Agilent Case Study: 4200 TapeStation system

# Enabling Quality and Sustainability in High-Throughput Short-Read Sequencing at the Wellcome Sanger Institute

## Driving discovery through scalable genomics

Understanding biology at its most fundamental level has the potential to reshape how we approach human health, disease, and the environment. This belief sits at the heart of the Wellcome Sanger Institute's mission: to apply and explore genomic technologies in order to advance biological understanding and improve health. Through an open and collaborative approach to science, the Institute brings together diverse expertise and advanced technologies to support improved healthcare, economic growth, and responsible stewardship of the planet.[1]

Conducting genomics research at this scope requires both scientific depth and operational rigor. The Institute's programs span human genetics, generative genomics, and planetary biology, producing large, complex datasets that must meet high standards of quality and reproducibility. To support these efforts, the Wellcome Sanger Institute has built an infrastructure designed for scale, enabling researchers to move efficiently from sample to data to biological insight.

Within this environment, the short-read sequencing (SRS) department plays a critical role. Liz Easthope, team lead in the department, oversees the group responsible for high-throughput library preparation for SRS platforms. While other teams focus on DNA workflows, Liz's team specializes in RNA-based library creation and supports specialized applications such as laser capture microdissection and biopsy libraries. These sequencing-ready libraries underpin research projects across the Institute.

Liz Easthope and fellow researchers in the lab at the Wellcome Sanger Institute with Agilent TapeStation systems, enabling quality control for sequencing workflows.

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## Meeting high-throughput demands with automation

Operating as a high-throughput service lab places demands on both workflow efficiency and quality control (QC). At peak capacity, the SRS lab can generate up to 15,000 libraries per week, with work performed in 96- and 384-well plate formats.

To achieve this level of output, the team relies heavily on automation in its workflows. Central to daily operations is the Agilent Bravo NGS platform. "We have a significant number of Agilent Bravo NGS platforms," Liz said. "We use them every day for our library creation." The Bravo NGS automates key sample preparation steps such as end repair, A-tailing, and adaptor ligation, which is then followed by amplification and clean-up prior to pooling.

Until this stage in the workflow, the primary focus is quantitative measurement to confirm that concentrations fall within required ranges. Once libraries are pooled, however, qualitative assessment becomes essential. "Up until that point, we mainly do quantitative checks," Liz explained. "Once the pools are made, that's when we must look at quality to make sure the shearing has worked properly and that there are no issues like primer dimers or other artifacts."

In a lab processing thousands of libraries each week, QC methods must be fast, reliable, and easy to scale.

## Ensuring data integrity before sequencing

In the past, the team relied on the Agilent Bioanalyzer system for their QC. "We've been using the Bioanalyzer for decades, right from when it first came out," Liz noted. "It's worked well for us." However, with the end of production of the Bioanalyzer instrument, the team reviewed how best to maintain the same level of confidence in sample quality within a modern, high-throughput environment. This step marked the transition from the Bioanalyzer to the Agilent TapeStation system.

To meet these requirements, the team upgraded from the 2100 Bioanalyzer to the Agilent 4200 TapeStation system for routine nucleic acid quality assessment. The TapeStation system enables rapid, standardized assessment of pooled libraries, delivering insight into fragment size, quantity, purity, and overall sample integrity before samples progress to sequencing. For Liz and her colleagues, this step serves as a vital checkpoint in a highly streamlined workflow.

Furthermore, sequencing is one of the most expensive stages of the genomics pipeline, and errors that go undetected due to inaccurate QC or quantification can have significant downstream consequences.

*"The last check on the TapeStation gives us the reassurance that everything upstream has actually worked as expected," Liz emphasized. "If sample quality or quantification isn't determined correctly, it can lead to expensive mistakes, such as repeating lanes of sequencing—which gets quite costly."*

**– Liz Easthope**

Beyond cost, inadequate QC can compromise sequencing performance, leading to higher duplicate rates and reduced data quality. "It's really important for us to get that quantification and quality right," Liz added. "Otherwise, it can affect the data that our researchers receive at the end."

## Improving turnaround time without compromising quality

Since transitioning to the 4200 TapeStation system, the SRS team has experienced clear operational gains. One of the most immediate impacts has been time savings. In a high-throughput environment, even small efficiencies at the QC stage quickly add up. "It's a much quicker process to follow than previously and the analysis is so much quicker as well," Liz said. "That time saving has really benefitted us and it's improved our turnaround time."

Streamlined analysis and intuitive software allow samples to move through the workflow more efficiently while maintaining consistency across runs. "The analysis package just pops up, and you can export the data straight away," Liz explained. "It's simple to use, and that really matters in a busy lab."

Lab personnel can also operate two TapeStation systems connected to the same computer, allowing Agilent ScreenTape devices to be shared between instruments. “If we have a used ScreenTape, we can use it on either of the systems that we have,” Liz said. This flexibility helps maximize instrument use and minimize delays during peak workloads. “It’s very user-friendly. You can easily see which lanes on the ScreenTape have been used and the location of the samples,” she noted. “And because the analysis opens in a separate program, you’re much less likely to accidentally disrupt someone else’s run.”

## Reducing waste for greener operations

Besides improving lab efficiency, sustainability and the efficient use of consumables are also important for the day-to-day operations. Sample numbers can vary widely from plate to plate. “When we’re pooling a plate, sometimes we’ll have one pool, other times five.”

Agilent ScreenTape devices allow users to load and analyze samples as needed, avoiding unnecessary disposal of partially used consumables.

*"It’s really important to consider sustainability and try to reduce both environmental and financial waste. The TapeStation system has enabled us to reduce waste and be more cost effective than before, so we’re able to operate in a more sustainable way.”*

– Liz Easthope

The result is a QC process that supports scale and data quality while aligning with the Institute’s long-term commitment to sustainable, high-impact science.

## Adapting workflows for the future of genomics research

As genomics research continues to evolve, flexibility remains central. The SRS team prioritizes expanding scientific capability on trusted, well-established technologies that offer ease-of-use, operational reliability, and the adaptability required to support diverse applications.

“The platforms that we use for all of our library creation are really quite adaptable,” said Liz. “We have many new programs written on them regularly.”

Agilent TapeStation systems are certified with the My Green Lab ACT EcoLabel, which offers third-party audited transparency into the instrument’s environmental footprint. By clearly outlining key impact metrics, the label helps laboratories make informed choices about the tools they use.

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This adaptability allows for quick responses to emerging research needs. Recently, Liz and her team launched a new workflow that generates multiple layers of biological insight from a single sample. “We’ve just launched a new process where we can generate whole-genome, transcriptome, and methylation data all from one sample,” she explained. “And, of course, we’re using those same platforms.”

Rather than limiting innovation, the stability of the lab’s core technologies supports scientific creativity. “We’re creating and changing the science that we’re doing just by writing new programs on our platforms—and that’s really powerful.”

As a service-driven lab, priorities are shaped by the needs of the researchers across the Institute. “All of our researchers are trying to stay world-leading in science,” Liz concluded. “We must keep up with them and modify our processes to continue to provide the right data for their analyses.”

By combining adaptable automation, scalable sample QC solutions, and a strong commitment to data quality and sustainability, the lab is well positioned to support the Wellcome Sanger Institute's mission and deliver reliable, high-quality genomic data as scientific questions grow ever more complex.

## References


1. Wellcome Sanger Institute, “Wellcome Sanger Institute,” accessed March 31, **2026**, https://www.sanger.ac.uk/


Learn more about Agilent TapeStation systems:
www.agilent.com/genomics/tapestation


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