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Introduction

The following development roadmap sets out to modernize RecFIN.org in order to provide its users with a clean, intuitive and secure platform that will be used for accessing reliable recreational fishery data. The roadmap is intended to outline requirements before providing a high-level design and project plan that will be used during implementation of the new RecFIN.org website.

The roadmap is divided into three logical areas (Requirements, High-Level Design and Project Plan) aimed at two different groups:

- **RecFIN Stakeholders:** The roadmap provides stakeholders with a vision for the future system and the information necessary for project budgeting and planning.
- **Implementer:** This roadmap provides the implementer with the materials required to begin detailed design and development with little to no additional analysis or high-level design.

Because the development roadmap must balance the technical details needed by the implementer with the business needs of the RecFIN stakeholders, certain sections of this document will be of greater interest to one group or the other. For the reader's convenience, each section begins by identifying the intended audience.

Finally, it is important to understand that even though this document provides some specific design details, the details are given to facilitate understanding and provide one possible approach. The design and plan materials are not meant to limit the implementer's creativity or RecFINs stakeholders' ability to adapt to changing needs. Defining the implementation specifics is ultimately a decision for the implementer working with the RecFIN stakeholders.

Development Roadmap

Requirements

Intended Audience: RecFIN Stakeholders and Implementer

Fundamental to the design and later development is an understanding of the requirements for RecFIN.org. *Table 1* below outlines high-level requirements that were considered in drafting the roadmap and should be expanded on during implementation efforts.

Before studying the requirements, it is helpful for the reader to understand that requirements have been grouped into one of seven categories.

- **General Website** – Requirements that focus on the website itself
- **Transparency** – Requirements that provide clear visibility into RecFIN data
- **Data** – Requirements that focus on specific data clean-up and model design
- **Security** – Requirements of authorization and authentication
- **Audit** – Requirements establishing audit and logging capabilities
- **Reporting** – Requirements of the various types of reports and reporting infrastructure needed to support different report types
- **Integration** – Requirements detailing how the new website and underlying database will interface with other systems.

Each requirement summarized in *Table 1* has been given a priority of high, medium, or low. Requirements given a high priority should be built into the system. Requirements that are either medium or low may not be necessary for early implementation efforts and will depend on budget considerations.

Table 1 - Requirements

ID	Category	Priority	Name	Description
S1	Security	High	Role Based Permissions	What a user can see and do within the application will depend on the role(s) they belong to.
S2	Security	High	Unregistered Users	Unregistered users can access unsecured areas of the application.
S3	Security	High	Secured Objects	While the majority of the application will be open to the public, there will be secured area(s) that only authorized users have access to.
S4	Security	High	User Maintenance	Internal admin users will have ability to approve, deny, enable/disable and assign role(s).

ID	Category	Priority	Name	Description
L1	Logging	Medium	Database Backups	Backups of the database will be performed daily. (Coordinate with PSMFC IT as needed).
L2	Logging	Low	Page Analytics	Analytics will be setup to track how the website is being used.
L3	Logging	Low	Report Analytics	Analytics will be setup to track how reports are being used.
L4	Logging	Low	Login Attempts	A log of users who have accessed the application will be kept.
L5	Logging	Low	SQL Audits	A log of queries run against the database will be kept.
R1	Reporting	High	Tabular Reports	The application will provide users with the ability to pass parameters and view results in an interactive results grid (sort, filter and export) after first defining column and row headers.
R2	Reporting	High	Standard Reports	The application will provide users with ability to pass parameters and view static "canned" reports.
R3	Reporting	Low	Email Reports	Users will be able to email links to saved reports via email. The application will support a notification mechanism.
R4	Reporting	Medium	Ad-Hoc Reports	Users will have the ability to create ad-hoc reports using a report model or OLAP cube when permissions permit.
R5	Reporting	Medium	Ad-Hoc Query	Users will have the ability to execute non-standard queries/ad-hoc requests against views in the database when permissions permit.
R6	Reporting	Low	R-Friendly File Types	Ability to output tabular report results to r-friendly file types.
R7	Reporting	Medium	Saved Queries	Users will have the ability to save custom queries for later use.
R8	Reporting	High	Multiple Aggregates / Parameter values	Users will be able to use multiple aggregate functions and specify multiple parameter values in reports.
R9	Reporting	Medium	Consistent Report Options	Users will have consistent report options for filtering (State, Year, Water Area, Species, Fishing Mode) based on the type of report (Tabular, Standard, Ad-hoc).

ID	Category	Priority	Name	Description
R10	Reporting	Low	Configurable Result Sets	On Standard and Tabular reports there will be a way to easily configure which fields are returned to the reports without redeployments of the application.
R11	Reporting	High	Relevant Result Sets	Reports will return relevant data only (Captured in Data Model).
R12	Reporting	High	Feature Rich Reports	Ability to include table data, charts, graphics.
R13	Reporting	Medium	Drill Through Reports	Users will have ability to drill through summary records to view underlying details.
R14	Reporting	High	Rounding	Reports will display records by the actual value, and not round them to the thousandth, unless values are large enough to justify it.
R15	Reporting	Medium	Data Warnings	Caveats with the data, such as missing years, will be displayed relative to the query/report being run.
R16	Reporting	Medium	Metric measurements	Use standard metric measurements on all reports (e.g. mm, kg) (Currently done but need to flex to use lbs. for Halibut only).
R17	Reporting	High	Reporting Categories	Reporting categories should be consistent with Pacific Fishery Management Council (PFMC) and other State Agencies
R18	Reporting	Medium	Processing Notification	Website will make it clear when running a report.
R19	Reporting	Low	Data Request Form	Form that provides users with the ability to request certain data sets not available from Tabular or Standard reports.
R20	Reporting	Medium	Map Results	Ability to view search results relative to an area on map.
R21	Reporting	Medium	Map Filters	Ability to filter search results based on map filters.
T1	Transparency	Medium	RecFIN Database Documentation	Users will have access to documentation of the new RecFIN database. With this they will be able to write appropriate queries.
T2	Transparency	Medium	Data Issue Documentation	Caveats with the data will be documented so users can correct for them during analysis.

