

# Advanced Manual Smart Contract Audit

June 26, 2023

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Audit requested by



**Lunna**

0x86d4c0037c4fa101b8b3fe9e2c32036f007364bc

# Global Overview

## Manual Code Review

In this audit report we will highlight the following issues:

Vulnerability Level	Total	Pending	Acknowledged	Resolved
● Informational	0	0	0	0
● Low-Risk	7	7	0	0
● Medium-Risk	3	3	0	0
● High-Risk	0	0	0	0

## Centralization Risks

Coinsult checked the following privileges:

Contract Privilege	Description
Owner needs to enable trading?	● Owner needs to manually enable trading
Owner can mint?	● Owner cannot mint new tokens
Owner can blacklist?	● Owner can blacklist addresses
Owner can set fees > 25%?	● Owner cannot set the sell fee to 25% or higher
Owner can exclude from fees?	● Owner can exclude from fees
Can be honeypotted?	● Contract can become honeypot
Owner can set Max TX amount?	● Owner can set max transaction amount

More owner privileges are listed later in the report.

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# Audit Summary

Project Name	Lunna
Website	
Blockchain	Ethereum
Smart Contract Language	Solidity
Contract Address	0x86d4c0037c4fa101b8b3fe9e2c32036f007364bc
Audit Method	Static Analysis, Manual Review
Date of Audit	26 June 2023

This audit report has been prepared by Coinsult's experts at the request of the client. In this audit, the results of the static analysis and the manual code review will be presented. The purpose of the audit is to see if the functions work as intended, and to identify potential security issues within the smart contract.

The information in this report should be used to understand the risks associated with the smart contract. This report can be used as a guide for the development team on how the contract could possibly be improved by remediating the issues that were identified.

# Audit Scope

Coinsult was commissioned by Lunna to perform an audit based on the following code:

<https://goerli.etherscan.io/token/0x86d4c0037c4fa101b8b3fe9e2c32036f007364bc#code>

Note that we only audited the code available to us on this URL at the time of the audit. If the URL is not from any block explorer (main net), it may be subject to change. Always check the contract address on this audit report and compare it to the token you are doing research for.

## Audit Method

Coinsult's manual smart contract audit is an extensive methodical examination and analysis of the smart contract's code that is used to interact with the blockchain. This process is conducted to discover errors, issues and security vulnerabilities in the code in order to suggest improvements and ways to fix them.

### Automated Vulnerability Check

Coinsult uses software that checks for common vulnerability issues within smart contracts. We use automated tools that scan the contract for security vulnerabilities such as integer-overflow, integer-underflow, out-of-gas-situations, unchecked transfers, etc.

### Manual Code Review

Coinsult's manual code review involves a human looking at source code, line by line, to find vulnerabilities. Manual code review helps to clarify the context of coding decisions. Automated tools are faster but they cannot take the developer's intentions and general business logic into consideration.

### Used tools

- Slither: Solidity static analysis framework
- Remix: IDE Developer Tool
- CWE: Common Weakness Enumeration
- SWC: Smart Contract Weakness Classification and Test Cases
- DEX: Testnet Blockchains

# Risk Classification

Coinsult uses certain vulnerability levels, these indicate how bad a certain issue is. The higher the risk, the more strictly it is recommended to correct the error before using the contract.

Vulnerability Level	Description
● Informational	Does not compromise the functionality of the contract in any way
● Low-Risk	Won't cause any problems, but can be adjusted for improvement
● Medium-Risk	Will likely cause problems and it is recommended to adjust
● High-Risk	Will definitely cause problems, this needs to be adjusted

Coinsult has four statuses that are used for each risk level. Below we explain them briefly.

Risk Status	Description
Total	Total amount of issues within this category
Pending	Risks that have yet to be addressed by the team
Acknowledged	The team is aware of the risks but does not resolve them
Resolved	The team has resolved and remedied the risk

# SWC Attack Analysis

The Smart Contract Weakness Classification Registry (SWC Registry) is an implementation of the weakness classification scheme proposed in EIP-1470. It is loosely aligned to the terminologies and structure used in the Common Weakness Enumeration (CWE) while overlaying a wide range of weakness variants that are specific to smart contracts.

