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Blockchain Security | Smart Contract Audits | KYC
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MADE IN GERMANY

StellaSwap Offchain Rewarder

AUDIT

SECURITY ASSESSMENT

25. September, 2023

FOR

StellaSwap

SolidProof_io   @solidproof_io

Introduction

SolidProof.io is a brand of the officially registered company MAKE Network GmbH, based in Germany. We're mainly focused on Blockchain Security such as Smart Contract Audits and KYC verification for project teams.
Solidproof.io assess potential security issues in the smart contracts implementations, review for potential inconsistencies between the code base and the whitepaper/documentation, and provide suggestions for improvement.

Disclaimer

SolidProof.io reports are not, nor should be considered, an "endorsement" or "disapproval" of any particular project or team. These reports are not, nor should be considered, an indication of the economics or value of any "product" or "asset" created by any team. SolidProof.io do not cover testing or auditing the integration with external contract or services (such as Unicrypt, Uniswap, PancakeSwap etc'...)

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SolidProof.io Reports represent an extensive auditing process intending to help our customers increase the quality of their code while reducing the high level of risk presented by cryptographic tokens and blockchain technology. Blockchain technology and cryptographic assets present a high level of ongoing risk. SolidProof's position is that each company and individual are responsible for their own due diligence and continuous security. SolidProof in no way claims any guarantee of the security or functionality of the technology we agree to analyze.

Project Overview

Summary

Project Name	Stella Swap
Website	https://stellaswap.com/
About the project	N/A
Chain	Moonbeam
Language	Solidity
Codebase Link	Provided as Files (From Private Repo)
Commit	N/A
Unit Tests	Provided

Social Medias

Telegram	https://t.me/stellaswap
Twitter	https://twitter.com/StellaSwap
Facebook	N/A
Instagram	N/A
Github	N/A
Reddit	https://www.reddit.com/r/stellaswap
Medium	https://stellaswap.medium.com/
Discord	https://discord.stellaswap.com/
Youtube	N/A
TikTok	N/A
LinkedIn	N/A

Audit Summary

Version	Delivery Date	Changelog
v1.0	21. September 2023	• Layout Project • Automated- /Manual-Security Testing • Summary
v1.1	25. September 2023	• Reaudit

Note - The following audit report presents a comprehensive security analysis of the smart contract utilised in the project. This analysis did not include functional testing (or unit testing) of the contract/s logic. We cannot guarantee 100% logical correctness of the contract as we did not functionally test it.

File Overview

The Team provided us with the files that should be tested in the security assessment. This audit covered the following files listed below with an SHA-1 Hash.

File Name	SHA-1 Hash
contracts/interfaces/IRewardRegistry.sol	ed10d8d53d6687ae25f784551b1cf6a5e415e088
contracts/interfaces/IRewarder.sol	f6c96b6f456752f076a4ea7660dbbfc19af21892
contracts/RewardRegistry.sol	fc8ab7b1592e57b12c650678673fe7995cf83e3c
contracts/Rewarder.sol	f56d53dec273cbc739beb165bc51afa282254477

Please note: Files with a different hash value than in this table have been modified after the security check, either intentionally or unintentionally. A different hash value may (but need not) be an indication of a changed state or potential vulnerability that was not the subject of this scan.

Imported packages

Used code from other Frameworks/Smart Contracts (direct imports).

Dependency / Import Path	Count
@openzeppelin/contracts-upgradeable/access/AccessControlUpgradeable.sol	1
@openzeppelin/contracts-upgradeable/proxy/utils/Initializable.sol	2
@openzeppelin/contracts-upgradeable/security/ReentrancyGuardUpgradeable.sol	1
@openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol	1
@openzeppelin/contracts/utils/cryptography/MerkleProof.sol	1

Note for Investors: We only audited contracts mentioned in the scope above. All contracts related to the project apart from that are not a part of the audit, and we cannot comment on its security and are not responsible for it in any way

Audit Information

Vulnerability & Risk Level

Risk represents the probability that a certain source threat will exploit vulnerability and the impact of that event on the organization or system. The risk Level is computed based on CVSS version 3.0.

Level	Value	Vulnerability	Risk (Required Action)
Critical	9 - 10	A vulnerability that can disrupt the contract functioning in a number of scenarios, or creates a risk that the contract may be broken.	Immediate action to reduce risk level.
High	7 – 8.9	A vulnerability that affects the desired outcome when using a contract, or provides the opportunity to use a contract in an unintended way.	Implementation of corrective actions as soon aspossible.
Medium	4 – 6.9	A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.	Implementation of corrective actions in a certain period.
Low	2 – 3.9	A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.	Implementation of certain corrective actions or accepting the risk.
Informational	0 – 1.9	A vulnerability that have informational character but is not effecting any of the code.	An observation that does not determine a level of risk

Auditing Strategy and Techniques Applied

Throughout the review process, care was taken to check the repository for security-related issues, code quality, and compliance with specifications and best practices. To this end, our team of experienced pen-testers and smart contract developers reviewed the code line by line and documented any issues discovered.