ID	Category	Priority	Name	Description
T3	Transparency	Low	Estimates Documentation	Users will be able to download sample data and documentation to enable them to generate the estimates from raw sample data.
T4	Transparency	High	Data Dictionary	Metadata tables of SQL Server will be used to provide data dictionary type information to end users.
T5	Transparency	Medium	MRFS Translation	Users will have ability to view a key demonstrating mapping of Marine Recreational Fisheries Statistics (MRFS) to common data.
T6	Transparency	Medium	Species Calculator	Form that allows users to simulate species calculation to view length and weight and corresponding algorithm.
W1	Website	Low	Responsive Design	Website will utilize a responsive framework to allow for viewing on PC, standard tablet and mobile.
W2	Website	Medium	Design Aesthetic	Website will have a clean and appealing design.
W3	Website	Low	Error Comment Box	Users will be able to fill out an error comment report on the website if an issue is encountered.
W4	Website	High	User Registration	Users will have the ability to request an account in order to view secured reports and areas of the website.
W5	Website	High	Password Management	System will support self-serving password management.
W6	Website	Low	State Agency Data Load	Admin users will have the ability to upload state agency data files and trigger RecFIN ETL scripts for loading the file into new database.
W7	Website	Low	Data Maintenance Forms	Admin users will be able to update and maintain RecFIN records through website.
W8	Website	High	Captcha Forms	The application will include Captcha plugin to cut down on automated junk form submissions.
W9	Website	High	Error Reporting	Any application or database errors will be logged and admin users will have an interface to view them.
W10	Website	High	Email Notifications	The site will have ability to generate automated email notifications.

ID	Category	Priority	Name	Description
W11	Website	Medium	News	The website will include an area where interested parties can view notable events, RecFIN messages and other general information.
D1	Data	High	Imputed Values Identification	Length and Weight values which have been imputed will be identified so users can handle them during analysis.
D2	Data	High	RecFIN Loading Scripts	ETL Scripts to load agency source data will be available for a RecFIN administrator to run manually or through the website.
D3	Data	High	Load Data 2004 - Present	Data from 2004 to present will be loaded from state agency files into the new database.
D4	Data	Medium	Load Data before 2004	Data from prior to 2004 will be loaded into the new database (analysis required).
D5	Data	High	Hard-Coded Values	Some hard-coded values which have special significance, such as harvest guidelines, need to be identified and stored in a consistent manner in the database.
D6	Data	High	Data Audit and Versioning	Records in the new system will be maintained and versioned for change tracking and audit purposes.
D7	Data	Medium	Preliminary Data Flag	Preliminary records from the states will be identified in the database. This data will be replaced once the final data set is submitted by the states.
D8	Data	High	Database Normalization	Database will be normalized (3NF)
I1	Integration	Low	RecFIN and PacFIN	RecFIN will have a mechanism to share data with PacFIN.
I2	Integration	Low	Web API Submissions	Application will provide web service capabilities that allow data pushes.
I3	Integration	Low	Web API Queries	Application will provide web service capabilities that allow data pulls.

The subsequent sections of this document will address the above requirements and expand on details where necessary.

High-Level Design

Building off the requirements in the previous section the high-level design will outline goals, considerations, navigation flow, an overview of the application and architectural decisions. Collectively these sections will provide a solid vision for RecFIN stakeholders and the implementer. Because the scope of this document is not detailed design, it is anticipated that the implementer may take certain liberties during implementation based on changes in requirements, developer skill sets, creativity and more exposure with RecFIN stakeholders.

Goals

The new RecFIN site should be used for years to come. With that in mind, the design should target the following goals:

- **Readability** – Code (methods, properties, classes, variables, etc.) and database objects (Tables, View, Indexes, Functions, etc.) should be named with descriptive and consistent names. Standard XML comments should be added where applicable to aid lower-level development efforts and automate system documentation.
- **Usability** – The application should be usable by the target audience (e.g. Fisheries Managers, Stock Assessors). To ensure usability, the target audience will have a positive experience through the site's responsiveness, helpful/guiding hints, and clear/concise notifications.
- **Reliability** – The application should perform consistently with high up times. When errors arise, the application should trap them and provide the users with clear notifications of the issue. In addition, when errors arise, they should be logged for later resolution. Reports should run smoothly and return accurate results.
- **Security** – Most of the RecFIN data is publicly accessible but exposing any system to the open web means there is an opportunity for malicious attacks. The application should take every preventive measure to prevent actions (malicious or otherwise) that could corrupt data or bring down the site. In addition, the application will keep private data secure and only allow access to authorized users.

Considerations

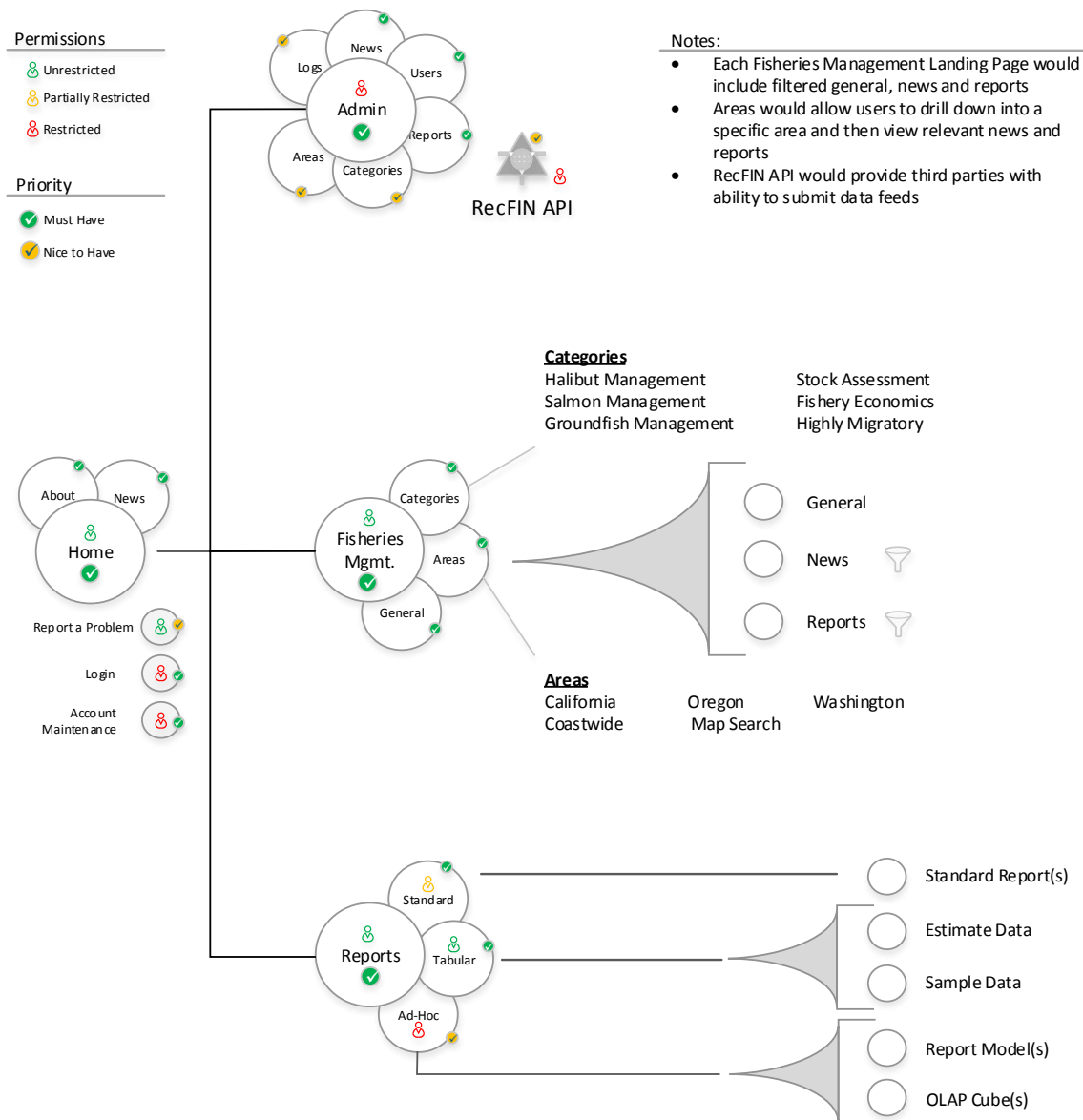
In addition to the high-level design goals, the following considerations were made when formulating the high-level design:

- **Skill Sets** – RecFIN does not have any in-house application developers. To limit maintenance tasks only a developer can carry out, business logic should be offloaded to the database and the User Interface for site administration should be easy and comprehensive for RecFIN staff to use.
- **SQL Server Database** – SQL Server was pre-selected as the database platform for the new RecFIN database. Existing data sets and data files will be migrated to a SQL Server database.
- **Current Website** – The current website is built with Drupal and uses iFrames to display SAS reports. RecFIN staff has indicated they are not wedded to the existing website and because the database management system will be SQL Server (including data migration from SAS to a SQL Server database) a rebuild of the RecFIN website is within reason.

Design Overview

The image below provides a high-level view for the new RecFIN.org website. This chart has been organized to:

- Itemize the different pages/areas of the application (Circles)
- Illustrate the navigation between different pages/areas of the application (lines)
- Identify restriction levels for the pages of the application (Red/Yellow/Green icons)
- Prioritization of functionality being added to the website (green and yellow checkmarks)

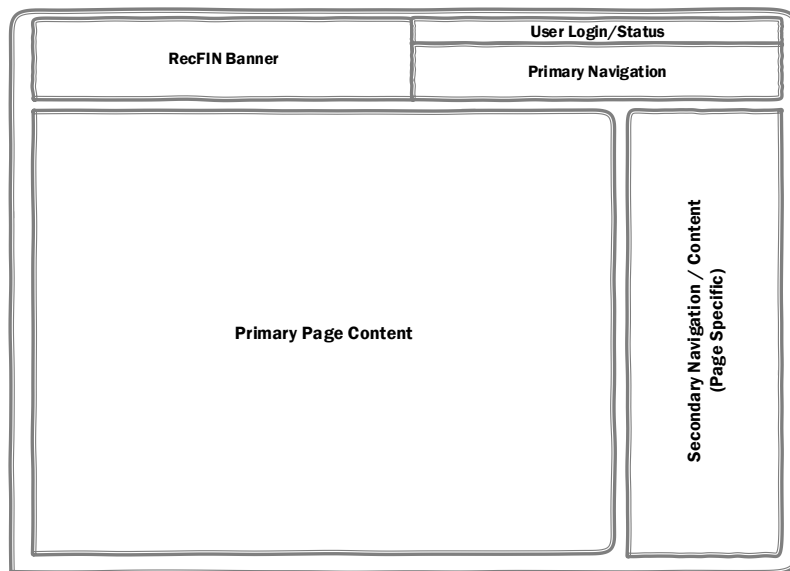


The diagram above will now be explained in greater detail by examining the various pages and areas of the site.

General Organization

The new RecFIN website should provide users with an intuitive experience that provides multiple pathways to relevant news and reports. For example, a user should be able to access a report summarizing aggregate catches by month when drilling down through fishery management categories or when selecting an area on the map. While the report will be the same, some of the reports filters will be automatically set based on how the user navigated to the report (e.g. halibut species when drilling through Halibut Management or California when selecting the area on the map).

The general layout of the site will be organized into three main sections (banner, primary page content and secondary navigation/content).



Of the three sections, only the banner will remain consistent as a user navigates around the site. The Primary Page Content and Secondary Navigation/Content areas while similar in structure will change as the user drills down into content of interest. For example, a user who is interested in Groundfish Management will see the primary and secondary content areas change to reflect only the news and reports that are specific to the Groundfish Management category.

Accessing specific pages of the site begins with the Primary Navigation which will consist of a row of high-level menu options. The specific menu items will be determined during implementation but are likely to include options for Fishery Management, Reports, About, News and Admin.

The menu options should be table driven so that they can be adjusted and re-organized without needing to redeploy the website. The Primary Navigation should also hide restricted menu options that the user does not have access to.

Authorization

The RecFIN.org website will hide and secure objects that a user does not have permission to see. By default, when a user accesses the website they will only have access to unrestricted areas and reports. In order to gain access to restricted areas and reports the user must login. Before this can happen

though the user needs to submit a registration request through a public facing web page. To cut down on SPAM traffic the site will include a Captcha form to verify actual users are submitting the request.

Once a request has been submitted, a RecFIN administrator will receive a system generated email and be able to authorize or reject the user registration through a secured user administration page.

By default, the permissions a user has will be set to the lowest level of privileges. If the RecFIN administrator approves the request or alters the account in any way, an email will be issued to the user instructing them on how to login and access the site.¹

When logging in, if the user has misplaced or forgotten their username or password, the system will provide the user with functionality that allows them to retrieve lost information without the assistance of a RecFIN administrator.

Once a user has logged in, they will have access to additional restricted areas of the site. Users who are designated administrators will have the highest level of permissions for the site with access to the administrative module where they can maintain user accounts, configure and publish reports, enter news and review system logs.

Administration

The administration module of the application will facilitate the maintenance of complex and dynamic content areas of the RecFIN site by minimizing the amount of coding or database scripting required.

News and user administration will be a regularly occurring and ongoing activity. As such, having a series of intuitive interfaces will reduce the time spent by RecFIN administrators in keeping user accounts and news up-to-date.

While report administration may not be as frequently needed as user and news maintenance, it is complex enough that having custom developed report maintenance screens will greatly simplify the process required to secure and publish reports. Perhaps the most complex part of report maintenance will be in configuring data warnings so they are triggered based on the filter options a user applies when running a report.