ID	Description	Status
SWC-100	Function Default Visibility	Passed
SWC-101	Integer Overflow and Underflow	Passed
SWC-102	Outdated Compiler Version	Passed
SWC-103	Floating Pragma	Failed
SWC-104	Unchecked Call Return Value	Passed
SWC-105	Unprotected Ether Withdrawal	Passed
SWC-106	Unprotected SELFDESTRUCT Instruction	Passed
SWC-107	Reentrancy	Passed
SWC-108	State Variable Default Visibility	Passed
SWC-109	Uninitialized Storage Pointer	Passed
SWC-110	Assert Violation	Passed
SWC-111	Use of Deprecated Solidity Functions	Passed
SWC-112	Delegatecall to Untrusted Callee	Passed
SWC-113	DoS with Failed Call	Passed
SWC-114	Transaction Order Dependence	Passed
SWC-115	Authorization through tx.origin	Passed

SWC-116	Block values as a proxy for time	Passed
SWC-117	Signature Malleability	Passed
SWC-118	Incorrect Constructor Name	Passed
SWC-119	Shadowing State Variables	Passed
SWC-120	Weak Sources of Randomness from Chain Attributes	Passed
SWC-121	Missing Protection against Signature Replay Attacks	Passed
SWC-122	Lack of Proper Signature Verification	Passed
SWC-123	Requirement Violation	Passed
SWC-124	Write to Arbitrary Storage Location	Passed
SWC-125	Incorrect Inheritance Order	Passed
SWC-126	Insufficient Gas Griefing	Passed
SWC-127	Arbitrary Jump with Function Type Variable	Passed
SWC-128	DoS With Block Gas Limit	Passed
SWC-129	Typographical Error	Passed
SWC-130	Right-To-Left-Override control character (U+202E)	Passed
SWC-131	Presence of unused variables	Passed
SWC-132	Unexpected Ether balance	Passed
SWC-133	Hash Collisions With Multiple Variable Length Arguments	Passed
SWC-134	Message call with hardcoded gas amount	Passed
SWC-135	Code With No Effects	Passed
SWC-136	Unencrypted Private Data On-Chain	Passed



Error Code	Description
CS-01	Address can never sell his full balance and always keep 1 token

 **Low-Risk:** Could be fixed, will not bring problems.

### Address can never sell his full balance and always keep 1 token

Check `testnet`

### Recommendation

Avoid decentralization risk

Error Code	Description
SLT: 078	Conformance to numeric notation best practices

● **Low-Risk:** Could be fixed, will not bring problems.

## Too many digits

Literals with many digits are difficult to read and review.

```
uint256 private _tTotal = 1000000000000000000;  
uint256 public _maxTxAmount = 1000000000000000000;  
uint256 public numTokensSellToAddToLiquidity = 1000000000000000000;  
require(maxTxAmount > 100000000, "Max Tx Amount cannot be less than 100 Million");  
require(SwapThresholdAmount > 69000000, "Swap Threshold Amount cannot be less than 69 Million");
```

## Recommendation

Use: Ether suffix, Time suffix, or The scientific notation

## Exploit scenario

```
contract MyContract{  
    uint 1_ether = 1000000000000000000;  
}
```

While 1\_ether looks like 1 ether, it is 10 ether. As a result, it's likely to be used incorrectly.

Error Code	Description
SLT: 056	Missing Zero Address Validation

● **Low-Risk:** Could be fixed, will not bring problems.

## No zero address validation for some functions

Detect missing zero address validation.

```
function setMarketingWallet(address walletAddress) public onlyOwner {  
    marketingWallet = walletAddress;  
}
```

## Recommendation

Check that the new address is not zero.

## Exploit scenario

```
contract C {  
  
    modifier onlyAdmin {  
        if (msg.sender != owner) throw;  
        _;  
    }  
  
    function updateOwner(address newOwner) onlyAdmin external {  
        owner = newOwner;  
    }  
}
```

Bob calls updateOwner without specifying the newOwner, so Bob loses ownership of the contract.

