

## Kicks and Ballooning

Twice prior to April 20, the Macondo well experienced an unwanted influx into the wellbore, or a “kick.” On October 26, 2009, the well kicked at 8,970 feet. The rig crew detected the kick and shut in the well. They were able to resolve the situation by raising the mud weight and circulating the kick out of the wellbore.<sup>31</sup> On March 8, 2010, the well kicked again, at 13,305 feet.<sup>32</sup> The crew once again detected the kick and shut in the well.<sup>33</sup> But this time, the pipe was stuck in the wellbore.<sup>34</sup> BP severed the pipe and sidetracked the well.<sup>35</sup>

On March 25 the Macondo well also had a ballooning, or “loss/gain,” event. The rig lost fluids into the formation. When the crew decreased the pressure of the mud in the wellbore, the rig then received an influx of fluids from the formation.

## Lost Circulation During Drilling

A major risk at Macondo was the loss of drilling fluid into the formation, called **lost circulation** or **lost returns**.<sup>36</sup>

At various points in February, March, and April, the pressure of drilling fluid exceeded the strength of the formation, and drilling fluid began flowing into the rock instead of returning to the rig.<sup>37</sup> Lost circulation events are common in offshore drilling. The *Horizon* rig crew generally responded with a standard industry tactic: It pumped thick, viscous fluid known as **lost circulation material** into the well and thereby plugged the fractures in the formation.

The *Horizon* crew successfully addressed repeated lost circulation events while drilling the Macondo well.<sup>38</sup> The events occurred frequently and at various depths, and sometimes lasted several days: once in mid-February, four times in March, and three times in April.<sup>39</sup> In total, BP lost approximately 16,000 barrels of mud while drilling the well, which cost the company more than \$13 million in rig time and materials.<sup>40</sup>

## Uncertain Pore Pressures Affect the Well Design

The kicks, ballooning, and lost circulation events at Macondo occurred in part because Macondo was a “well with limited offset well information and preplanning pressure data [were] different than the expected case.”<sup>41</sup> Given BP’s initial uncertainty about the pore pressures

Figure 4.2.8. Timeline of drilling events.

