

# Security Assessment Final Report



# Liquidity Bootstrap Pool

February 2025

Prepared for Balancer Labs





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# Project Summary

### **Project Scope**

Project Name	Repository (link)	Latest Commit Hash	Platform
Balancer V3	balancer-v3-monorepo	<u>12f2c3d</u>	EVM

#### **Project Overview**

This document describes the verification of **Liquidity Bootstrap Pool** using manual code review. The work was undertaken from **10 February 2025** to **17 February 2025**.

The following contract list is included in our scope:

```
pkg/pool-weighted/contracts/lbp/LBPool.sol
pkg/pool-weighted/contracts/lbp/LBPoolFactory.sol
pkg/pool-weighted/contracts/lib/LBPoolLib.sol
pkg/pool-weighted/contracts/lib/GradualValueChange.sol
```

During the manual audit, the Certora team discovered issues in the Solidity contracts code, as listed on the following page.

#### **Protocol Overview**

The Liquidity Bootstrap Pool enables Balancer pools to bootstrap liquidity for token sales. The protocol offers the ability to create pools in a permissionless manner, enabling pool creators to configure the duration of the sale and weights to suit their needs. Liquidity for the project token is raised in a blue-chip reserve token to ensure reliable price discovery based on the start and end weights defined by the pool owner.



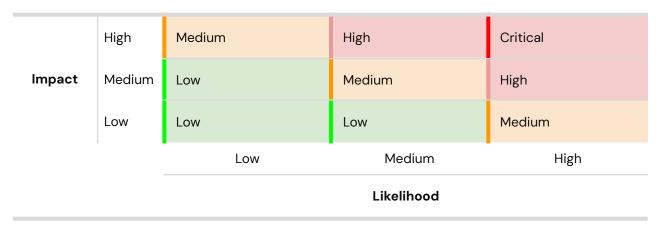


### **Findings Summary**

The table below summarizes the findings of the review, including type and severity details.

Severity	Discovered	Confirmed	Fixed
Critical	-	-	-
High	-	-	-
Medium	-	-	-
Low	-	-	-
Informational	4		
Total	4		

### **Severity Matrix**







# **Detailed Findings**

### **Informational Severity Issues**

#### I-01. Event GradualWeightUpdateScheduled emits incorrect startTime

**Description:** In the constructor of the LBPool contract, the start time of the bootstrap event is retrieved from the lbpParams parameter, which is utilized for the emission of the GradualWeightUpdateScheduled event.

```
Unset emit GradualWeightUpdateScheduled(lbpParams.startTime, lbpParams.endTime, startWeights, endWeights);
```

However, the actual start time of the event can be different from lbpParams.startTime since function resolveStartTime() updates the startTime to block.timestamp if the startTime is in the past.

```
Unset
function resolveStartTime(uint256 startTime, uint256 endTime) internal view returns (uint256
resolvedStartTime) {
    // If the start time is in the past, "fast forward" to start now
    // This avoids discontinuities in the value curve. Otherwise, if you set the
start/end times with
    // only 10% of the period in the future, the value would immediately jump 90%
    resolvedStartTime = Math.max(block.timestamp, startTime);

if (resolvedStartTime > endTime) {
    revert GradualUpdateTimeTravel(resolvedStartTime, endTime);
  }
}
```





This would lead to the event GradualWeightUpdateScheduled emitting incorrect data, potentially misleading off-chain consumers (such as frontends) and the LBPool owner as to what the actual start time for the bootstrap event is.

**Recommendation:** Use the state variable \_startTime in the event emission instead of lbpParams.startTime.

Customer's response: Fixed in <u>02de03d</u>

#### I-O2. Incorrect validation for startTime/endTime as per specification

**Description:** The natspec comment from LBPoolLib.sol mentions that the endTime should be strictly greater than the actualStartTime:

```
Unset
/**
  * @dev Normalize `startTime` to block.now (`actualStartTime`) if it's in the past, and
verify that
  * `endTime` > `actualStartTime` as well as token weights.
  */
```

However, function resolveStartTime() in GradualValueChange.sol does not implement this strict validation. This means it is possible for the endTime to be equal to the startTime.

```
Unset
function resolveStartTime(uint256 startTime, uint256 endTime) internal view returns (uint256
resolvedStartTime) {
    // If the start time is in the past, "fast forward" to start now
    // This avoids discontinuities in the value curve. Otherwise, if you set the start/end
times with
    // only 10% of the period in the future, the value would immediately jump 90%
    resolvedStartTime = Math.max(block.timestamp, startTime);

if (resolvedStartTime > endTime) {
    revert GradualUpdateTimeTravel(resolvedStartTime, endTime);
}
```





While this does not pose a risk in LBPool.sol, we should stick to the specification to avoid any issues in the future with the use of the libraries LBPoolLib.sol and GradualValueChange.sol.

Recommendation: Use resolvedStartTime >= endTime instead of resolvedStartTime > endTime.

Customer's response: Fixed in <u>02de03d</u>

#### I-03. \_projectTokenIndex and \_reserveTokenIndex are not exposed

**Description:** Some external viewer functions, such as getGradualWeightUpdateParams() and getLBPoolImmutableData(), use \_projectTokenIndex and \_reserveTokenIndex to represent the corresponding token indexes in the returned start and end weight arrays. However, these indexes are never exposed (both of them are defined as uint256 private immutable).

This makes the contract ABI a bit unfriendly to use/integrate with since integrators will need to calculate the indexes themselves.

**Recommendation:** Expose the \_projectTokenIndex and \_reserveTokenIndex via external viewer functions.

Customer's response: Fixed in <u>51c5291</u>.

### I-04. Optimize redundant boolean comparison in function onSwap()

**Description:** Function onSwap() in LBPool.sol ensures that swaps can only occur between the startTime and endTime of the bootstrap event. The if condition at the start of the function ensures this.

While there is no logical issue with the current condition, it can be optimized by simply negating the returned boolean value from the <code>\_isSwapEnabled()</code> function call. This would save gas on swaps since comparing to a constant (true or false) is a bit more expensive than directly checking the returned boolean value.

Unset

function onSwap(





```
PoolSwapParams memory request
) public view override(IBasePool, WeightedPool) onlyVault returns (uint256) {
    // Block if the sale has not started or has ended.
    if (_isSwapEnabled() == false) {
        revert SwapsDisabled();
    }
}
```

**Recommendation:** Optimize if (\_isSwapEnabled() == false) to if (!\_isSwapEnabled()).

Customer's response: Acknowledged. This is by design.





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