Error Code	Description
SWC: 103	Floating Pragma

● **Low-Risk:** Could be fixed, will not bring problems.

## Floating Pragma

Contracts should be deployed with the same compiler version and flags that they have been tested with thoroughly. Locking the pragma helps to ensure that contracts do not accidentally get deployed using, for example, an outdated compiler version that might introduce bugs that affect the contract system negatively.

```
pragma solidity ^0.8.18;
```

## Recommendation

Lock the pragma version and also consider known bugs

(<https://github.com/ethereum/solidity/releases>) for the compiler version that is chosen.

Pragma statements can be allowed to float when a contract is intended for consumption by other developers, as in the case with contracts in a library or EthPM package. Otherwise, the developer would need to manually update the pragma in order to compile locally.

Error Code	Description
SLT: 054	Missing Events Arithmetic

● **Low-Risk:** Could be fixed, will not bring problems.

## Missing events arithmetic

Detect missing events for critical arithmetic parameters.

```
function setMarketingFeePercent(uint256 fee) public onlyOwner {
    require(fee <= 100, "Marketing fee cannot be more than 100% of liquidity");
    marketingFeePercent = fee;
}

function setMarketingWallet(address walletAddress) public onlyOwner {
    marketingWallet = walletAddress;
}

function setTaxFeePercent(uint256 taxFee) external onlyOwner() {
    require(taxFee <= 10, "Tax fee cannot be more than 10%");
    _taxFee = taxFee;
}

function setBurnFee(uint256 burnFee) external onlyOwner() {
    require(burnFee <= 10, "burn Fee cannot be more than 10%");
}
```

## Recommendation

Emit an event for critical parameter changes.

## Exploit scenario

```
contract C {

    modifier onlyAdmin {
        if (msg.sender != owner) throw;
        _;
    }

    function updateOwner(address newOwner) onlyAdmin external {
        owner = newOwner;
    }
}
```

updateOwner() has no event, so it is difficult to track off-chain changes in the buy price.

Error Code	Description
CS: 071	Using safemath in Solidity 0.8.0+

● **Low-Risk:** Could be fixed, will not bring problems.

### Using safemath in Solidity 0.8.0+

SafeMath is generally not needed starting with Solidity 0.8, since the compiler now has built in overflow checking.


```
library SafeMath {
    /**
     * @dev Returns the addition of two unsigned integers, with an overflow flag.
     *
     * _Available since v3.4._
     */
    function tryAdd(uint256 a, uint256 b) internal pure returns (bool, uint256) {
        unchecked {
            uint256 c = a + b;
            if (c < a) return (false, 0);
            return (true, c);
        }
    }

    /**
     * @dev Returns the subtraction of two unsigned integers, with an overflow flag.
```

### Recommendation

Check if you really need SafeMath and consider removing it.

Error Code	Description
CS: 016	Initial Supply

 **Low-Risk:** Could be fixed, will not bring problems.


### Initial Supply

When the contract is deployed, the contract deployer receives all of the initially created assets. Since the deployer and/or contract owner can distribute tokens without consulting the community, this could be a problem.

### Recommendation

Private keys belonging to the employer and/or contract owner should be stored properly. The initial asset allocation procedure should involve consultation with the community.

Error Code	Description
CS: 017	Reliance on third-parties

 **Low-Risk:** Could be fixed, will not bring problems.

### Reliance on third-parties

Interaction between smart contracts with third-party protocols like Uniswap and Pancakeswap. The audit's scope presupposes that third party entities will perform as intended and treats them as if they were black boxes. In the real world, third parties can be hacked and used against you. Additionally, improvements made by third parties may have negative effects, such as higher transaction costs or the deprecation of older routers.

### Recommendation

Regularly check third-party dependencies, and when required, reduce severe effects.



Error Code	Description
CSM-01	Owner can lock the contract ownership arbitrary long

● **Medium-Risk:** Should be fixed, could bring problems.