Although a lower priority, RecFIN may decide it makes sense to include functionality that gives RecFIN administrators the ability to maintain general content (separate from news and reports) for the Fishery Management landing pages (e.g. Highly Migratory, California, etc.). Having this functionality would remove the need to modify code files directly.

In addition to maintaining site content, user accounts and reports, administrative users may choose they want to view log reports that can be used to diagnose application errors, audit user logins, review report and general site usage.

¹ An auto-generated password will be created that the user is required to change the first time they login.

Fisheries Management

The new website will logically group news, reports and other relevant information into Fisheries Management Categories and Areas. Doing so will allow users to more quickly drill into relevant information.

The Fishery Management categories will initially include Biological Data, Fishery Economics, Groundfish, Halibut Management, Highly Migratory, Salmon Management and Stock Assessment. Each of these categories will have their own landing page that provides general information about the category as well as relevant news and reports.

Like Fishery Management categories, areas will logically group location information, news and reports. Initially areas will include Coastwide, California, Oregon and Washington but can be expanded at a later time. In addition, the website will include an interactive map tool that will allow users to select areas on the map to further filter relevant news and reports.

Reporting

Reporting will make up the core functionality of the new RecFIN.org website. Due to different reporting needs and requirements, the new website will provide three different types of reports:

- Standard – The user can run the report while changing the filter values on the report, but the user cannot change the structure of the report. Standard reports will be published by RecFIN administrators and listed on the site. Where the reports appear on the website and which users can see them will be defined in the administrative module of the website.
- Tabular – To begin, the website will include tabular reports for estimate and sample data (more tabular report types may be added at a later date). When running a tabular report the user will have the ability to configure the reports layout (rows, columns, groupings) as well as the filters to apply on the report.
- Ad-Hoc – Ad-hoc reporting may or may not be built into the website. Ad-hoc reporting will allow users to create their own reports without the assistance of RecFIN administrators.

To facilitate understanding of the reports and fishery data, the website will include a dynamic data dictionary and intelligent data warnings (triggered by filter selections).

Misc. Pages

In addition to the areas listed above, the RecFIN.org site will include standard website pages such as About Us, Report a Problem, etc.

User Stories

RecFIN has expressed a desire to have implementation of the new website follow an agile approach. As a result, the requirements and general site overview sections earlier in the document have been translated into the following user stories. To facilitate understanding of the user stories and where they fit in the overall site design the application map includes red markers that can be used for cross-referencing the story IDs while providing a greater level of detail than the general site overview.



RecFINWireframe.pdf

ID	Epic	As a <type of user>	I want to <the goal / action>	In order to <reason>	Req. ID
0a	General	user of the site	access RecFIN.org	view news, reports and learn about what RecFIN does.	W1 - W11
0b	General	user of the site	report a problem	notify RecFIN staff of an issue with the site	W3
1a	Authorization	public user	register	seek approval to view restricted information available through the site	S1, S3, W4, W8
1b	Authorization	registered user	login	access restricted information through the site	S1, S3, L4
1c	Authorization	administrator	manage user accounts	set permissions for the site	S1, S3, S4, W4
1d	Authorization	registered user	retrieve username or password	regain access to restricted information available through the site	W5
1e	Authorization	logged in user	logout	end my session and close access to secured information	S1, S2, S3
1f	Authorization	registered user	edit my account details	update general information and permissions	W4
2a	Administration	administrator	view a list of standard reports	administer standard report settings (e.g. permissions, filters)	R2
2b	Administration	administrator	view a list of Tabular reports	administer Tabular report settings (e.g. permissions, filters, query string)	R1
2c	Administration	administrator	configure standard report general information	display general information when running a standard report	R2
2d	Administration	administrator	configure tabular report general information	display general information when running a data table report (e.g. query string)	R1
2e	Administration	administrator	assign role(s) to a report	limit report access to user roles (course grained)	S1, S3

ID	Epic	As a <type of user>	I want to <the goal / action>	In order to <reason>	Req. ID
2f	Administration	administrator	assign user account(s) to a report	limit report access to specific users (fine grained)	S1, S3
2g	Administration	administrator	assign area(s) to a report	identify what report(s) belong within area specific regions of the site	R21
2h	Administration	administrator	assign reporting category(ies) to a report	identify what report(s) belong in reporting category regions of the site	R17, T2
2i	Administration	administrator	configure filter messages	display a message / warning when user applies certain filters when running reports	R10
2j	Administration	Administrator	Manage content on fishery management landing pages	To keep content fresh and provide relevant and changing information.	
3a	News	administrator	post RecFIN news	communicate to users notable events, messages and general information	W11
3b	News	public user	view RecFIN news	learn about events, projects, RecFIN messages and other general information	W11
4a	Logs	administrator	view website errors	diagnose potential issues with the site	W9
4b	Logs	administrator	view logins	view both users who have accessed the site or tried accessing the site	L4
4c	Logs	administrator	view SQL audit queries	that have been executed against the underlying database	L5
4d	Logs	administrator	view page and report analytics	understand how the site is being used and what reports are being run	L2, L3
5a	Reports	user of the site	select from a list of report types	narrow down list of available reports to run	R1
5b	Reports	user of the site	view a data dictionary	understand the meaning of fields stored within the RecFIN database	T1, T4
5c	Reports	user of the site	request data from RecFIN	obtain data that is not accessible from existing reports	R19
5d	Reports	user of the site	email a report	provide a link that a user can click on to view report with preset filters	R3
6a	Estimates Data	user of the site	configure estimate tabular report and run report	view report results	R9
6b	Estimates Data	user of the site	reset estimate report options	reconfigure report filters and rerun	R9
6c	Estimates Data	user of the site	view known data issues based on selected report filters	be aware of issues with estimate data	R15

ID	Epic	As a <type of user>	I want to <the goal / action>	In order to <reason>	Req. ID
6d	Estimates Data	user of the site	page through estimate report results	limit the number of records displayed on a page	R1
6e	Estimates Data	user of the site	export report results to R-friendly file types	perform independent analysis on estimate data	R6
6f	Estimates Data	user of the site	sort result set values by clicking on column header	organize the estimate data view	R1
7a	Sample Data	user of the site	configure sample data tabular report and run report	view report results	R9
7b	Sample Data	user of the site	reset sample data report options	reconfigure report filters and rerun	R9
7c	Sample Data	user of the site	view known data issues based on selected report filters	be aware of issues with the sample data	R15
7d	Sample Data	user of the site	page through sample data report results	limit the number of records displayed on a page	R1
7e	Sample Data	user of the site	export report results to R-friendly file types	perform independent analysis on sample data	R6
7f	Sample Data	user of the site	sort result set values by clicking on column header	organize the sample data view	R1
8a	Ad-Hoc Tool	registered user	run a custom query	get custom results	R5
8b	Ad-Hoc Tool	registered user	save a query	re-run query at a later time	R7
8c	Ad-Hoc Tool	registered user	view list of saved queries	re-run an existing query without needing to create a new one	R7
8d	Ad-Hoc Tool	registered user	view and download statistical models	perform independent analysis on RecFIN data	R4, R5
9a	Management Categories	user of the site	view a list of categorized management reports	better locate relevant reports	R2
9b	Management Categories	user of the site	see report filter instructions	make informed choices on filter configuration	T1
9c	Management Categories	user of the site	view source data driving reports with charts	verify accuracy of charts and perform independent analysis	R13
9d	Management	user of the site	configure report filters and run report	view report results based on desired filters	R9,R11 , R12

