

# Engineering And Robotics Learned Young

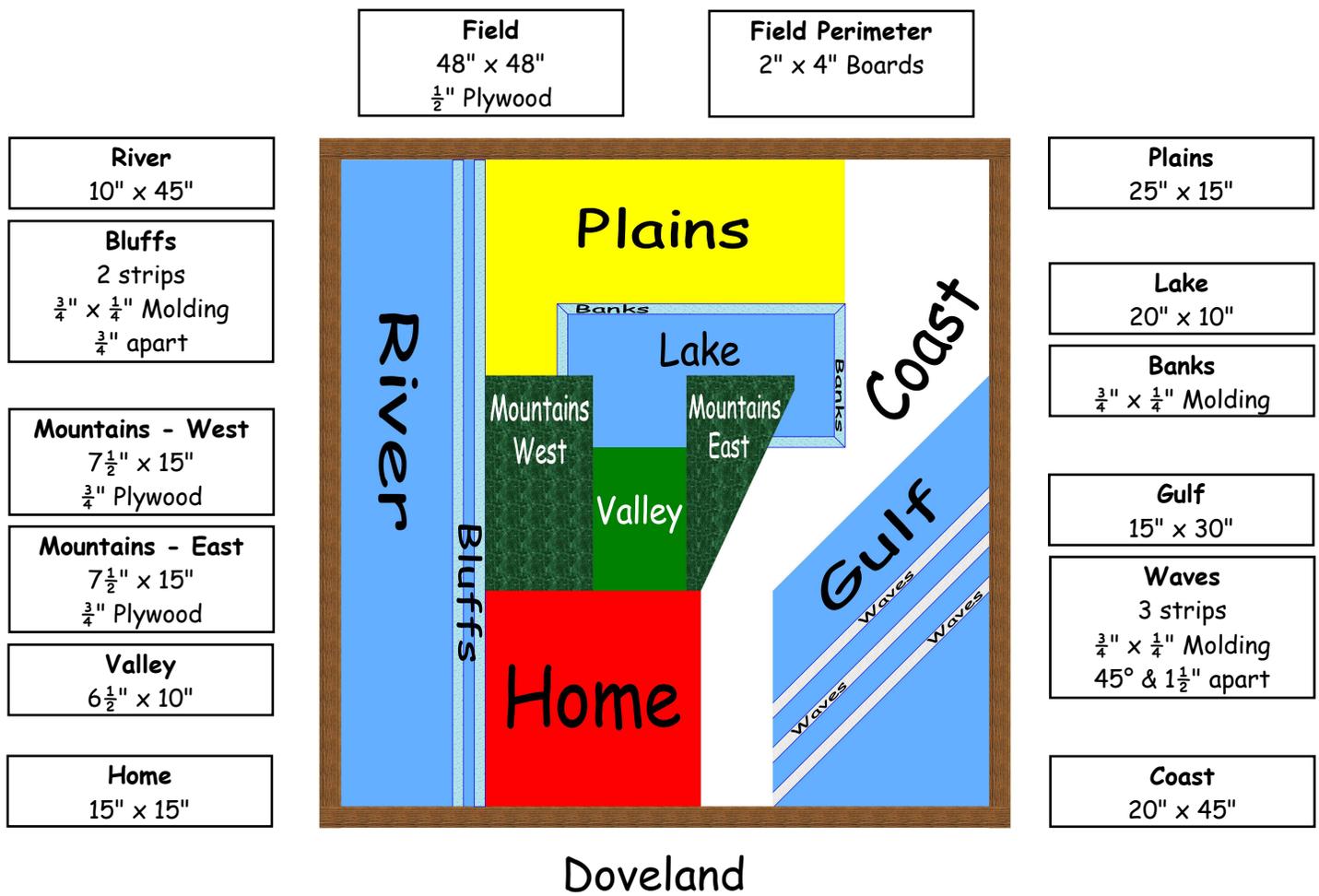
◆ EARLY ◆

## Spring 2014 Robotics Competition

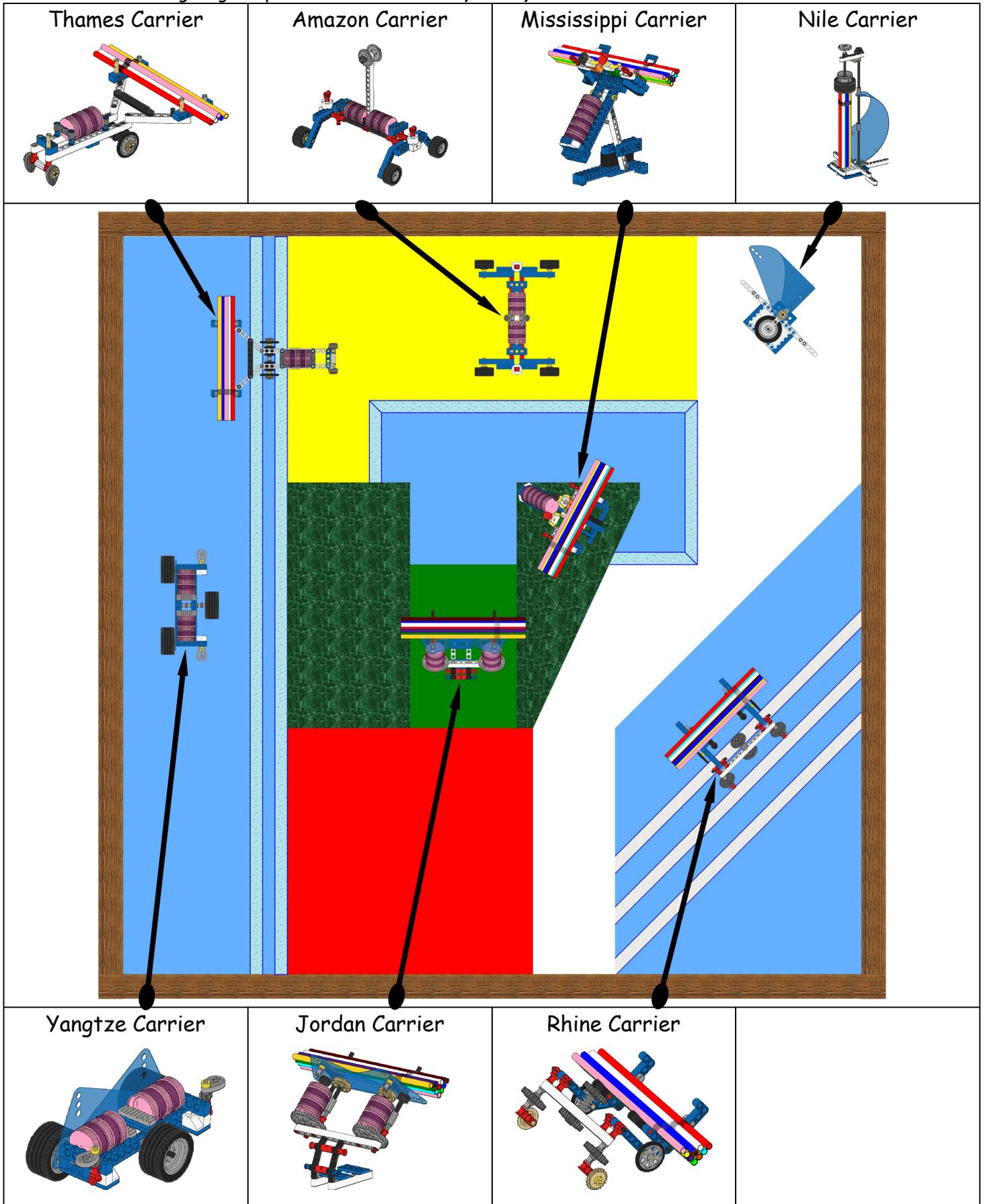
Roboticists, thank you for helping Doveland construct their water purification system! Doveland's water purification system, which will provide clean drinking water to every citizen, is almost complete. Doveland now needs you to build a robot to deploy Pumps & Pipes to different areas of Doveland. Please help the citizens of Doveland!

Below is everything that we know about the mission.

- The team must be ready to execute the mission for your EARLY Tournament.
- The equipment available for a team to build a robot is 3 LEGO® Simple & Motorized Mechanisms Kits.
- The following diagram presents the environment that will be encountered. Construction details are found in the *Mission Field Details* document.



- The following diagram presents where the *Pumps & Pipes* and *Carriers* will be in Doveland.



