

# BaseSpace™ Clarity LIMS

Efficient sample and workflow management for Illumina next-generation sequencing and arrays.

## Highlights

- Intuitive, role-based interfaces**  
 Enables sample traceability and real-time status monitoring
- Illumina preset protocols**  
 Expedites adoption of new workflows with ready-to-use protocols
- Out-of-the-box integration with Illumina instruments**  
 Streamlines workflow development by eliminating the need to code integration touchpoints from scratch
- Built-in features for audit trails, e-signatures, and escalations**  
 Maintains compliance with regulatory standards

## Introduction

Many genomics labs face multiple information management challenges, such as frequently changing lab workflows, integration of rapidly evolving instruments and tools, cross-organizational collaborations, stringent regulatory compliance standards, and overloaded IT and informatics teams. Responding to these issues can require significant investments of time and resources.

To help labs address these challenges, Illumina offers BaseSpace Clarity LIMS, an innovative laboratory information management system (LIMS) (Figure 1). BaseSpace Clarity LIMS enables labs to run samples more quickly, track them effortlessly, and achieve or maintain regulatory compliance efficiently. BaseSpace Clarity LIMS is easy to use, implement, and configure. It includes the following features:

- Sample traceability and real-time status monitoring
- Preset protocols
- Instrument integration
- Automation
- Regulatory support
- Configurability
- Extensibility



Figure 1: BaseSpace Clarity LIMS—The overview dashboard allows users to view all active workflows easily.

## Intuitive, role-based interfaces

Bench scientists, managers, IT, and bioinformatics all have different computer skill levels and comfort with software applications. These roles don't interact with the LIMS in the same way because each one has specific tasks they need to accomplish. BaseSpace Clarity LIMS features different user interfaces that are tailored to the skill set and interaction of each lab role. It includes interfaces for the lab manager, lab scientist, and collaborator.

## End-to-end sample traceability

Each sample entered into BaseSpace Clarity LIMS is given a unique identifier (LIMS ID). As lab activities are recorded in BaseSpace Clarity LIMS, the resulting sample histories (sample genealogies) are automatically created and associated with the LIMS ID from sample quality control (QC) through data analysis (Figure 2).

Sample tracking enables you to:

- Organize samples by workflow stages in the lab
- Retrieve all metadata and results associated with any submitted sample
- Keep detailed records of sample information, including date stamps for work processed, technician information, instrument ID, container IDs, and reagent lot numbers or barcodes
- Store and search all results in a centralized secure location
- Plan operations through real-time workflow tracking
- Catch poor quality samples before analyzing them

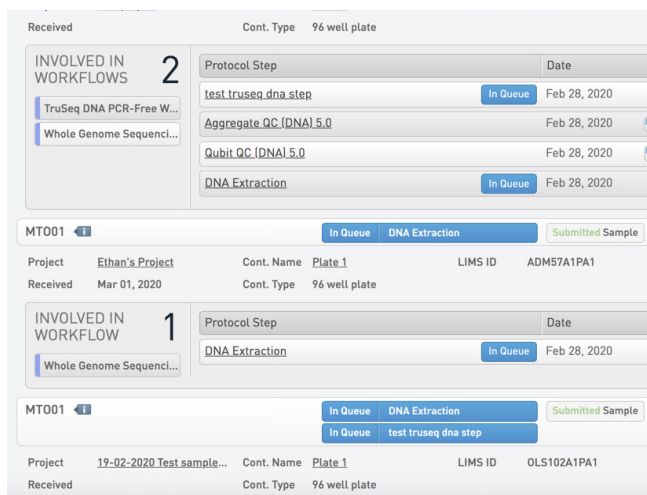


Figure 2: Sample traceability in BaseSpace Clarity LIMS

## Real-time status monitoring

Lab managers need to pinpoint bottlenecks in the wet lab quickly, understand project or sample progress in real-time, and resolve issues before they delay results delivery. BaseSpace Clarity LIMS includes mobile supported real-time status tools, such as Dashboards, for lab managers (Figure 3).

## Dashboards

The Lab Manager Dashboard views in BaseSpace Clarity LIMS allow multitasking lab managers to use collected data within the LIMS to inform future operations. BaseSpace Clarity LIMS dashboards display the number of samples currently in progress throughout the lab and where the samples are in the pipeline, all without running queries or building a custom report. Lab managers can view real-time key data, such as sample or project status, completion date, and alert messages, so that stakeholders or collaborators can be updated without the need to sort through multiple data sources.