We check every file manually. We use automated tools only so that they help us achieve faster and better results.

Methodology

The auditing process follows a routine series of steps:

1. Code review that includes the following:
    a. Reviewing the specifications, sources, and instructions provided to
    SolidProof to ensure we understand the size, scope, and functionality of the
    smart contract.
    b. Manual review of the code, i.e., reading the source code line by line to identify potential vulnerabilities.
    c. Comparison to the specification, i.e., verifying that the code does what is described in the specifications, sources, and instructions provided to SolidProof.

2. Testing and automated analysis that includes the following:
    a. Test coverage analysis determines whether test cases cover code and how much code is executed when those test cases are executed.
    b. Symbolic execution, which is analysing a program to determine what inputs cause each part of a program to execute.

3. Review best practices, i.e., review smart contracts to improve efficiency, effectiveness, clarity, maintainability, security, and control based on best practices, recommendations, and research from industry and academia.

4. Concrete, itemized and actionable recommendations to help you secure your smart contracts.

Overall Security

Upgradeability

Contract is an upgradeable	❌ Deployer can update the contract with new functionalities
Description	The deployer can replace the old contract with a new one with new features. Be aware of this, because the owner can add new features that may have a negative impact on your investments.
Example	We assume that you have funds in the contract and it has been audited by any security audit firm. Now the audit has passed. After that, the deployer can upgrade the contract to allow him to transfer the funds you purchased without any approval from you. This has the consequence that your funds can be taken by the creator.
Comment	N/A

Alleviation - *"We will use Gnosis Multisig as Proxy Admin to avoid a single point of failure. We intentionally keep it upgradeable so we can add/ remove functionality in future. The user funds are never staked into these smart contracts, so we cannot just upgrade the contract and move user funds."*

Ownership

The ownership is not renounced	❌ **The owner is not renounce**
Description	The owner has not renounced the ownership that means that the owner retains control over the contract's operations, including the ability to execute functions that may impact the contract's users or stakeholders. This can lead to several potential issues, including: • Centralizations • The owner has significant control over contract's operations
Comment	N/A

Note - If the contract is not deployed, we would consider the ownership not renounced. Moreover, if there are no ownership functionalities, ownership is automatically considered renounced.

Ownership Privileges

These functions can be dangerous. Please note that abuse can lead to financial loss. We have a guide where you can learn more about these Functions.

Minting tokens

Minting tokens refer to the process of creating new tokens in a cryptocurrency or blockchain network. This process is typically performed by the project's owner or designated authority, who has the ability to add new tokens to the network's total supply.

Contract owner cannot mint new tokens	✅ **The owner cannot mint new tokens**
Description	The owner is not able to mint new tokens once the contract is deployed.
Comment	N/A

Burning tokens

Burning tokens is the process of permanently destroying a certain number of tokens, reducing the total supply of a cryptocurrency or token. This is usually done to increase the value of the remaining tokens, as the reduced supply can create scarcity and potentially drive up demand.

Contract owner cannot burn tokens	✅ **The owner cannot burn tokens**
Description	The owner is not able burn tokens without any allowances.
Comment	N/A

Blacklist addresses

Blacklisting addresses in smart contracts is the process of adding a certain address to a blacklist, effectively preventing them from accessing or participating in certain functionalities or transactions within the contract. This can be useful in preventing fraudulent or malicious activities, such as hacking attempts or money laundering.

Contract owner cannot blacklist addresses	✅ **The owner cannot blacklist addresses**
Description	The owner is not able blacklist addresses to lock funds.
Comment	N/A

Fees and Tax

In some smart contracts, the owner or creator of the contract can set fees for certain actions or operations within the contract. These fees can be used to cover the contract's cost, such as paying for gas fees or compensating the contract's owner for their time and effort in developing and maintaining the contract.

Contract owner cannot set fees more than 25%	✅ **The owner cannot levy unfair taxes**
Description	The owner is not able to set the fees above 25%
Comment	N/A

Lock Functions

In a smart contract, locking refers to restricting access to certain functions or assets for a specified period. When tokens or assets are locked in a smart contract, they cannot be transferred or used until the lock-up period has expired or certain conditions have been met.

Contract owner can pause the pools	❌ **The owner is able to pause the contract**
Description	Locking the contract means that the owner is able to lock any funds or functionality of the contract.
Example	An example of locking is by pausing the contract. That causes that some or all functionalities of the contract are not useable anymore.
Comment	N/A

Alleviation - *"The user funds aren't staked here but more of Merkl airdrop approach where users can only claim. The pause functionality helps our off-chain script only to consider active pools."*

External/Public functions

External/public functions are functions that can be called from outside of a contract, i.e., they can be accessed by other contracts or external accounts on the blockchain. These functions are specified using the function declaration's external or public visibility modifier.

State variables

State variables are variables that are stored on the blockchain as part of the contract's state. They are declared at the contract level and can be accessed and modified by any function within the contract. State variables can be defined with a visibility modifier, such as public, private, or internal, which determines the access level of the variable.