### Owner can lock the contract ownership arbitrary long

```
function lock(uint256 time) public virtual onlyOwner {  
    _previousOwner = _owner;  
    _owner = address(0);  
    _lockTime = block.timestamp + time;  
    emit OwnershipTransferred(_owner, address(0));  
}
```

### Recommendation

require the time variable to prevent infinite contract locking

Error Code	Description
CSM-02	Only owner can trade before trading is opened

● **Medium-Risk:** Should be fixed, could bring problems.

### Only owner can trade before trading is opened

```
function _tokenTransfer(address sender, address recipient, uint256 amount, bool takeFee) private {
    if(!canTrade){
        require(sender == owner()); // only owner allowed to trade or add liquidity
    }

    if(botWallets[sender] || botWallets[recipient]){
        require(botscantrade, "bots arent allowed to trade");
    }

    if(!takeFee)
        removeAllFee();

    if (_isExcluded[sender] &&& !_isExcluded[recipient]) {
        _transferFromExcluded(sender, recipient, amount);
    } else if (!_isExcluded[sender] &&& _isExcluded[recipient]) {
        _transferToExcluded(sender, recipient, amount);
    } else if (!_isExcluded[sender] &&& !_isExcluded[recipient]) {
        _transferStandard(sender, recipient, amount);
    } else if (_isExcluded[sender] &&& _isExcluded[recipient]) {
        _transferBothExcluded(sender, recipient, amount);
    } else {
```

### Recommendation

It is recommended to let excluded addresses be able to trade before trading is opened. For example excluding a presale router to allow claiming tokens before trading.

Error Code	Description
CSM-03	Contract can revert all sells if fee receiving wallets do not accept ETH

● **Medium-Risk:** Should be fixed, could bring problems.

### Contract can revert all sells if fee receiving wallets do not accept ETH

```
payable(marketingWallet).transfer(marketingshare);
```

### Recommendation

Using require on the success variable, sells will revert when swapTokensAtAmount is reached and the fee receiving wallets do not accept ETH. You can prevent reverts by checking the wallets are not contracts, or to return the success value rather than require it.

## Simulated transaction

Test Code	Description
SIM-01	Testing a normal transfer

<https://testnet.bscscan.com/tx/0x3f5278acfa6a36a05a862a2aa2212c9364c3d1b92caea4929c93bcfc5a523>

## Maximum Fee Limit Check

Error Code	Description
CEN-01	Centralization: Operator Fee Manipulation

Coinsult tests if the owner of the smart contract can set the transfer, buy or sell fee to 25% or more. It is bad practice to set the fees to 25% or more, because owners can prevent healthy trading or even stop trading when the fees are set too high.

Type of fee	Description
Transfer fee	<span style="color: red;">●</span> Owner can set the transfer fee to 25% or higher
Buy fee	<span style="color: green;">●</span> Owner cannot set the buy fee to 25% or higher
Sell fee	<span style="color: green;">●</span> Owner cannot set the sell fee to 25% or higher

Type of fee	Description
Max transfer fee	100%
Max buy fee	100%
Max sell fee	100%

## Contract Pausability Check

Error Code	Description
CEN-02	Centralization: Operator Pausability

Coinsult tests if the owner of the smart contract has the ability to pause the contract. If this is the case, users can no longer interact with the smart contract; users can no longer trade the token.

Privilege Check	Description
Can owner pause the contract?	<span>●</span> Owner can pause the smart contract

## Function

Check medium risks and fees

## Max Transaction Amount Check

Error Code	Description
CEN-03	Centralization: Operator Transaction Manipulation

Coinsult tests if the owner of the smart contract can set the maximum amount of a transaction. If the transaction exceeds this limit, the transaction will revert. Owners could prevent normal transactions to take place if they abuse this function.

