145.615

Data taken at N5DQ home station in Southwest Torrance
Expect stronger signals using the tower antennas at LMT

Sharing Frequencies

- Frequency and geographic separation are required for success
- Consider radio line of sight when sharing frequencies
- The formula is great but better to use empirical data collected by the simplex interoperability exercise
- We will also use tone squelch on simplex
- Our DCS plan will be self consistent, compliant with the coordination entity band plans and considerate of other groups who use the band



Line-of-Sight Formulas

Visual Line-of-Sight

Approximate distance in miles = 1.33 x √ (height in feet)

Radio Line-of-Sight

$D = \sqrt{(2Hr)} + \sqrt{(2Ht)}$

Where:
D = approximate distance (range) to radio horizon in miles
Hr = height of receive antenna in feet
Ht = height of transmit antenna in feet

Range (miles)	Tx Ant. Height (ft)	Rx Ant. Height (ft)
8	10	5.5
10	20	5.5
11	30	5.5
12	40	5.5
13	50	5.5
16	75	5.5
17	100	5.5

Range (miles)	Tx Ant. Height (ft)	Rx Ant. Height (ft)
21	150	5.5
23	200	5.5
28	300	5.5
32	400	5.5
35	500	5.5
42	750	5.5
48	1000	5.5

– 68 –

DISASTER COMMUNICATIONS SERVICE
DISTRICT SIMPLEX COMMUNICATIONS INTEROPERABILITY MATRIX

DISTRICT	2	3	4	5	6	8	9	11	12	13	14	15	16	17	18	21	22	26	27	29	95
2 EAST LOS ANGELES																					
3 SOUTH LOS ANGELES																					
4 NORWALK																					
5 TEMPLE																					
6 SANTA CLARITA																					
8 SAN DIMAS																					
9 WEST HOLLYWOOD																					
11 LANCASTER																					
12 CRESCENTA VALLEY																					
13 LAKEWOOD																					
14 INDUSTRY																					
15 PICO RIVERA																					
16 CARSON																					
17 LOMITA																					
18 AVALON																					
21 CENTURY																					
22 LOST HILLS / MALIBU																					
26 PALMDALE																					
27 MARINA DEL REY																					
29 WALNUT																					
95 AERO BUREAU																					

Date	

Signal Strength Key

Weak Unreadable	**Q1**
Weak Barely Readable	**Q2**
Weak Readable; Some Noise	**Q3**
Good Readable; Little Noise	**Q4**
Loud Clear, Full Quieting	**Q5**
Nothing Heard	**Blank**