Components

📝Contracts	📚Libraries	🔍Interfaces	🎨Abstract
2	0	2	0

Exposed Functions

This section lists functions that are explicitly declared public or payable. Please note that getter methods for public stateVars are not included.

🌐Public	💰Payable
48	1

External	Internal	Private	Pure	View
24	20	0	4	27

StateVariables

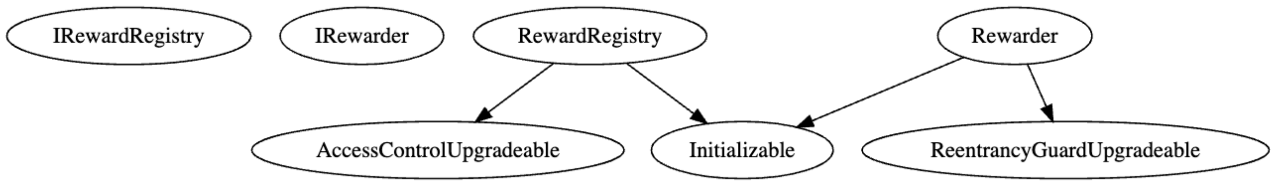
Total	🌐Public
12	12

Capabilities

Solidity Versions observed	🧪 Experimental Features	💰 Can Receive Funds	🖥 Uses Assembly	💣 Has Destroyable Contracts
`^0.8.17` `0.8.17`		Yes		

Inheritance Graph

An inheritance graph is a graphical representation of the inheritance hierarchy among contracts. In object-oriented programming, inheritance is a mechanism that allows one class (or contract, in the case of Solidity) to inherit properties and methods from another class. It shows the relationships between different contracts and how they are related to each other through inheritance.



Centralisation Privileges

Centralisation can arise when one or more parties have privileged access or control over the contract's functionality, data, or decision-making. This can occur, for example, if a single entity controls the contract or if certain participants have special permissions or abilities that others do not.

In the project, some authorities have access to the following functions:

File	Privileges
1. RewardRegistry.sol	• OPERATOR_ROLE • Add Pool • Pause/Unpause Pool • Set Pool Rewarder • Set Positions Manager Address • Add Position Manager
2. Rewarder.sol	• onlyOperator • Add Rewards token including its start/end time, reward per second, and the native status • Withdraw Tokens from the contract's balance manually, including the reward tokens • Only the Trusted Updater address can update the merkle rool value

Recommendations

To avoid potential hacking risks, it is advisable for the client to manage the private key of the privileged account with care. Additionally, we recommend enhancing the security practices of centralised privileges or roles in the protocol through a decentralized mechanism or smart-contract-based accounts, such as multi-signature wallets.

Here are some suggestions of what the client can do:

- Consider using multi-signature wallets: Multi-signature wallets require multiple parties to sign off on a transaction before it can be executed, providing an extra layer of security e.g. Gnosis Safe
- Use of a timelock at least with a latency of e.g. 48-72 hours for awareness of privileged operations
- Introduce a DAO/Governance/Voting module to increase transparency and user involvement

- Consider Renouncing the ownership so that the owner can no longer modify any state variables of the contract. Make sure to set up everything before renouncing.

Audit Results

Critical issues

No critical issues

High issues

No high issues

Medium issues

#1 | Owner can withdraw reward tokens

File	Severity	Location	Status
Rewarder	Medium	L118	ACK

Description - The owner of the contract is able to withdraw the complete balance of the contract, including the reward tokens, by calling this function. Hence, if done so, then no user will be able to claim their tokens

Remediation - Make sure that it is not possible to take out reward tokens.

Alleviation - *"For us to do active management of rewards, we need some ownership/access control to make those changes. The owner will be Gnosis Multisig wallet."*

Low issues

#1 | Missing Events

File	Severity	Location	Status
RewardRegistry	Low	L47—68	ACK

Description - Make sure to emit events for all the critical parameter changes in the contract to ensure the transparency and trackability of all the state variable changes.

Informational issues

#1 | NatSpec documentation missing

File	Severity	Location	Status
All	Informational	N/A	ACK

Description - If you started to comment on your code, comment on all other functions, variables, etc.

#2 | Disable initializing

File	Severity	Location	Status
All	Informational	N/A	ACK

Description
If the owner updates the contract, a disableInitializer call in the constructor must be implemented. This prevents calling the initialize function again to set the state variables in the contract. This should be implemented only if the contract was deployed before. Otherwise, the owner cannot call the initialize function to set the variables.

Recommendation
If the contract hasn't been deployed, remove the disableInitializer in the constructor. Otherwise, you are not able to initialize the contract. When the contract has a deployed version already, leave it as it is.

#3 | Floating Pragma

File	Severity	Location	Status
All	Informational	N/A	ACK

Description - The contracts should be deployed with the same compiler version and flag that they have been tested thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using other versions.

Legend for the Issue Status

Attribute or Symbol	Meaning
Open	The issue is not fixed by the project team.
Fixed	The issue is fixed by the project team.
Acknowledged(ACK)	The issue has been acknowledged or declared as part of business logic.

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