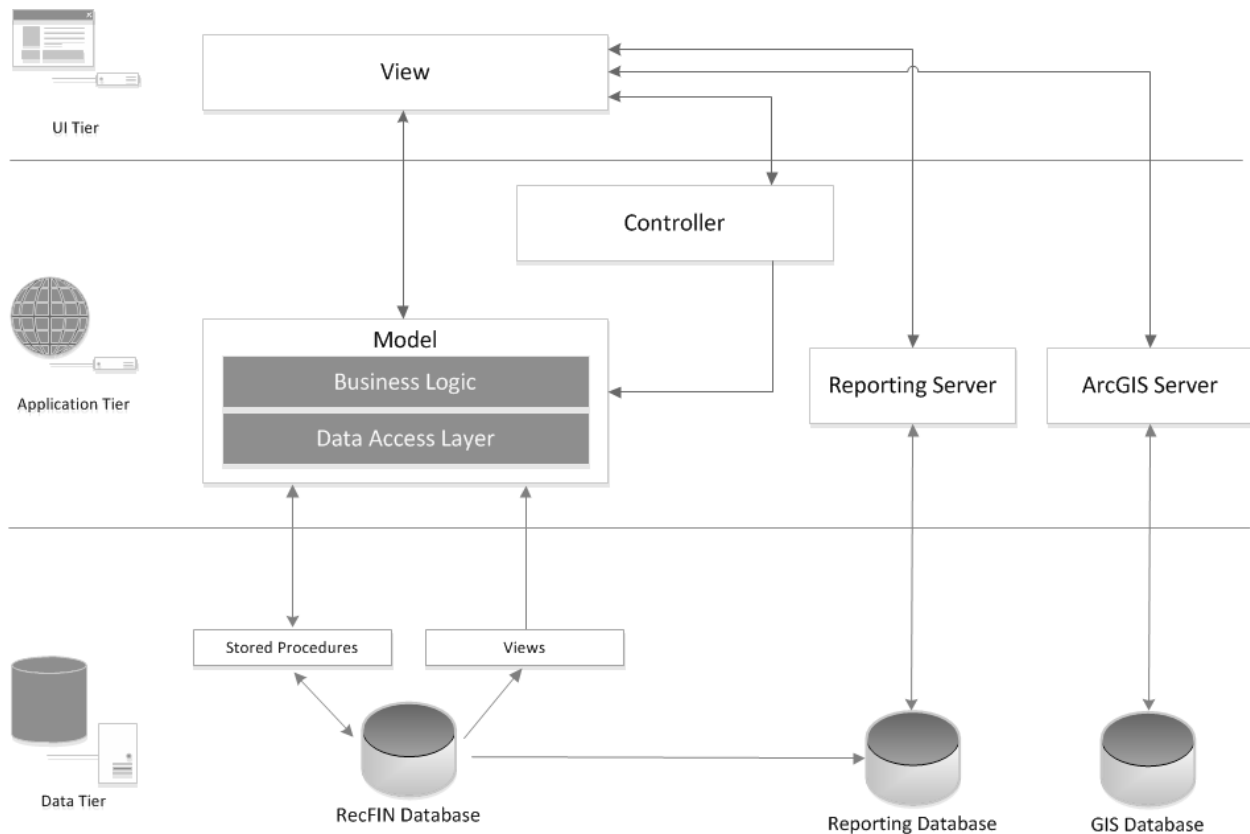
ID	Epic	As a <type of user>	I want to <the goal / action>	In order to <reason>	Req. ID
Categories					
9e	Management Categories	user of the site	update report filters	refresh and refine the report results	R9
9f	Management Categories	user of the site	access Management Category landing page	view general information about management categories and see list of categories	R2, R17
10a	Management Areas	user of the site	view list of reports relevant to the area	better locate relevant reports	R2, R21
10b	Management Areas	user of the site	view and select management areas on a map	refine list of reports beyond the standard list of areas	R20, R21
10c	Management Areas	user of the site	access Management Area landing page	view general information about management areas and see list of areas	R2
11a	Integration	Authorized user	submit data feeds through an API	provide RecFIN with new data	I2
11b	Integration	Authorized Users	query data through an API	obtain RecFIN data without going through web site	I1, I2, I3

The user stories and application map will be key tools for the development team when building the application. The developers alongside RecFIN stakeholders will use the user stories as the Product Backlog for prioritizing work and conducting detail estimates.

Architecture

The high-level design up to this point has largely focused on functional components of the new website's design. This section will focus more on how the website will be built.

The new RecFIN website, reporting system, and database will make use of modern, industry standard technologies that address the previous requirements and high-level design. The website will be distributed across three tiers and will adopt the Model-View-Controller (MVC) architectural design pattern displayed below:



DECISION POINT: The architecture outlined is one of the most common and widely accepted design patterns in modern web design. In addition to being widely accepted, the architecture targets existing RecFIN infrastructure. RecFIN does not anticipate the architecture provided here needing to change significantly during implementation. Any deviation away from this design during implementation should be approved by RecFIN.

MVC

MVC is a software design pattern which divides the application components into three groups based on their functionality. This is done to make the system more stable, and ease ongoing maintenance for developers. These three groups are:

- **Model** – Manages the behavior and data of the application domain, responds to requests for information about its state (usually from the view), and responds to instructions to change state (usually from the controller).
- **View** – Manages the display of information to the user.
- **Controller** – The controller mediates requests and responses between views and models.

The Three Tiers

Based on the anticipated server setup and requirements, three tiers have been identified. A tier is a logical layer of the application and each is explained below:

- **Data Tier** – Consists of the databases themselves and all the database objects (Tables, Views, Stored Procedures, etc.) which make up the database, along with the data. Stored Procedures and Views will be used to expose the data to the application tier. Direct table access will not be used.
- **Application Tier** – Responsible for data access and business logic. Models and Controllers are included in this tier because they are internal to the application and not visible to the users. This application tier will reside on a Windows server running IIS.
- **User Interface Tier** – Consists of the application views which are used to present the User Interface. This tier is generated on the server and sent to the user's web browser for display.

