Soon, the Rev John Stutt, superintendent of North Belfast Mission, surveyed a site on the Whitewell Road, which was subsequently purchased for the construction of a church building. He is attributed as being the founder of Greencastle Church, in 1939.

The Boys' Brigade formed the 95th Belfast Company in 1940, followed by the Life Boys, and numbers increased steadily. A Girls' Life Brigade Company was also started, amalgamating with the Girls' Friendly Society later to form Girls' Brigade in 1966.

In 1940 the Rev George Good was appointed to Greencastle, and the church was flourishing until Easter 1941 when bombs devastated the area. The church building was badly damaged and the congregation had to worship in the 'Upper Room' until 1943.

After the war there followed great development of new housing, and the Greencastle congregation continued to grow. From the earliest days a choir was formed, starting a tradition of choral music and a spirit of enthusiasm and loyalty among choir members which still exists. A Bowling Fellowship was also initiated, and, when not throwing bowls, the members busied themselves using practical skills around the premises.

By the end of the 1940s the congregation numbered 300 families, and the organisations were thriving. Throughout the 1950s and 1960s there emerged from the ranks of this modest little church missionaries and clergy, one reaching the distinction of President of the Methodist Church. At this time, the buildings – a multipurpose hall/church, an Upper Room, and a Nissen hut – had become inadequate. During the ministry of the Rev Billy Buchanan, a new suite of premises was built and opened by NI Prime Minister Terence O'Neill in 1966.

The 1970s proved to be a difficult time for Greencastle with the 'Troubles' and huge demographic change. The congregation is now small and mature, but faithful, and Greencastle maintains a warm fellowship which draws back many former members, and embraces and encourages all who enter its doors.