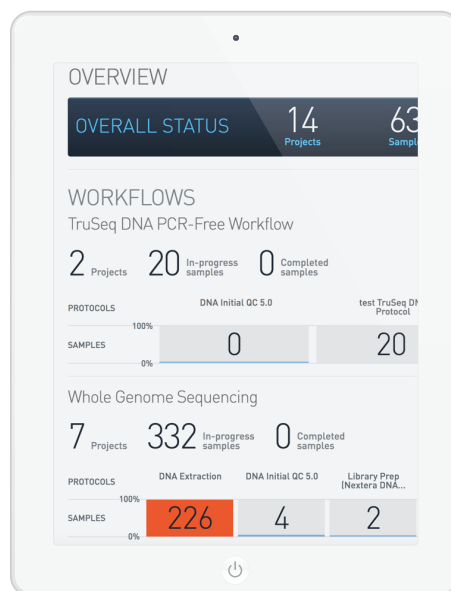


Figure 3: Mobile-supported dashboard for real-time monitoring

## Illumina preset protocols

BaseSpace Clarity LIMS offers more than 30 preset protocols for popular next-generation sequencing (NGS) applications (Table 1). These preset protocols are based on Illumina reference guides for optimal results. They allow labs to install, chain preset protocols together to create workflows that best suite the lab's needs and adopt BaseSpace Clarity LIMS faster. Preset protocols also aid lab staff in experimental planning and performing complex tasks such as assigning indexes, sample sheet generation, and calculation of dilution volumes for library normalization.

## Instrument integrations

Genomics technologies are complex and many labs struggle to keep pace with integrating new technology, instruments, and methodologies. BaseSpace Clarity LIMS is built specifically for genomics labs to simplify the integration process. These instrument integrations automate manual tasks, reduce errors, and enforce lab and industry best practices. Instrument integrations are available for many common QC, sample preparation, and assay instruments, such as NGS, microarrays, and RT-PCR.