Security and Error Logging

Spanning the application tiers and MVC organization are objects to facilitate security and error logging.

Security

Most of the RecFIN website and its reports are publicly available but some contain confidential data which requires a user account to access. There are three levels of access to the website:

- **Public** – Any user can access the public areas of the site. No user account or login is required.
- **Restricted** – User account is required and access is only granted by RecFIN staff. User can access public and restricted reports.
- **Administrator** – User has access to all pages and reports.

User and Role management will be defined in the data tier and access control will be used to execute stored procedures or select from views. The application tier will contain business logic to control access to pages on the RecFIN website and to show and hide restricted reports based on the reports security configuration.

The security model developed for the RecFIN.org re-build should take a least-privileged user account approach. In addition, while the implementer has certain latitude in implementation level details, RecFIN stakeholders expect the security model to adhere to industry standard best practices.

Error Logging

Any errors in the application or database code will be logged in the database error log.

Reporting

Key to the RecFIN website will be the reporting component which will give users the ability to run standard, tabular and ad-hoc reports.

Standard Reports

Standard reports will be developed targeting SQL Server Reporting Services (SSRS). The reports once designed will be published and viewable through a report viewer control embedded into the RecFIN website. Whether a report is viewable or not will be determined based on the users permissions.

The expressed desire is that reports can be developed external to the website and published to the site with little or no coding to the website. Because SSRS is not naturally built for external facing reporting, the implementer must take extra precautions during implementation to ensure PSMFC IT resources and the RecFIN SQL Server remain secure.²

Reports can also be built to run in a disconnected mode from the report server. While this reduces security concerns it increases the complexity of the application and the deployment of new reports. Report definition files (.rdlc file type) will need to include a data source (DataTable) as part of the report.

Tabular Reports

Where standard reports target SSRS, the implementer will have flexibility in how tabular reports are built, so long as they achieve the following:

- Can leverage the security and logging infrastructure of the RecFIN website
- Allow users to freely define column and row headers
- Meets relevant high priority reporting requirements

Ad-Hoc Reports

Ad-Hoc reports and querying will allow users to generate their own queries and reports without the assistance of RecFIN staff. Ad-Hoc reporting capabilities may or may not be built within the RecFIN website. The implementer has flexibility in the design and development of an ad-hoc reporting solution as long as it:

- Does not have direct access to the underlying RecFIN database tables
- Does not result in performance issues for RecFIN website
- Does not expose sensitive information
- Meets relevant high priority reporting requirements

² See Microsoft online documentation detailing SSRS deployment considerations:
[https://technet.microsoft.com/en-us/library/ms159272\(v=sql.105\).aspx](https://technet.microsoft.com/en-us/library/ms159272(v=sql.105).aspx)

Map Component

A web map with a tool to run spatial queries will be integrated into the website using the ArcGIS API for JavaScript.³ This component of the application will rely on ArcGIS map services to retrieve the results of spatial queries.

UI / UX Design

The actual appearance and UI design of the site will be determined during implementation but should follow the PSMFC standard website style guide:



PSMFC Website
Style Guide

Technology Selection

SQL Server and SQL Server Reporting Services have been selected as the Database and Reporting solutions for RecFIN. Beyond that, specific technologies selected will be up to the implementer working closely with RecFIN. With that said, based on analysis and design work conducted during the preparation of the implementation plan, the following technologies are recommended:

- HTML5/CSS3/JavaScript for the user interface tier
- Microsoft .NET Framework 4.5, C#/VB .NET, ASP .NET MVC5 for UI and application tiers
- Entity Framework 5 for data access in the application tier
- Transact-SQL (stored procedures and views) for the data tier
- [ELMAH](#) library for error logging
- ASP .NET and SQL Server for security

NOTE: Leveraging a CMS solution for the rebuild of the RecFIN.org site was considered, however, due to the complexity that would come from developing a custom report administrative module within a CMS, security considerations and the desire to maintain a consistent technology stack across all tiers, a custom solution using Microsoft technologies is recommended. For additional detail on recommendation see Appendix A.

³ <https://developers.arcgis.com/javascript/>

Project Plan

Intended Audience: RecFIN Stakeholders

Where the Requirements and High-Level Design sections outline the needs and vision for the new RecFIN website, the Project Plan sets out to identify what it will take to implement the solution as designed. The plan will include the information necessary for RecFIN to plan and budget for the implementation phase.

Approach

RecFIN has indicated they would prefer an agile methodology be followed during the implementation phase. By taking an agile approach RecFIN and the development team will participate in short iterative cycles (ranging from 2 to 4 weeks) that allow the team to adapt and address new and changing requirements. Fundamental to the agile process will be the product backlog which is a list of requirements (see [user stories](#)) that can be drawn on and refined throughout the project. At the beginning of each iteration, the product owner at RecFIN will review and prioritize the backlog. Once the backlog has been prioritized, a brief planning session will take place involving the full project team. During the planning the team will pull from the prioritized list of requirements in the backlog and detail out the tasks required to achieve the stated requirements.

Immediately following the planning session the team will set out to perform detailed design (building of the [high-level design](#)), implementation, testing and documentation for the individual requirements they were assigned or volunteered for. These activities will continue throughout the iteration until the end when it is expected that all task work is completed and production ready.

Work Breakdown Structure

While the agile approach lends itself to changing priorities that may alter the scope of the implementation phase, the high-level design does provide enough detail to where a work breakdown structure can be formed based on the most-likely tasks required to achieve the project's requirements.

Type	Priority	Difficulty	Description	Responsibility
Initiation	High	Low	Project Kickoff and Initiation	Implementer, RecFIN
Initiation	High	Low	Establish project collaboration tools	Implementer, RecFIN
Initiation	High	Medium	Work with RecFIN to update the product backlog and high-level design	Implementer, RecFIN
Initiation	High	Medium	Review project plan and schedule	Implementer, RecFIN
Database	High	High	In coordination with RecFIN staff update database model.	RecFIN, Implementer
Database	High	High	In coordination with RecFIN staff assist with needed ETL, data mapping and supplemental data.	RecFIN, Implementer
Infrastructure	Medium	Low	Setup database backups	Implementer, RecFIN