Privilege Check	Description
Can owner set max tx amount?	<span>●</span> Owner can set max transaction amount

## Function

```
function setMaxTxAmount(uint256 maxTxAmount) external onlyOwner() {
    require(maxTxAmount > 100000000, "Max Tx Amount cannot be less than 100 Million");
    _maxTxAmount = maxTxAmount * 10**9;
}
```

## Exclude From Fees Check

Error Code	Description
CEN-04	Centralization: Operator Exclusion

Coinsult tests if the owner of the smart contract can exclude addresses from paying tax fees. If the owner of the smart contract can exclude from fees, they could set high tax fees and exclude themselves from fees and benefit from 0% trading fees. However, some smart contracts require this function to exclude routers, dex, cex or other contracts / wallets from fees.

Privilege Check	Description
Can owner exclude from fees?	● Owner can exclude from fees

## Function

```
function excludeFromFee(address account) public onlyOwner {
    _isExcludedFromFee[account] = true;
}
```




## Ability To Mint Check

Error Code	Description
CEN-05	Centralization: Operator Increase Supply

Coinsult tests if the owner of the smart contract can mint new tokens. If the contract contains a mint function, we refer to the token's total supply as non-fixed, allowing the token owner to "mint" more tokens whenever they want.

A mint function in the smart contract allows minting tokens at a later stage. A method to disable minting can also be added to stop the minting process irreversibly.

Minting tokens is done by sending a transaction that creates new tokens inside of the token smart contract. With the help of the smart contract function, an unlimited number of tokens can be created without spending additional energy or money.


Privilege Check	Description
Can owner mint?	 Owner cannot mint new tokens

## Enable Trading

Error Code	Description
CEN-06	Centralization: Operator enable trading

Coinsult tests if the owner of the smart contract needs to manually enable trading before everyone can buy & sell. If the owner needs to manually enable trading, this poses a high centralization risk.

If the owner needs to manually enable trading, make sure to check if the project has a SAFU badge or a trusted KYC badge. Always DYOR when investing in a project that needs to manually enable trading.

Privilege Check	Description
Owner needs to enable trading?	 Owner needs to manually enable trading

## Ability To Blacklist Check

Error Code	Description
CEN-07	Centralization: Operator Disallows Wallets

Coinsult tests if the owner of the smart contract can blacklist accounts from interacting with the smart contract. Blacklisting methods allow the contract owner to enter wallet addresses which are not allowed to interact with the smart contract.

This method can be abused by token owners to prevent certain / all holders from trading the token. However, blacklists might be good for tokens that want to rule out certain addresses from interacting with a smart contract.

Privilege Check	Description
Can owner blacklist?	<span>●</span> Owner can blacklist addresses

## Function

```
function addBotWallet(address botwallet) external onlyOwner() {  
    botWallets[botwallet] = true;  
}
```

## Other Owner Privileges Check

Error Code	Description
CEN-100	Centralization: Operator Priviliges

Coinsult lists all important contract methods which the owner can interact with.

Owner can withdraw tokens from the contract address

Owner can exclude addresses from reward

Owner receives lp tokens

# Notes

## Notes by Lunna

No notes provided by the team.

## Notes by Coinconsult

Contract contains airdrop

# Contract Snapshot

This is how the constructor of the contract looked at the time of auditing the smart contract.

```
contract luna is Context, IERC20, Ownable {
    using SafeMath for uint256;
    using Address for address;

    mapping (address => uint256) private _rOwned;
    mapping (address => uint256) private _tOwned;
    mapping (address => mapping (address => uint256)) private _allowances;

    mapping (address => bool) private _isExcludedFromFee;

    mapping (address => bool) private _isExcluded;
    address[] private _excluded;

    mapping (address => bool) private botWallets;
    bool botscantrade = false;

    bool public canTrade = false;
```

# Certificate of Proof

● Not KYC verified by Coinsult

## Lunna

Audited by Coinsult.net



Date: 26 June 2023

✓ Advanced Manual Smart Contract Audit

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Coinsult is not responsible if a project turns out to be a scam, rug-pull or honeypot. We only provide a detailed analysis for your own research.

Coinsult is not responsible for any financial losses. Nothing in this contract audit is financial advice, please do your own research.

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# End of report

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