Table 1: Preset protocols in BaseSpace Clarity LIMS v5.3

16S rRNA sequencing	Genotyping by sequencing	Targeted DNA sequencing
Nextera™ XT DNA Library Preparation Kit	AmpliSeq for Illumina Custom DNA Panel	AmpliSeq for Illumina TCR beta-SR Panel
Amplicon sequencing	TruSeq DNA Nano	MiSeq™ Dx Cystic Fibrosis 139-Variant Assay
AmpliSeq™ for Illumina <i>BRCA</i> Panel	TruSeq DNA PCR-Free	MiSeqDx Cystic Fibrosis Clinical Sequencing Assay
AmpliSeq for Illumina Cancer Hotspot Panel v2	Immunosequencing	Nextera Flex for Enrichment
AmpliSeq for Illumina Childhood Cancer Panel	AmpliSeq for Illumina Immune Response Panel	Nextera Rapid Capture Custom Enrichment Kit
AmpliSeq for Illumina Comprehensive Cancer Panel	TruSight Oncology 500	TruSeq Methyl Capture EPIC Library Preparation Kit
AmpliSeq for Illumina Comprehensive Panel v3	Long-read sequencing	TruSight Myeloid Sequencing Panel
AmpliSeq for Illumina Custom DNA Panel	Nextera Mate Pair Library Preparation Kit	TruSight Oncology 500
AmpliSeq for Illumina Custom RNA Fusion Panel	Methylation sequencing	TruSight Oncology 500 ctDNA
AmpliSeq for Illumina Custom RNA Panel	TruSeq Methyl Capture EPIC Library Preparation Kit	TruSight Tumor 15
AmpliSeq for Illumina Exome Panel	mRNA and small RNA sequencing	TruSight Tumor 170
AmpliSeq for Illumina Focus Panel	TruSeq Small RNA Library Preparation Kit	Targeted RNA sequencing
AmpliSeq for Illumina Immune Repertoire Plus, TCR beta Panel	mRNA sequencing	AmpliSeq for Illumina Comprehensive Panel v3
AmpliSeq for Illumina Immune Response Panel	AmpliSeq for Illumina Transcriptome Human Gene Expression Panel	AmpliSeq for Illumina Custom RNA Fusion Panel
AmpliSeq for Illumina Myeloid Panel	SureCell WTA 3' Library Preparation Kit for the ddSEQ System	AmpliSeq for Illumina Custom RNA Panel
AmpliSeq for Illumina On-Demand Panel	TruSeq RNA Exome	AmpliSeq for Illumina Immune Repertoire Plus, TCR beta Panel
AmpliSeq for Illumina TCR beta-SR Panel	TruSeq RNA Library Preparation Kit v2	AmpliSeq for Illumina Immune Response Panel
Nextera DNA Flex Library Preparation Kit	TruSeq Stranded mRNA	AmpliSeq for Illumina Myeloid Panel
TruSeq™ Custom Amplicon Kit Dx	Shotgun sequencing	AmpliSeq for Illumina TCR beta-SR Panel
TruSight™ Myeloid Sequencing Panel	Nextera DNA Flex Library Preparation Kit	AmpliSeq for Illumina Transcriptome Human Gene Expression Panel
TruSight Tumor 15	Nextera XT DNA Library Preparation Kit	TruSeq Targeted RNA Expression Library Preparation Kits
ChIP-Seq	TruSeq DNA Nano	TruSight Oncology 500
TruSeq ChIP Library Preparation Kit	TruSeq DNA PCR-Free	TruSight RNA Fusion Panel
Custom sequencing	Target enrichment	TruSight Tumor 170
AmpliSeq for Illumina Custom DNA Panel	Nextera Flex for Enrichment	Whole-genome sequencing
AmpliSeq for Illumina Custom RNA Fusion Panel	Nextera Rapid Capture Custom Enrichment Kit	Nextera DNA Flex Library Preparation Kit
AmpliSeq for Illumina Custom RNA Panel	TruSight Oncology 500	Nextera Mate Pair Library Preparation Kit
Nextera DNA Flex Library Preparation Kit	TruSight Oncology 500 ctDNA	Nextera XT DNA Library Preparation Kit
Nextera Rapid Capture Custom Enrichment Kit	TruSight RNA Fusion Panel	TruSeq DNA Nano
TruSeq Custom Amplicon Kit Dx	TruSight Tumor 170	TruSeq DNA PCR-Free
De Novo sequencing	Targeted DNA sequencing	Whole-transcriptome sequencing
Nextera DNA Flex Library Preparation Kit	AmpliSeq for Illumina <i>BRCA</i> Panel	TruSeq Stranded Total RNA
Nextera Mate Pair Library Preparation Kit	AmpliSeq for Illumina Cancer Hotspot Panel v2	
Nextera XT DNA Library Preparation Kit	AmpliSeq for Illumina Comprehensive Cancer Panel	
Exome sequencing	AmpliSeq for Illumina Comprehensive Panel v3	
AmpliSeq for Illumina Exome Panel	AmpliSeq for Illumina Custom DNA Panel	
AmpliSeq for Illumina Transcriptome Human Gene Expression Panel	AmpliSeq for Illumina Focus Panel	
Nextera Flex for Enrichment	AmpliSeq for Illumina Myeloid Panel	
TruSeq RNA Exome	AmpliSeq for Illumina On-Demand Panel	

Protocols listed are available in the current version of BaseSpace Clarity LIMS v5.3; new protocols will be added with new software updates.

## Regulatory support

BaseSpace Clarity LIMS provides a comprehensive solution for laboratories working in regulated environments, such as Clinical Laboratory Improvement Amendments (CLIA)-certified organizations or those regulated under 21 CFR Part 11, to achieve or maintain certification and compliance. The system provides key features for CLIA and other regulated labs, including:

- Data entry enforcement
- Workflow enforcement
- Issue resolution documentation
- Precision monitoring
- Role-based permissions
- Audit trail
- Electronic signatures
- Optional validation services

## Secure, remote collaboration with LabLink

Laboratories generating genomics data may be working with customers and partners across the hall or across the globe. These customers or partners need a secure mechanism for communicating with the lab on sample submission, status, and results delivery without sending multiple emails, accessing shared spreadsheets, or making phone calls. BaseSpace Clarity LIMS provides the LabLink interface (Figure 4) to enable external clients to:

- View and retrieve results securely
- Submit contextual sample information
- View sample and project status securely
- Access self-service status updates
- Transfer information directly from the LIMS without manual data entry

## Automation with liquid-handling robotics

Reducing the amount of manual interaction with a system supports the reporting of accurate real-time documentation, reduces errors, and speeds the turnaround time from sample receipt to data acquisition. BaseSpace Clarity LIMS enables qualified staff to automate a wide variety of functions such as:

- Assigning samples to workflows
- Defining sample placement and container type (Figure 5)
- Pooling samples (Figure 5)
- Adding reagent labels to samples
- Assigning next steps in the workflow

Clinical and high-throughput laboratories must significantly shorten sample turnaround time and reduce the possibility of errors in sample preparation. One key method for dramatically improving performance in these areas is to introduce automation. BaseSpace Clarity LIMS includes support for liquid-handling robotics and enables the automation of many LIMS functions.