Type	Priority	Difficulty	Description	Responsibility
Infrastructure	High	Low	Define and document development standards for the project.	Implementer, RecFIN
Infrastructure	High	Low	Setup source code repository	Implementer
Infrastructure	High	Low	Ensure Web Application Server is setup and configured	RecFIN, Implementer
Infrastructure	High	Medium	Setup Base Solution (site logging, security, mater/layout page, routing, etc.)	Implementer
Infrastructure	High	Low	Setup automated notification capabilities	Implementer, RecFIN
Infrastructure	Medium	Medium	GIS Capabilities	Implementer, RecFIN
Administration	High	Low	Base Administration Page	Implementer
Administration	High	Low	General News Administration Functionality	Implementer
Administration	Medium	Medium	Integration of external news sources	Implementer
Administration	High	Medium	User Administration Functionality	Implementer
Administration	High	Low	Base Report Administration Page	Implementer
Administration	High	Medium	Standard Reports Administration	Implementer
Administration	High	High	Standard Reports Filter Message Configuration	Implementer
Administration	Medium	High	Tabular Reports Administration	Implementer
Administration	High	High	Tabular Reports Filter Message Configuration	Implementer
Administration	Medium	Low	Base Logs Page	Implementer
Administration	Medium	Low	Error Logs Page	Implementer
Administration	Medium	Low	Login Attempts Logs Page	Implementer
Administration	Medium	Low	SQL Queries Logs Page	Implementer
Administration	Low	Low	Google Analytics Logs Page	Implementer
Administration	Medium	Medium	Base Fishery Management Content Administration	Implementer
Administration	Medium	Medium	Categories Administration Page	Implementer
Administration	Medium	Medium	Areas Administration Page	Implementer
General	High	Low	Home Page	Implementer
General	High	Low	Navigation Menu	Implementer
General	High	Low	About Us Page	Implementer
General	High	Low	Report a Problem Page	Implementer
General	High	Low	News Page	Implementer
Authorization	High	Low	Registration Page	Implementer
Authorization	High	Low	Login Page	Implementer
Authorization	High	Low	Password Reset Page	Implementer
Authorization	High	Low	Retrieve username/password page and process	Implementer
Fisheries Management	High	Medium	Fisheries Management Landing Page	Implementer, RecFIN

Type	Priority	Difficulty	Description	Responsibility
Fisheries Management	High	Low	Biological Data Landing Page	Implementer, RecFIN
Fisheries Management	High	Low	Fisheries Economics Landing Page	Implementer, RecFIN
Fisheries Management	High	Low	Groundfish Landing Page	Implementer, RecFIN
Fisheries Management	High	Low	Halibut Management Landing Page	Implementer, RecFIN
Fisheries Management	High	Low	Highly Migratory Landing Page	Implementer, RecFIN
Fisheries Management	High	Low	Salmon Management Landing Page	Implementer, RecFIN
Fisheries Management	High	Low	Stock Assessment Landing Page	Implementer, RecFIN
Fisheries Management	High	Low	Coastwide Landing Page	Implementer, RecFIN
Fisheries Management	High	Low	California Landing Page	Implementer, RecFIN
Fisheries Management	High	Low	Oregon Landing Page	Implementer, RecFIN
Fisheries Management	High	Low	Washington Landing Page	Implementer, RecFIN
Fisheries Management	High	Medium	Fisheries Management Area Map Tool	Implementer, RecFIN
Reports	High	High	Standard Report Viewer and Report Setup	Implementer, RecFIN
Reports	High	High	Sample Data Tabular Report and Report Setup	Implementer, RecFIN
Reports	High	High	Estimate Tabular Report and Report Setup	Implementer, RecFIN
Reports	Low	High	Ad-Hoc Query and Reports	Implementer, RecFIN
Reports	Medium	Low	Statistical Models	Implementer, RecFIN
Reports	Medium	Low	Data Request Tool	Implementer, RecFIN
Reports	High	Low	Data Dictionary	Implementer, RecFIN
Reports	High	Low	Email a Report Functionality	Implementer, RecFIN
Reports	Medium	Low	Report - Secured State Data Files	Implementer, RecFIN
Reports	High	Low	Report - Metric Tons of Recreational Impacts for Current Year GMT scorecard species	Implementer, RecFIN
Reports	High	Low	Report - Number of Angler Trips (in thousands) - Effort Summary	Implementer, RecFIN

Type	Priority	Difficulty	Description	Responsibility
Reports	High	Low	Report - Number of angler Trips (in thousands) - State Details	Implementer, RecFIN
Reports	High	Low	Report - Total OY Species Details - States Combined	Implementer, RecFIN
Reports	High	Low	Report - SAFE Tables by State - Catch by Catch Type	Implementer, RecFIN
Reports	High	Low	Report - Estimate Status Report	Implementer, RecFIN
Reports	High	Low	Report - Scorecard report for key rockfish species tracking catch toward harvest goals	Implementer, RecFIN
Reports	High	Low	Report - Scorecard report for Pacific halibut tracking catch toward harvest goals	Implementer, RecFIN
Reports	High	Low	Report - Scorecard report for highly migratory species tracking catch toward harvest goals	Implementer, RecFIN
Reports	Low	Low	Report - Length Frequency Plots and Size Analysis	Implementer, RecFIN
Reports	Low	Low	Report - Angler Bag Frequency Plots and Size Analysis	Implementer, RecFIN
Reports	High	Low	Report - Code Lookup Lists	Implementer, RecFIN
Reports	Medium	Low	Report - Survey Sampling Reports	Implementer, RecFIN
Reports	Low	Low	Report - CRFS Estimates	Implementer, RecFIN
Reports	Low	Low	Report - CRFS On-Board Charter Location	Implementer, RecFIN
Reports	Low	Low	Report - CRFS Dockside Boat Fishing Location	Implementer, RecFIN
Reports	Low	Low	Report - ORBS On-board Charter Location Data	Implementer, RecFIN

Estimates for low difficulty tasks range from 1-20, medium difficulty 21-40 and high difficulty 41-80 hours.

NOTE: The task list provided here should only be used for project planning, actual estimates to deliver functional features during development should occur using the product backlog and during iteration planning.

Assumptions

- Given capacity considerations, RecFIN anticipates needing some level of database design assistance.
- RecFIN staff will carry out the historical data load process but may require assistance loading data into the adjusted model.
- Software licensing and hardware costs will be covered by RecFIN.
- The development team for the project will have at least one expert in each of the required technologies.
- The development team of the project will have an understanding or experience working with fisheries data.

Risk Assessment

Intended Audience: RecFIN Stakeholders and Implementer

This section identifies potential risks, estimates severity of each risk and describes preventive measures that can be taken.

Time between the roadmap development and implementation

Because the creation of the development roadmap and implementation are distinct projects, the greater amount of time between the two phases, the more likely the business processes, requirements and versions of technology can change.

The severity of this risk depends on the amount of time between the two phases. If within six months, it's unlikely much will change. After six months, the design will continue to become less relevant and additional re-work may be required when implementation work begins.