# Mission Rules

1. The team has 2 minutes to complete the mission.
2. There are 45 *Pumps* on the playing field at the beginning of each mission, represented by water bottle caps and there are 45 *Pipes* on the playing field at the beginning of each mission, represented by straws. Cap and straw details are found in the *Mission Object Details* document.
3. There are 7 *Pump & Pipe Carriers* on the playing field at the beginning of the mission constructed from one LEGO® Simple & Motorized Mechanisms kit. Carrier details are in each *Carrier Instruction* document.
4. The team's score is determined at the end of the 2-minute mission.
5. If a *Pump* or *Pipe* is moving when time expires, the *Pump* or *Pipe's* scoring position is determined when the *Pump* or *Pipe* has come to rest.
6. There are six scoring zones: the **MOUNTAINS**, **PLAINS**, **COAST**, **RIVER**, **LAKE**, and **GULF**. The **MOUNTAINS**, **PLAINS**, and **COAST** are "*land*" scoring zones and the **RIVER**, **LAKE**, and **GULF** are "*water*" scoring zones. The **BLUFFS** are part of the **RIVER**, the **BANKS** are part of the **LAKE**, and the **WAVES** are part of the **GULF**.
7. The goal of the mission is to *deploy Pumps* amongst the *water* zones and *deploy Pipes* amongst the *land* zones. Please note that this is opposite of the EARLY 2013 Fall Mission where the mission was to *deploy Pumps* amongst the *land* zones and *deploy Pipes* amongst the *water* zones.
8. A *Pump* or *Pipe* is *deployed* when the *Pump* or *Pipe* is directly supported by the field or other *Pumps* or *Pipes* that are *deployed*. A *Pump* or *Pipe* is *NOT deployed* if it is on a *Carrier* or on a robot.
9. The team scores 1 point for each *Pump* that is *deployed* in a *water* scoring zone.
10. The team scores 1 point for each *Pipe* that is *deployed* in a *land* scoring zone.
11. There is one penalty zone: the **VALLEY**.
12. The team is penalized 2 points for each *Pump* or *Pipe* that is *deployed* in the **VALLEY**.
13. A perfect score is achieved by having all 45 *Pumps* in *water* zones and all 45 *Pipes* in *land* zones resulting in a score of  $(45 \times 1) + (45 \times 1) = 90$  points.
14. A *Pump* or *Pipe* *deployed* and breaking the plane of a scoring zone is considered *deployed* in the scoring zone.
15. A *Pipe* or *Pump* *deployed* in multiple zones simultaneously (scoring zone & scoring zone, scoring zone & non-scoring zone, scoring zone & penalty zone, penalty zone & non-scoring zone, etc.) is considered *deployed* in the zone that results in the greatest points. Unlike the EARLY 2013 Fall Mission, a *Pump* or *Pipe* *deployed* and breaking the plane of two scoring zones simultaneously is considered *deployed* in only one of the scoring zones.
16. Only the parts that are contained in three LEGO® Simple & Motorized Mechanisms kits along with nine 20" controller extension wires may be used to construct the robot and attachments (i.e. no other materials such as glue may be used on the robot). The kit parts may not be altered.
17. **HOME** is the 15" x 15" boundary extended vertically.

18. The robot and all attachments must begin completely inside **HOME** at the beginning of the 2-minute mission (i.e. no LEGO parts may be off the playing field when the mission begins). The parts do not have to be assembled together and the parts may be removed from and returned to the field during the 2-minute mission.
19. The team may retrieve their robot without penalty when the robot is partially inside **HOME** by lifting the robot vertically. After retrieving, the robot must be returned to **HOME**. If a *Pump*, *Pipe*, or *Carrier* remains with the robot when the robot is retrieved, the *Pump*, *Pipe*, or *Carrier* must be removed from play.
20. If a team touches their robot, including parts that have become separated from the robot, that is completely outside **HOME**, the team is penalized 10 points. After touching, the robot must be returned to **HOME** to continue the mission. If a *Pump*, *Pipe*, or *Carrier* remains with the robot when the robot is returned **HOME**, the *Pump*, *Pipe*, or *Carrier* must be removed from play.
21. The robot must start completely inside **HOME** every time the robot is returned **HOME** (i.e. after retrieving the robot, no part of the robot may be breaking the **HOME** plane when continuing the mission).
22. The controllers and wires are NOT considered part of the robot.
23. The controller wires may only be used to provide electrical power to robot motors (i.e. the controller wires may not be used to drag or corral a robot, *Pump*, *Pipe*, or *Carrier*). If a controller wire is used illegally (referee's judgment), the robot must immediately be returned **HOME** to continue the mission.
24. The robot shall not have any elastic stored energy when the mission begins or when the mission continues after the robot is returned **HOME**, but elastic stored energy may be created with a motor during the mission (i.e. the robot may not be "wound up" manually).
25. If a team touches a *Pump*, *Pipe*, or *Carrier* that is partially or completely inside **HOME**, the *Pump*, *Pipe*, or *Carrier* must be removed from play. If a *Carrier* is touched, the *Carrier*, along with any *Pumps* and *Pipes* on the *Carrier*, must be removed from play. This is the *EARLY Game Changing Rule* intended to make the Spring Mission more challenging than the Fall Mission.
26. If a team touches a *Pump*, *Pipe*, or *Carrier* that is completely outside **HOME**, the team is penalized 10 points and the *Pump*, *Pipe*, or *Carrier* must be removed from play. If a *Carrier* is touched, the *Carrier*, along with any *Pumps* and *Pipes* on the *Carrier*, must be removed from play.
27. A *Pump*, *Pipe*, or *Carrier* is never considered part of the robot.
28. Because *Pumps* and *Pipes* are very valuable, the team is penalized 10 points for each *Pump* or *Pipe* ejected from the field. A *Pump* or *Pipe* is ejected if no portion of the *Pump* or *Pipe* is breaking the plane of a field zone. No penalty shall be assessed for a *Pump* or *Pipe* that is removed by a referee.
29. A score of zero shall be awarded if penalties result in a negative score.
30. All referees' rulings are final.

Please contact [Mission.Control@EARLYrobotics.org](mailto:Mission.Control@EARLYrobotics.org) with any questions or comments.  
Thank you for maintaining the spirit of the game!