BaseSpace Clarity LIMS automatically informs liquid-handling robotics on sample placement location and container types, as well as track and record any information reported by robotics. Specifically, the liquid-handling robotics support in BaseSpace Clarity LIMS enables automation of sample placement and output sample creation and track instrument logs (Figure 5).

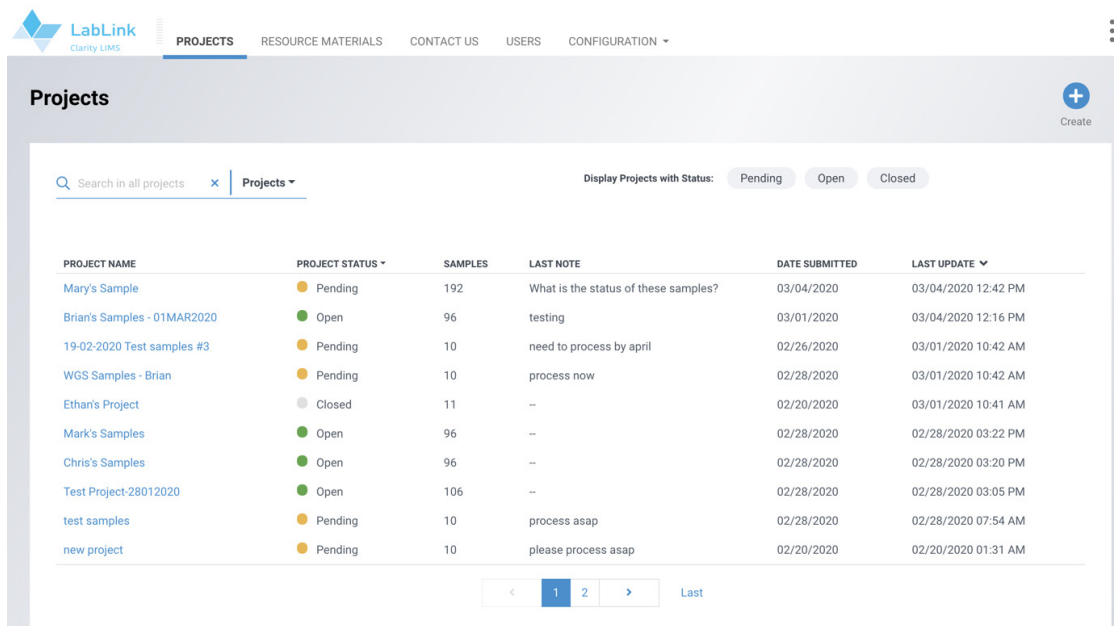


Figure 4: BaseSpace Clarity LIMS LabLink

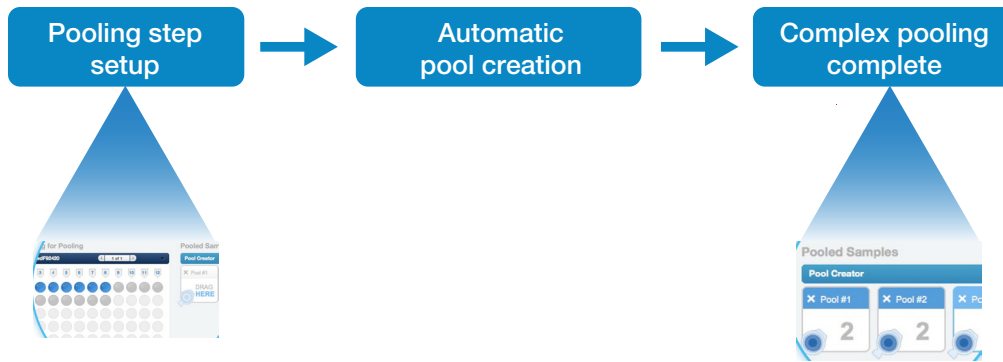


Figure 5: Example automated sample pooling in BaseSpace Clarity LIMS

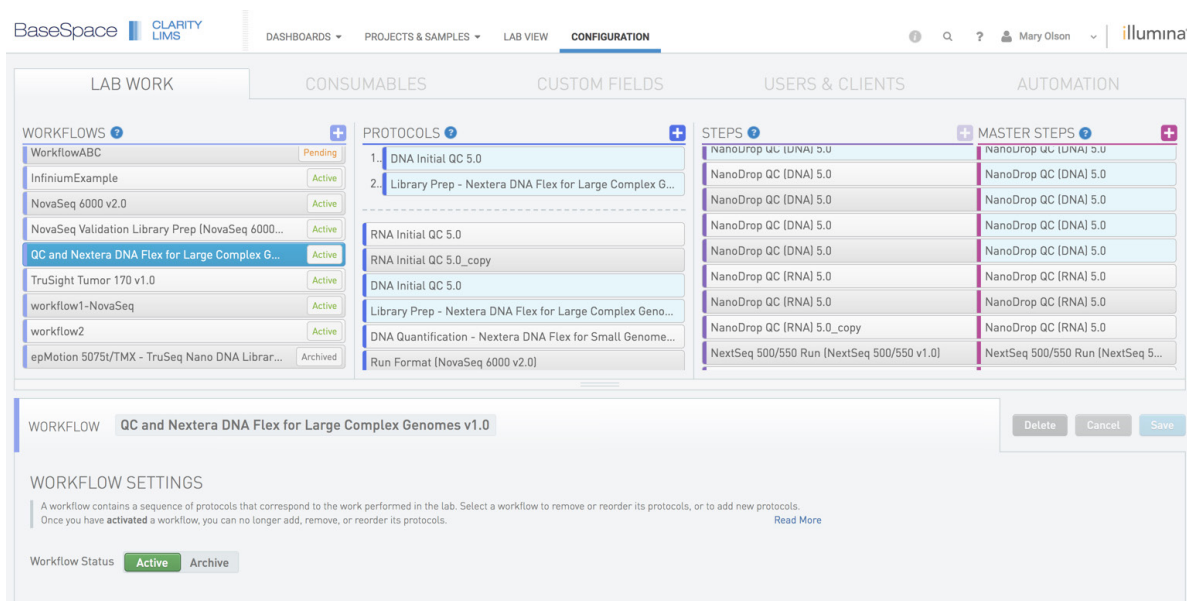


Figure 6: New workflow configuration in BaseSpace Clarity LIMS

## Configurability

Typically, adding new protocols to support new technologies to a LIMS requires significant software development resources. BaseSpace Clarity LIMS puts lab managers in control without the need for new software coding. Via the user interface, lab managers can easily add new protocols, fields, and workflows and control what other staff members can view or edit, all with a few clicks (Figure 6).

## Extensibility

As with bench protocols, analysis methodologies and technologies evolve and laboratories require a LIMS that can evolve with them. BaseSpace Clarity LIMS provides the Application Programming Interface (API) to empower customers to integrate various analysis and third-party tools, as well as, automate processes and integrate robotics.

The API uses technologies in other software and instrument systems; provides detailed documentation, how-to videos, example cookbooks; and packages written and published by other customers. The API allows qualified users to:

- Automate sample tracking to ensure quality results
- Incorporate new analysis methods
- Automate the transfer of data from an instrument or other systems to the LIMS

**Table 2: BaseSpace Clarity LIMS subscriptions**

Feature	Professional	Enterprise
Sample traceability	✓	✓
Preset protocols	✓	✓
Out-of-the-box Illumina instrument integrations	✓	✓
Dashboard reporting	✓	✓
Data and workflow enforcement	✓	✓
API access with toolkits	✓	✓
Lablink for sample submission	✓	✓
Web interface workflow configuration	✓	✓
Database read-only access		✓
LDAP for single sign-on		✓
HIPAA/PHI instance		✓
Deployment	Cloud	Cloud

## BaseSpace Clarity LIMS subscriptions

From small, regulated institutions to large commercial or academic genomics centers, there's a BaseSpace Clarity LIMS that fits the needs of every customer (Table 2). BaseSpace Clarity LIMS is available in two subscription plans, renewed annually.

### Learn more

For more details on BaseSpace Clarity LIMS, visit [www.illumina.com/informatics/sample-experiment-management/lims.html](http://www.illumina.com/informatics/sample-experiment-management/lims.html)

Read about BaseSpace Clarity LIMS in the Illumina Informatics blog at [blog.software.illumina.com/2020/03/11/back-in-action-clarity-lims/](http://blog.software.illumina.com/2020/03/11/back-in-action-clarity-lims/)

## Ordering information

Product	Catalog no.
BaseSpace Clarity LIMS Professional Annual Subscription	20042028
BaseSpace Clarity LIMS Professional One-Time Onboarding	22042030
BaseSpace Clarity LIMS Enterprise Annual Subscription	20042029
BaseSpace Clarity LIMS Enterprise One-Time Onboarding	20042030