The risk can be avoided by beginning the implementation phase of the project as soon as possible.

Limited web development experience and technical resources in RecFIN

With limited internal technical resources, RecFIN may need to rely on external resources to address bugs or required enhancements to the web application after the implementation phase concludes.

The likelihood of changes being needed after the new web application and reports have been built is high. The severity of this risk to RecFIN will depend on whether or not critical issues are encountered after the implementation phase concludes and the support period ends.

To mitigate this risk RecFIN can institute the following preventive measures:

- Negotiate an extended support/warranty period after initial development
- Play a highly active role in user testing
- Encourage implementer to adopt a methodology that will allow for longer periods of end user testing
- Encourage implementer to have a comprehensive testing strategy in place

- Ensure the implementer provides comprehensive and easy to follow documentation
- Develop / obtain in-house expertise
- Offload as much of the business logic and processing to the database or files that RecFIN staff can maintain themselves either through existing tools or custom built administrative forms.

Running old and new web applications in parallel during development

Developing a new application while maintaining and supporting the legacy application will further reduce limited technical resources at RecFIN. This risk is further elevated by mitigation factors in the previous section that look to make RecFIN staff an integral part of the development effort.

The likelihood that running the two applications in parallel will present problems is high. To mitigate the risk the following measures can be taken:

- Focus on having the SQL Server database synchronized with the existing SAS files before beginning heavy implementation of the reports and web application
- Include audit queries / reports that highlight differences between old and new data sets (to limit debugging in the application and reports)
- Define an implementation schedule that will space out development tasks so that RecFIN staff can properly balance their time between new implementation and ongoing support
- Limit the duration of time in which both applications are being run in parallel by prioritizing task work in such a way that essential existing functions are replaced first

Moving target on data model design and development between RecFIN and State Agencies

While RecFIN is designing and developing a new database the state agencies have similar projects underway. The re-design of state agency database(s) may result in challenges in the structure of data and how it's organized which may create complications when trying to load the RecFIN database and reconcile data between the different organizations.

Unless there are substantial changes to the data collected and how it relates to one another, the risk that efforts underway at the state agencies will complicate matters for RecFIN is moderate. RecFIN can further reduce this risk by:

- Collaborating with state agencies during the design of the database
- Avoid significant re-engineering of the database after reporting and implementation of the website has begun
- Ensuring the database is designed by an expert with an understanding of recreational fishery data
- Avoid designing the database to closely meet one state agencies design if the rules/requirements of other agencies are conflicting
- RecFIN should designate a subject matter expert to the database design team who has an understanding of past and future data requirements (ideally for both RecFIN and the state agencies).

Standard Project Risks

In addition to the risks outlined above some common risks that should be discussed and planned for at the onset of the implementation project are:

- Scope creep
- Budget and schedule overruns
- Team turnover

Appendix A – Content Management System (CMS) Recommendation

During a January 7, 2015 design meeting at PSMFC the question was raised whether a Content Management System (CMS) would be used to manage the content of RecFIN website. While there was an expectation that there would be administrative functionality to manage users, reports and news, the question when raised re-established a focus on the technology selection decision, which initially was a custom solution leveraging Microsoft technologies.

This analysis sets out to define what a CMS is before weighing the pros and cons of using a site wide CMS. The analysis will conclude with a recommendation based on current understanding of RecFIN's needs relative to the pros and cons outlined.

Definition:

A CMS is generally understood to be a platform that provides administrators with tools that can be used to manage the content of a web site. There are a number of widely known and used CMS solutions, below are some of the more popular that are available today:

- WordPress
- Drupal
- Joomla
- DotNetNuke (DNN)

With each CMS, users are provided with a platform in which they can manage the look and feel of their site without needing to write a bunch of custom code. Because of this, CMS solutions have grown in popularity, especially as the importance in maintaining fresh site content has increased.

The Pros:

Each CMS offers a large number of plugins or extensions that can be integrated into the CMS to provide specific functionality and a general look and feel without a lot of custom coding. Without needing to do a lot of custom coding administrators can update and maintain the site without a strong background in programming. For example, if the site administrator wanted to add a news feed to their website in which the news articles were in a horizontal slider, there is likely a plugin that has been developed in the community that can be integrated into the site with limited effort (and very little coding). In addition to providing a framework that allows sites to be built and maintained with ease, CMS solutions include the following strengths:

- Search Engine Optimization (SEO) – CMS systems are typically structured in such a way that they can improve search engine rankings for an organization without a deep understanding of SEO.
- Preview Functionality – In most CMS systems the administrator can preview the changes before publishing them to the public.
- Versioning – Source and version control is often built into the CMS (depending on the type of CMS) so administrator aren't required to setup version and source control tools independent of the solution.
- Cost – The cost of developing a web site using a CMS may be lower because a lot of the web sites infrastructure does not have to be built from the ground-up.

The Cons:

While it's true that CMS solutions facilitate quick development of websites without a deep understanding of software development; that strength can also prove to be a weakness for the following reasons:

- Security – By relying on plugin / extensions from the community an organization opens up the opportunity for being hacked since many of the plugins come from untrusted sources. In addition, CMS systems are often targeted by hackers so vulnerabilities when found can lead to a site becoming compromised until the plugin is patched and the site administrator applies the updates (this requires that the administrator keep plugins up to date).
- Resource Usage – Because CMS systems try and be everything to everyone they tend to use more server resources.
- Customization – CMS systems enforce a particular paradigm upon the website which can be detrimental to custom development. When there are requirements for a custom module to the site the complexity may actually be higher since an understanding of coding will be needed. In addition, often the coder is constrained to developing within the infrastructure of the CMS, which can be complex and not directly geared toward the infrastructure of the organization.
- Quality Control – The quality of a CMS sites is often reduced since the site administrator who is making the changes directly publishes the changes live. Because of the ease in pushing out changes a formal and controlled software development methodology is not usually applied increasing the opportunity that mistakes are made public.

Recommendation:

While CMS systems can simplify the creation of a site and subsequent updates to that site, the requirements of RecFIN.org are such that custom development will be required regardless. Because the reporting module will be the most substantial component of the site it is anticipated that it will require the most development time. We believe that development time will actually decrease if the module can be integrated into a custom built infrastructure, rather than extending a CMS system to include this custom component. Further, RecFIN has expressed the desire that the technologies be consistent across the full application stack. With SQL Server being a predetermined technology for the project it makes the most sense that development target the Microsoft .NET framework. **Based on the complexity of developing a custom reporting module for a CMS and an expressed interest to leverage Microsoft technologies, RDI recommends that a custom solution be built without the use of a CMS.** The custom solution should include administrative functionality (interactive user interfaces) that facilitate maintenance of user accounts, news and reports.